EPNS
Mini symposium
EPNS symposium: Genetic movement disorders in children

Genetic movement disorders in children
M. Willemsen1, J. van Gaalen1, D. Sival2
1Radboud University Medical Center, NIJMEGEN, The Netherlands
2University Medical Center Groningen, GRONINGEN, The Netherlands

Pediatric movement disorders compromise a group of acquired and genetic motor disorders with a wide phenotypic spectrum and a broad range of possible therapeutic strategies (paramedics, devices, drugs, orthopedic and neurosurgery) that can be applied. During this symposium on genetically determinant movement disorders, we will first focus on clinical recognition (classification) and modern diagnostic work-up of these disorders as a group. Subsequently, we will concentrate on the ataxias, and discuss their diagnostic work-up and pathophysiology, as well as the ways to score the severity of the motor abnormality quantitatively. Finally, we'll provide an overview of the therapeutic approaches of ataxias, with a special emphasis on some of the rare recessive ataxias with disease-onset in childhood like ataxia telangiectasia and Friedreich ataxia.

IC-001
Instructional course
Morning session 1: IC 1 TEACH CVI: building a bridge between teachers/educators and health care professionals

TEACH CVI: building a bridge between teachers/educators and health care professionals working with children with cerebral visual impairment
E. Ortibus1, E. Janssens1, S. Sigurdardottir2, R. Cziker3
1KU Leuven, LEUVEN, Belgium
2State Diagnostic and Counselling Centre, KOPAVOGUR, Iceland
3The Icelandic National Institute for the Blind, Visually Impaired, and Deafblind, REYKJAVIK, Iceland

Objective
The overall objective is to increase knowledge of screening for, assessing and remediating Cerebral Visual Impairment (CVI) in order to improve literacy, defined in a broad way as "reading the world".

Learning objectives of the course
To give the audience insight in the way of screening for CVI and referring correctly for in depth evaluation by an expert team.
To give the audience resources to support their work in the assessment of CVI.
To give the audience teaching methodologies to enforce the child with CVI’s access to literacy

Target audience
Teachers/educators, clinical and educational psychologists, pediatricians, pediatric neurologists, ophthalmologists, optometrists, orthoptists...

Summary
In this interactive, ICF based, course, we will first overview the background of CVI and its classification as well as the definition and classification of literacy. Next, we will go over the screening and assessment tools that are available for detecting and diagnosing CVI, stressing the multidisciplinarity of the diagnostic process, including neuropsychological assessment, evaluation of functional vision and intelligence.
Finally, we will present the methodologies to enable these childrens’ access to literacy. This part of the session will be very practical and interactive.

Outline of the course
Els Ortibus, child neurologist: introduction, background of CVI and literacy (5’)
Els Ortibus, child neurologist: screening tools for CVI (15’)
Eva Janssens, clinical psychologist: neuropsychological assessment of CVI and intelligence testing (20’)
Solveig Sigurdardottir, developmental pediatrician: Functional vision assessment (20’)
Roxana Cziker, VI teacher, teaching materials for CVI children (20’)
Discussion with the audience (10’)

IC-002
Instructional course
Morning session 1: IC 2 Dystonia, spasticity and choreoathetosis: how to recognize, discriminate and measure them in cerebral palsy?

Dystonia, spasticity and choreoathetosis: how to recognize, discriminate and measure them in cerebral palsy?
E. Monbaliu1, J. de Cat2, B. Dan3
1KU Leuven, University of Leuven, LEUVEN, Belgium
2University Hospitals Leuven, PELENBERG, Belgium
Inkendaal Rehabilitation Hospital, Vlezenbeek, Belgium

**Objective:** This instructional course overviews definitions, classification, pathophysiology and clinical presentation of dystonia (D), spasticity (S) and choreoathetosis (CA) in cerebral palsy (CP). Participants will leave the session with an up-to-date clinical picture and a practical framework for recognizing and discriminating D/S/CA. The instructional course is built up as a practical and interactive session based on current scientific findings and illustrated with clinical cases.

**Learning objectives:**
- describe definitions and classification of D/S/CA
- understand the pathophysiology of D/S/CA
- recognize clinical characteristics of D/S/CA
- acquire a practical framework for discriminating and evaluating D/S/CA

**Target Audience:** medical doctors, therapists, kinesiologists, orthotists

**Summary:** Dystonia, spasticity and choreoathetosis predominate in spastic and dyskinetic CP but are present globally in 95% of individuals with CP. Over the last decade, consensus specific definitions, increasing insights in pathophysiology and measurements have been suggested. However, because D/S/CA are often simultaneously present in CP, clinical discrimination is often experienced as difficult and challenging. Yet, good recognition of the condition is vital for targeted medical interventions and rehabilitation in order to improve daily life activities and quality of life.

In the first part, participants will be introduced to the definitions and classification of D/S/CA. In the second part pathophysiology will be overviewed based on recent neuroimaging findings. In the third part clinical discrimination and measurement of dystonia, spasticity and choreoathetosis will be overviewed. In the final part, cases of D/S/CA will be interactively discussed.

**Outline:**
- 10 min: Definition & classification
- 20 min: Pathophysiology
- 20 min: Clinical discrimination and overview measurement
- 40 min: Clinical cases & discussion

---

**IC-003**

**Instructional course**

Morning session 1: IC 3 Can one have sex when having CP? Answering 121 queries to sex and Cerebral Palsy; how and when?

**Can one have sex when having CP? Answering 121 queries to sex and Cerebral Palsy; how and when?**

J.M.A. Verheijden, D.J.H.G. Wiggerink, L. Ketelaar

BOSK, UTRECHT, The Netherlands

**Objective**

Research shows adults with CP have an unmet need for information on sexuality related to CP. They have many challenges, but sex is still a taboo in rehabilitation. The project ‘121 queries and answers about Sex and CP’ provided information for people with CP and professionals. However, personal embarrassment brought all involved in a situation sex still is not being addressed.

**Learning objectives** The goal is to equip professionals to discuss sexuality in relation to Cerebral Palsy with people with CP. Participants will:

- Have insight in queries and answers that arise in adults with CP regarding sexuality
- Be able to use tools to discuss the various subjects
- Feel comfortable enough to actually talk about sexuality

**Target audience**

Professionals working with adults; adults with CP and parents.

**Summary**

Sexuality and its challenges when having CP is a taboo in rehabilitation. The goal of this session is breaking with this taboo based on information collected in the project, practical tools and awareness of personal hindrances.

**Outline of the course**

10 min - Introduction and theoretical background – D. Wiggerink

20 min - Presentation: ‘121 Queries and answers about sex and CP’ – J. Verheijden

30 min - PLISSIT model and discussing possibilities and practical tools to start talking about sexuality – D. Wiggerink

20 min - Interactive workshop creating awareness of conceptualisation of sexuality and personal hindrances in starting a discussion about sexuality – J. Verheijden, D. Wiggerink, Ketelaar

5 min – Taking home message
IC-004
Instructional course
Morning session 1: IC 4 'They silently live in terror...': Challenging Disruptive Sleep Wake Behaviours: How to Support Parental Caregiver Advocacy

'O.S Ipsiroglu, S. McCabe, M. Plant, L. Wiggs
1University of British Columbia, VANCOUVER, Canada
2Edith Cowen University, PERTH, Australia
3University of the West of England, BRISTOL, United Kingdom
4Oxford Brookes University, OXFORD, United Kingdom

Objective
To assist care providers in supporting parents/caregivers to advocate using various communication strategies for recognition and treatment of sleep disorders in children with neurodevelopmental conditions.

Learning objectives
Participants will learn to support parents/caregivers in creating evidence by:

1. Developing a shared language via interpretation of information provided by parent/caregivers
2. Utilizing patient/parent/caregiver-owned paper or electronic recording and monitoring concepts
3. Optimizing delivery of management by personalizing outcome measures

Target audience
Nursing, Allied Health and Medical Practitioners

Summary
Communication errors in chronic care management and knowledge gaps contribute to missed identification and management of sleep disorders (SD) in children with neurodevelopmental conditions. SD aggravate mental health problems and lead to a cascade of diagnoses and medication prescriptions; however, they are poorly recognized during routine clinical assessments. Moreover, screening for SD is not typically part of routine assessments. Training culture is daytime disorder-focused, which blocks screening, assessment and follow up of SD and therapeutic intervention options. Further, parents' understanding and definition of SD depends on how they have previously been informed.

Outline
"Creating a shared language" (10m): Nurse, psychotherapist, MP, will introduce the conceptual framework.
"They silently live in terror" (20m): Paediatrician, OSI, will present videos of challenging/disruptive sleep/wake-behaviours.
"Engaging in the home setting" Part 1 (20m): Occupational therapist, SMc will present on practical aspects of information gathering in the home.
"Engaging in the home setting" Part 2 (20m): Psychologist, LW, will present on how to apply behavioural therapy and engage parents.
Q&A (20m)

IC-005
Instructional course
Morning session 2: IC 5 Power training

Functional power training to improve walking capacity in young children with cerebral palsy. A new challenge?
L.F. van Vulpen, D. Kranendonk, S. Verberne, E.E.A. Rameckers
1Amsterdam Rehabilitation Research Center | Reade, AMSTERDAM, The Netherlands
2Reade, Center for rehabilitation and rheumatology, AMSTERDAM, The Netherlands
3School for Public Health and Primary Care (CAPHRI), MAASTRICHT, The Netherlands

Objective: This course provides a basic understanding of functional power training principles (high-velocity strength training in functional movements) and gives insights in the effects of this training method on the walking capacity and muscle strength. Personal experience of a parent and therapist is shared with the audience.

Learning objective of the course: To understand the value of functional power training for treatment of walking problems in children with cerebral palsy. To learn how this treatment method can be applied in clinical practice.

Target audience: Pediatric physiatrists, physiotherapist, researchers, parents of children with cerebral palsy.

Summary: Children with cerebral palsy (CP) have significantly impaired walking capacity because of their motor impairments such as spasticity, coordination problems, loss of selective motor control and muscle weakness. A common complaint in this group is reduced walking speed, distance and early fatigue during daily life activities. A key aspect of the decreased walking capacity in children with CP is lower-limb muscle weakness. Strength training programs are commonly used in clinical practice to improve walking capacity. There is, however, no evidence of its effectiveness in improving walking capacity. In this instructional course we will look at a new approach, functional power training, to improve walking capacity. We will discuss training method, measurements, results and experience of parents and therapists.

Outline of the course: Overview strength training (10 min), principles of high-velocity strength training (10 min),
interactive session about training method and demonstration (40 min), results (10 min), parent and therapist experience (10 min), discussion (10 min).

IC-006
Instructional course
Morning session 2: IC 6 When is a problem a problem? Evaluation of oropharyngeal dysphagia in preschool children with cerebral palsy

When is a problem a problem? Evaluation of oropharyngeal dysphagia in preschool children with cerebral palsy
K.A. Benfer¹, K.A. Weir², K.L. Bell¹, R.S. Ware², P.S.W. Davies¹, R.N. Boyd¹
¹The University of Queensland, SOUTH BRISBANE, Australia
²Griffith University, GOLD COAST, Australia

Objective
This workshop aims to facilitate participant discussion regarding the question “When is a problem a problem?” when considering evaluation of a child with OPD and CP.

Learning objectives of course
To identify the most effective measures for evaluating OPD in preschool children with CP (including clinical evaluation, cervical auscultation and videofluoroscopic swallow study).
To understand the health impacts associated with various subtypes and severity of OPD.
To understand the potential longitudinal progression of OPD in children with CP at 18 months, during this important period of feeding development (18-60 months).
To review the OPD intervention literature, discussing the application of evaluation data in selecting treatment targets.

Target audience
Clinicians involved in the management of dysphagia/ feeding difficulties (speech, occupational and physical therapists; dieticians; physicians), and those working in early intervention.

Summary
An understanding of the patterns of oropharyngeal dysphagia (OPD) across the full spectrum of CP (mild to severe) forms a critical foundation for planning feeding and nutritional management. Data based on the prevalence and patterns of OPD in a population-based longitudinal cohort of 179 children with CP assessed at 18, 36 and 60 months (with 438 data points) will be presented.

Outline of course
This interactive workshop centres around 3 longitudinal cases of children with CP and possible OPD (GMFCS I, III, V). It includes assessment results (clinical, and VFSS when available) from 18, 36 and 60 months.

IC-007
Instructional course
Morning session 2: IC 7 Transforming the healthcare of women with disabilities

Transforming the healthcare of women with disabilities
R. Byrne¹, D. Gaebler², E. Fowler³, S. Gray⁴
¹Cerebral Palsy Lanka Fundation, NEW YORK, United States of America
²Rehabilitation Institute of Chicago, CHICAGO, United States of America
³Center for Cerebral Palsy at UCLA, LOS ANGELES, United States of America
⁴Boston Children's Hospital, BOSTON, United States of America

Learning Objectives Identify the best practices and barriers to care that women with CP encounter when accessing gynecological care. Describe the best practices of reproductive life planning and pregnancy as they pertain to women with CP. Employ knowledge of best practices and adolescent health and transition with regard to females with CP. List the best practices and barriers in mammography for women with CP.

Purpose This course will increase the knowledge of attendees on these topics and inform them of methods that can be used to enhance care for women with disabilities.

Target Audience Healthcare providers involved with the care of women with CP and similar physical disabilities.

Course Summary This course will present the results of surveys distributed to women with disabilities and providers. Data from four pilot interventions will be presented. Disparities, best practices and interventions will be discussed on gynecological care, reproductive life planning, adolescent health and transition and mammography.

Course Format Introduction and Gynecological Care- Rachel Byrne, BA. Provide overview of project and case studies and overview of barriers to gynecological care, best practices and example patient checklists and educational tools (20 minutes)Reproductive Life Planning- Eileen Fowler, PhD Review of reproductive life planning, patient checklists and provider tools (20 minutes) Adolescent Health Susan Gray, MD Review of adolescent health and transition for females with CP (20 minutes)Deborah J. Gaebler-Spira, MD Best Practices/Barriers in Mammography. Review on best practices in mammography for women with CP. Example training module for technicians (20 minutes). Q&A
IC-008
Instructional course
Morning session 2: IC 8 Adolescents and Adults with Cerebral Palsy: Tales from the Clinic

Adolescents and Adults with Cerebral Palsy: Tales from the Clinic
E.A. Hurvitz1, M.D. Peterson1, W.M.A. van der Slot2, J.W. Gorter3
1University of Michigan, ANN ARBOR, United States of America
2Rijndam Rehabilitation, ROTTERDAM, The Netherlands
3McMaster University, HAMILTON, ONTARIO, Canada

Objective: To discuss diagnosis, intervention, and patient education for adolescents and adults with cerebral palsy (CP) using case examples
Learning Objectives: The learner will be able to:
Discuss common complaints of adolescents and adults with CP, and their interventions
Identify knowledge gaps common among these patients, and how to address them
Describe ways of encouraging greater participation in this patient group
Target Audience: Physicians, nurses, therapists
Summary: Adolescents and adults with cerebral palsy present with unique challenges. Along with treating pain, fatigue, constipation, arthritis, and other conditions, the physician must work on increasing independence and participation. Both clinicians and patients lack information on what to expect in the future for this patient group. In this course, we will present several case examples to illustrate medical care, health promotion, psychosocial counseling and other issues that arise in clinical practice. Each speaker will include information from their research findings and how they have informed practice. Dr. Gorter will also explain the new “6 F’s” and their use in the clinical setting.

Outline of the Course
Introduction (10 mins): Physiology and health promotion of adolescents and adults with cerebral palsy—Mark Peterson, PhD (moderator), Exercise Physiology
Common (and less common) medical issues in adults with CP (20 mins)—Edward A. Hurvitz, MD, Physiatrist
Bringing the 6 F’s into practice (20 mins)—Jan Willem Gorter, MD, Physiatrist
Conquering pain and fatigue with physical activity and other treatment options (20 mins)—Wilma van der Slot, MD, PhD, Physiatrist
Audience interaction (20 mins)

IC-009
Instructional course
Morning session 2: IC 9 Involving parents of children with disabilities as partner in scientific research, treatment and innovations

Involving parents of children with disabilities as partner in scientific research, treatment and innovations in rehabilitation care
K. van Meeteren1, C. Kroon2, M. Verdonk3
1University Medical Center Utrecht, De Hoogstraat Rehabilitation, UTRECHT, The Netherlands
2University of Amsterdam, AMSTERDAM, The Netherlands
3Bomenbos, AMSTELVEEN, The Netherlands

Objective
Creating awareness and providing tools for direct involvement of parents for better, more relevant research.

Learning objectives of the course
Being aware of and appreciate the added value of involving parents right from the start.
Acknowledging the benefits of communicating results in layman’s terms for implementing results and innovations.
Direct parent involvement in all phases leads to better focused research, more participants and culturally responsive results.

Target audience
Researchers, health care professionals and parents

Summary
For years, professionals have set the research agenda and have struggled to implement results and innovations without (or only minimally) consulting parents as partners. But, studies have shown that involving parents as partner in research, where relevant, improves the quality of the research and its outcomes. However, guidelines and good practices on how effective parent engagement can be achieved are lacking. Fortunately, the parents’ voice to be closely involved in research has become louder and researchers are acknowledging the positive impact of giving parents a bigger role. Parents are capable to inform, advise and be actively involved in research as an equal partner, which will be shown in an interactive workshop providing researchers tools to implement parent partnership in their own research.

Outline of the course
10 min - Introduction and theoretical background – Karen van Meeteren BSc, parent-researcher
20 min - Presentation: “Being the guinea pig or being a partner?” – Carmen Kroon MSc, psychologist
IC-010
Instructional course
Morning session 3: IC 10 The Hand Assessment for Infants (HAI); an introduction

The Hand Assessment for Infants (HAI); an introduction
L.K.S. Krumlinde-Sundholm1, L.E. Ek1, E. Sicola2, G. Sgandurra2, A. Guzzetta3, G. Cioni2, A.C. Eliasson1
1Karolinska Institutet, STOCKHOLM, Sweden
2IRCCS Fondazione Stella Maris, University of Pisa, PISA, Italy
3University of Pisa, Stella Maris Scientific Institute, PISA, Italy

Objective
The course will give an introduction to the concept and the construct of the new Hand Assessment for Infants (HAI), report evidence of psychometric properties as well as inform about the test administration and scoring.

Learning objectives
On completion of the course participants will be informed about:
- The concept and construct of the test
- The administration procedure and choice of toys for the test play session
- The test items and scoring criteria

Target Audience
Clinicians and researchers involved in treatment or follow-up of infants at risk of having a cerebral palsy.

Summary
The HAI is a new and unique assessment of hand function developed for infants in the age range 3-12 months old, who are at risk of developing cerebral palsy (CP). The HAI intends to be a diagnostic, and evaluative measure evaluating the degree and quality of goal directed actions for each hand separately and both hands together. These actions are elicited during play with selected toys. The outcome of the test renders a separate score for each hand, illustrating possible asymmetric hand use, as well as a measure of general upper limb ability. The HAI is scored on 17 items (12 unimanual and 5 bimanual) on a 3-point rating scale. Unidimensionality of the scale and excellent internal scale validity was demonstrated by Rasch measurement model analysis. The test is criterion referenced but age norms will also be available.

Outline of the course
Presentations and video demonstrations of cases. Interactive examples of scoring from videos.

IC-011
Instructional course
Morning session 3: IC 11 Reading and spelling instruction for children with physical and multiple disabilities who do not speak and use AAC

Reading and spelling instruction for children with physical and multiple disabilities who do not speak and use AAC
L.J.R. Theunissen1, J.J.W. van der Burg2
1Sint Maartenskliniek, UBBERGEN (NIJMEGEN), The Netherlands
2Radboud University Nijmegen, NIJMEGEN, The Netherlands

Objective
To present a practice-based procedure for reading and spelling instruction for children with physical and multiple disabilities who do not speak and use Augmentative and Alternative Communication (AAC).

Learning objectives of the course
- To understand the importance of literacy development for these children.
- To get an impression of a step-wise approach to reading and spelling instruction, tailored to the needs of these children.
- To gain knowledge about the theoretical background and the current evidence for this approach.

Target audience
Speech-language therapists, psychologists, remedial educationalists, teachers, parents, physicians

Summary
The acquisition of reading and spelling by children with physical and multiple disabilities who do not speak and use AAC often appears difficult. As a consequence, their participation and autonomy may be limited. At present, there is no detailed curriculum/intervention for reading and spelling for this population. We present a practice-based procedure for reading and spelling instruction with preliminary results from case studies.

Outline of the course
Jan van der Burg, psychologist: Present results of a survey on the current practice in reading and spelling instruction to children who do not speak and use AAC in Dutch special schools. (15min)
Loes Theunissen, speech and language therapist: Describe theoretical backgrounds and present the development
of a step-wise approach to reading and spelling instruction for this group. (15min)
Jan van der Burg: Present preliminary results of case studies. (15min)
Loes Theunissen: Give detailed (video) illustration of the practice based procedure for reading and spelling instruction to this group. (30min)
Questions and discussion. (15min)

IC-012
Instructional course
Morning session 3: IC 12 Strategies to Incorporate Mental Health Care for the Holistic Treatment of Patients with Cerebral Palsy

Strategies to Incorporate Mental Health Care for the Holistic Treatment of Patients with Cerebral Palsy
D. Linhares, J.P. Dutzkowsky, D.P. Roye, Jr.
Weinberg Family Cerebral Palsy Center at Columbia University Medical Center, NEW YORK, United States of America

Objective – To discuss the implementation of on-site integrated mental health care at the Weinberg Family Cerebral Palsy Center at Columbia University Medical Center.

Learning objectives of the course – At the end of this course, attendees will gain an appreciation of:
1. Importance of evaluating and treating the psychiatric health of patients with cerebral palsy (CP).
2. Tips and pitfalls of prescribing psychotropic medications to patients with CP.
3. Importance of a holistic approach to care for patients with CP.

Target audience – This course is applicable to clinicians (primary care, pediatricians, internists, psychiatrists, physiatrists, nurses) who care for patients with CP. Patients and their families will also benefit.

Summary – This instructional course focuses on treating mental health in patients with CP. This population has been severely neglected in mental health care despite reported prevalence of mental health issues as a common comorbidity of cerebral palsy. Due to the lack of evidence-based care in this area, we want to share our experiences in order to raise awareness of this important topic.

Outline of the course
- Our experience with implementing psychiatric services at the CP clinic. – 15 minutes. Presenters: Authors#1-3 (Psychiatry, Orthopedics)
  - Importance of multidisciplinary team approach for holistic care of patients with CP. – 10 minutes. Presenters: Authors#1-3 (Psychiatry, Orthopedics)
  - Effective management of mental health issues. – 10 minutes. Presenters: Author#1 (Psychiatry)
  - Balancing benefits and risks of psychotropic medications. – 20 minutes. Presenter: Author#1 (Psychiatry)
  - Case presentation of patient with CP and significant psychiatric health issues. – 20 minutes. Presenter: Author#1-3 (Psychiatry, Orthopedics)
- Questions and Answer Session – 15 minutes

IC-013
Instructional course
Morning session 3: IC 13 Self-management support in pediatric rehabilitation; from therapist to coach

Self-management support in pediatric rehabilitation; from therapist to coach
1Revalidatie Friesland, BEETSTERZWAAG, The Netherlands
2Erasmus University Medical Center, ROTTERDAM, The Netherlands
3BOSK, UTRECHT, The Netherlands
4VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands
5VU University Amsterdam, AMSTERDAM, The Netherlands

Objective
Introduction in supporting self-management and the coaching role needed

Learning objectives of the course
Participants will learn about self-management and self-management support and become aware of the accompanying change in role from therapist to coach.

Target audience: Professionals working in pediatric rehabilitation interested in enhancing their knowledge on supporting self-management and coaching.

Summary: In pediatric rehabilitation services self-management support is increasingly recognized as an essential aspect of successful interventions. Self-management support in light of the treatment process involves empowering parents and children for their own process of care and partnership between the individual and health care professional. In this, communication, mutual trust and respect take a central place. Coaching skills are competences that enable professionals to support the self-management skills of individuals to tune in to their individual needs and
Experiences from the Dutch LEARN2MOVE research program in children and young adults with Cerebral Palsy have shown the importance of a coaching role of professionals during the intervention. Based on contemporary literature and experiences of parents and rehabilitation experts an E-learning course has been developed focusing on improving professionals' knowledge of self-management support and coaching. The e-learning course will be demonstrated and used as a starting point for discussion about self-management support.

**Outline of the course:**

Via video fragments about care situations, opportunities and pitfalls of self-management support will be discussed. Participants will be invited to plenary share their opinions and ideas with regard to the statements and assignments they performed in groups together with parents.

---

**K-001 Keynote**

**Keynote 1: Christopher Morris - Involving families as meaningful partners in childhood disability research & prioritising research questions**

_Involving families as meaningful partners in childhood disability research & prioritising research questions_

_C. Morris_

University of Exeter Medical School, EXETER, United Kingdom

PenCRU (the Peninsula Cerebra Research Unit) is a childhood disability research group at the University of Exeter Medical School (http://www.pencru.org). Funding from the charity Cerebra and NIHR PenCLAHRC enables us to work in close partnership with parents of disabled children through our PenCRU Family Faculty and clinicians. We work in this way to produce, find and share research findings that are accessible, useful and relevant for those who want to use evidence to inform decisions about treatments, therapies and health services.

Public involvement in research is now commonly pursued across health research in the UK and many other countries. Public involvement is defined as doing research 'with patients and their carers' not 'on them', 'to them' or 'for them'. Doing research in this way often appears to have a positive impact on members of the public who get involved. Parents in our Family Faculty describe their being respected as experts and seeing their advice acted upon as empowering. We have found it changes the way we approach research as researchers.

One strategy to reduce avoidable waste in research is ensuring that the questions being researched are those most important to patients, carers and clinicians. The James Lind Alliance-British Academy of Childhood Neurodisability Research Priority Setting Partnership was led by PenCRU and supported by an active Steering Group. It involved young people, parent carers and clinicians in identifying and prioritising questions about the effectiveness of interventions. In an open survey, 369 people (40% of whom were not health professionals) submitted one or more suggestions for areas of future research. Following prioritisation, we published Top 10 and Top 25 lists of research topics, thus highlighting to researchers and research funders what families and the health professionals who work with them consider to be the right research questions. Subsequently this work led to substantial investment by NIHR, the main UK Government funder of health research, commissioning research on these topics.

Involving families in childhood disability research requires resources, planning and flexibility in the research team. A culture of institutional commitment and high level leadership helps to ensure that involvement is valued. Involving families is also incredibly rewarding and helps keep research real, and fun.

We will present examples of how families, principally parent carers, have been involved in all stages of the research cycle at PenCRU identifying issues, designing studies, interpreting the results and telling people the results and re-evaluating after completing projects. This presentation has been put together with several parents in the PenCRU Family Faculty.

---

**K-002 Keynote**

**Keynote 2: Richard Lieber - What is the matter with muscle in cerebral palsy?**

_What is the matter with muscle in cerebral palsy?_

_R. Lieber_

Rehabilitation Institute of Chicago, CHICAGO, United States of America

Spasticity, secondary to upper motor neuron lesion, can result in muscle contractures. We have studied the mechanics and biology of muscle from children with wrist flexion contractures secondary to Cerebral Palsy (CP).

Dramatic architectural changes are observed in these children whereby sarcomere lengths are dramatically altered relative to patients without upper motor neuron lesions. This suggests dramatic alterations in the regulation of muscle growth in these children. Biomechanical studies of isolated single muscle cells reveal an increased passive modulus and decreased resting sarcomere length suggesting alterations in the cellular cytoskeleton. Similar studies on small bundles of muscle fiber reveal an increase in the compliance of the extracellular matrix and a proliferation of endomyosial connective tissue. Thus, passive biomechanical properties of muscle from children with CP are dramatically altered in ways that are unparalleled by other altered use models. Expression profiling reveals a number of "conflicting" biological pathways in spastic
Specifically, this muscle adapts by altering processes related to extracellular matrix production, fiber type determination, fiber hypertrophy and myogenesis. We also obtained evidence that calcium handling is altered secondary to cerebral palsy and may be a significant component of this disease. These transcriptional adaptations were not characteristic of muscle adaptations observed in Duchenne muscular dystrophy or limb immobilization. Superimposed upon the dramatic biological and structural adaptations is a loss in the number of satellite cells that are located throughout the muscle. Even the remaining satellite cells have epigenetic changes that can dramatically influence our ability to rehabilitate these muscles. Taken together, these results support the notion that, while spasticity is multifactorial and neural in origin, significant structural alterations in muscle also occur. An understanding of the specific changes that occur in the muscle and extracellular matrix may facilitate the development of new conservative or surgical therapies for this devastating problem. Thus, there are a number of structural and biological defects in muscle from children with CP that must be addressed in order to relieve contractures and improve function.

**Literature References**
Smith LR, Chambers HG, Lieber RL. Reduced satellite cell population may lead to contractures in children with cerebral palsy. Dev Med Child Neurol 2013;55:264-270.

**K-003**
**Keynote**
**Keynote 3: Tim Theologis - Recent developments in clinical gait analysis used in the orthopaedic management of cerebral palsy**

**Recent developments in clinical gait analysis used in the orthopaedic management of cerebral palsy**
T. Theologis
Oxford Brookes University, Oxford University, Oxford, United Kingdom

Single-event multi-level surgery (SEMLS) in children with diplegic CP is guided by gait analysis and aims to correct all bone, joint and muscle deformities in one operation with one rehabilitation period. It is the most commonly used orthopaedic treatment for ambulant children with the condition. SEMLS evolved over the past 30 years to replace repeated episodes of limited surgery. The SEMLS treatment consists of a single episode of multiple operations all undertaken under the same anaesthetic. It aims to correct complex lower limb deformities and allow a comprehensive rehabilitation lasting 18-24 months. The treatment regimens, however, are not standardised and there are often major differences among the centres that undertake this treatment in patient selection, the choice of the specific surgical interventions to be used, the surgical techniques and post-operative rehabilitation. Despite its wide use, there is only weak evidence available in the medical literature on how effective SEMLS is in improving gait and function. There is also very limited information on the effects of SEMLS on quality of life as perceived by the patients and their families. Patient/parent satisfaction levels after SEMLS are unknown and often unpredictable: limited success, as measured by objective outcomes, can be accompanied by high levels of satisfaction and vice-versa. The outcomes usually used in the literature in this field (clinical examination, motor function scores, gait analysis) quantify body function but do not assess limitations in activities and participation. What previous literature has measured through objective scores of gait and function does not capture the whole picture. There is a clear need for patient based outcome tools that would capture these aspects of treatment effects and would help patient selection, leading thus to better outcomes, as perceived by the patients.

A new minimally-invasive technique has recently been developed in Oxford which causes less damage and scarring to the muscles and is quicker to perform. The aim of developing this type of treatment was to improve on the prolonged hospitalization and rehabilitation associated with this treatment. In contrast to conventional SEMLS children mobilise immediately after surgery. A pilot study found faster recovery, which reduces the burden on healthcare resources including length of hospital stay, extensive physiotherapy and repeat functional assessments. The preservation of tissue and lack of damage to muscles may produce long-term functional benefits and improvement in quality of life, however, the evidence on this is still lacking.

**K-004**
**Keynote**
**Keynote 4: Andrea Guzzetta - From activity to interactivity: finding the active ingredient of very early intervention**
Extensive studies in humans and non-human models suggest how early intersubjectivity is the foundation for emotional and cognitive development, not only in typical but also in atypical development. Mother’s as well as infant’s wellbeing are both necessary for a healthy development of early interactions and, in turn, for infant later outcome. For example, post-natal depression in the mother is known to have negative impact on both mother-infant interaction and later neurodevelopment of the baby. Similarly, adverse conditions in the baby, e.g. cleft lip and palate, affect early intersubjectivity and infant later emotional and cognitive outcome.

In babies with congenital brain damage it is unquestionable how early development of intersubjectivity is at very high risk. The ability to generate (transmit) and to recognize (receive) social stimuli is potentially disrupted in both components of the dyadic relationship, due to the physical wound in the baby and the psychological one in the parent. One of the main sensory channels, vision, that is active in newborns from the first hours and critical to connect with the physical and social environment, is generally affected, and holds the baby off from critical social cues. Profound pain and sense of discomfort during spontaneous, and therefore unavoidable, behaviours are further barriers to the accessibility of the baby to early interaction. For these and other reasons, congenital brain damage should be considered as a paradigmatic model of disruption of early interaction, and possible opportunities for focused intervention should be investigated.

Within this framework, we will review recent scientific findings on brain mechanisms supporting the interactive, motor and social processes of infant development. By focusing on the effects of specific sensorimotor and social experiences, we will evaluate the limits and potentials of intervention strategies centred on the promotion of early intersubjectivity to overcome the adverse effects of neonatal brain lesions.
Therefore, periodical evaluation of their ongoing psychological development is essential. Physicians should have knowledge about their developmental trajectory and pay attention to this during treatment.


http://www.nahetziekenhuis.nl: This website is based on research in the Pediatric Intensive Care Unit in which posttraumatic stress is reported by children and parents. The website provides information for children, parents and health care providers about medical traumatic stress.

http://www.hetouderkompas.nl: This website provides information around 8 themes to help parents and children to achieve optimal support for children and adolescents who grow up with a chronic disease. It addresses the importance of family and peer support, and includes information on the impact of chronic illness on relationships, personal development, and health care providers about medical traumatic stress.

In several case reports we described patients with intractable seizures. In our department we have developed several interventions to prevent psychosocial problems of children and family members. In the advent of MRI in the eighties in medicine has revolutionized the leukodystrophy field, allowing in vivo visualization of the white matter abnormalities. It soon became clear that different leukodystrophies have different patterns of preferentially involved brain structures. We developed MRI pattern recognition, based on this observation. MRI pattern recognition has become the central tool in the diagnostic process of leukodystrophies, facilitating the diagnosis in known disorders and allowing definition of novel disorders.

Vanishing white matter (VWM) has been identified as a novel leukodystrophy in the early nineties and defined by us by MRI criteria. MRI shows extensive cerebral white matter abnormalities with progressive white matter rarefaction and cystic degeneration. There are radiating stripes of better preserved tissue strands within the affected white matter. Using MRI criteria, we selected patients for a genetic linkage study. VWM is relatively prevalent in the eastern part of the Netherlands. In the genetic linkage study we focused on families from this area, because we suspected a founder effect. Using these families we found a locus on chromosome 3q27. Mutational analysis of genes in the candidate region revealed mutations in the gene EIF2B5, encoding the e-subunit of eukaryotic initiation factor B (eIF2B). eIF2B consists of 5 subunits, encoded by 5 different genes. A second set of families came from the southern part the Netherlands and for these families we found linkage with a locus on chromosome 14, where EIF2B2 is located, encoding the b-subunit of eIF2B. In the end, we found that mutations in all 5 genes EIF2B1-5, encoding subunits α-ε, lead to the same disease, VWM.

We made a database of all patients for whom we provided genetic confirmation and started a natural history study. Recent analysis of results on 300 patients shows that VWM may occur at any age, from the antenatal period till adulthood, but most commonly has its onset between 2 and 6 years. The disease is chronic progressive with additionally episodes of major deterioration, provoked by stresses like febrile infections and minor head trauma. Such episodes may end in coma. Following an episode partial recovery occurs, although some patients die during a coma. Disease onset before 1 year is typically associated with death within a few months. Onset between 1 and less than 4 years is also a rapidly progressive disease, often with death within a few years. Onset from the age of 4 years or later is associated with a slower disease course and often death after decades.

Since we identified the genetic cause of VWM, we worked on the pathophysiology. We made a mutant mouse model that replicates the disease. Using these mice, we showed that astrocytes play a central role in VWM. We also showed that cellular stress responses are constitutively activated in VWM. For now therapy consists of avoidance of provoking stresses, symptomatic treatment and rehabilitation. We are working on different therapeutic modalities, including pharmaceutical treatment targeting cellular stress pathways, stem cell therapy and gene therapy.

**K-007**

**E-mental health interventions supporting The Needs of Children, Siblings and Parents in Pediatrics**

M.A. Grootenhuis

Princess Máxima Center for Pediatric Oncology & Emma Children's Hospital AMC, The Netherlands

Children growing up with a chronic or life-threatening disease are at greater risk for psychosocial problems than their healthy peers. Preventing and treating medical-related stress and chronic complications, and achieving the highest health-related quality of life (HRQOL) have become main goals of treatment nowadays. Providing psychosocial care to children and their families is indispensable, since psychosocial factors can have a significant impact on health and HRQOL.

Internet and e-mental health interventions have become more and more popular because they provide the opportunity to reach more children and family members. E-mental Health is defined as the delivery of health services and information through the internet and related technologies. For children the use of the computer and internet has become part of their daily life.

In our department we have developed several intervention to prevent psychosocial problems of children and family members. In several cases the effectiveness have been studied, and implementation has been evaluated. These e-mental health interventions are:

- **http://www.hetouderkompas.nl**: This website provides information around 8 themes to help parents find non-medical answers and tips, related to their child’s situation. Parents often have questions regarding finances, work, siblings or family matters. This website provides a source of reliable information and links to relevant websites.
- **http://www.nahetziekenhuis.nl**: This website is based on research in the Pediatric Intensive Care Unit in which posttraumatic stress is reported by children and parents. The website provides information for children, parents and health care providers about medical traumatic stress.
- **http://www.hetklikt.nu**: To achieve optimal support for children and adolescents who grow up with a chronic disease, physicians should have knowledge about their developmental trajectory and pay attention to this during treatment. Therefore, periodical evaluation of their ongoing psychosocial, educational, neuropsychological and vocational
needs during their developmental process should be an integral component of the comprehensive care of children and parents. This can be achieved by using the portal in which PROs can be filled in and are provided to the health care providers http://www.opkoersonline.nl: this online chat group intervention focuses on teaching active use of coping skills to adolescents and parents during weekly sessions. The background, development and research about effectiveness about these applications will be discussed.

MS-001
Mini symposium
Morning session 1: MS 1 Enabling activity and participation of children with complex and Intensive support needs

Enabling activity and participation of children with complex and Intensive support needs; results of the European Enablin+ project
J. Lebeer1, M. Rodocanachi2, M. Nijland3, C. Plivard4, A.M. Dal Brun5, A.M. Boutin6, A. Araújo Candeias5, R. Orban6, E. Batiz6, E. Houot7, M. Grégoire7, H. Neerinckx8, B. Schraepen1, Z. Atanasova9, N. Yoncheva9

1University of Antwerp, WILRIJK, Belgium
2Fondazione Don Gnocchi, MILANO, Italy
3Quality of Life Centre, WIJHE, The Netherlands
4CESAP Centre d'Etudes et de Soins auprès des Polyhandicapés, PARIS, France
5University of Evora, EVORA, Portugal
6Babes-Bolyai University, CLIJU-NAPOCA, Romania
7ASFA, ST. DENIS, Reunion
8Catholic University of Leuven, LEUVEN, Belgium
9Karin Dom Centre, VARNA, Bulgaria

Objectives
To present the results of the European Enablin+ Project, oriented at training to deal with children and youngsters (0-25) with complex and intense support needs (CISN), including children with PIMD (profound intellectual and multiple disabilities) and “polyhandicap”

Summary
The ENABLIN+ project (1/1/2014 - 30/4/2017 http://www.enablinplus.eu) was supported by the EU Leonardo Life-Long Learning Programme. The project’s goals were to develop in-service interprofessional training based on the principles of the UN Convention for the Rights of People with Disability, Quality of Life paradigm and Nussbaum’s capability approach, oriented at awareness raising, optimizing staff attitude, mindsets and skills with respect to enhancing communication, daily life activities, behaviour regulation, health promotion, activation and participation in learning and inclusive schooling. Its core partners are academic training institutions, expert centres and service centres from Belgium, France, the Netherlands, Romania, Réunion Island, Bulgaria, Italy and Portugal. We did a families’ and professionals' needs assessment study; a search for examples of good practice responding to criteria of QoL and continuity of support; we developed a common core training and training materials (book & DVD), which were piloted in some EU countries.

Outline of the symposium
Presentation of Enablin+ project’s results
Assessment of needs of children and families with CISN
A model to integrate research, assistance and care in Rett syndrome in Italy
Pain management & other health issues in children
Good practices enabling inclusive schooling of children with CISN in some EU countries
Enablin+ interprofessional training proposal & results of pilot trainings
Parent’s testimonials
Discussion

MS-002
Mini symposium
Morning session 1: MS 2 Stepping into the future with knowledge mobilization in childhood disability across the world

Stepping into the future with knowledge mobilization in childhood disability across the world: Experiences in stakeholder engagement from four organizations.
T.N. Nguyen1, M. Ketelaar2, J.W. Gorter1, I. Novak3, C. Morris4, L. Rijpstra5
1McMaster University, HAMILTON, Canada
2De Hoogstraat Rehabilitation, UTRECHT, The Netherlands
3Cerebral Palsy Alliance, The University of Sydney, SYDNEY, Australia
4University of Exeter Medical School, EXETER, United Kingdom
5BOSK, UTRECHT, The Netherlands

Learning objectives
To learn from the experiences of researchers and stakeholders about knowledge mobilization (KM) and engagement in childhood disability globally.

To learn about strategies to promote best practices, frameworks, pitfalls and values for KM at Cerebral Palsy Alliance Australia, PenCRU United Kingdom, CanChild Centre for Childhood Disability Research, and CP-Net Netherlands

**Summary**

Effective KM ensures individuals with disabilities and their families benefit optimally from advances in healthcare through research that addresses issues of importance for them. The aim of this mini-symposium is to provide an opportunity to learn from the experiences of researchers and stakeholders (individuals with disabilities, parents, providers, and policymakers) regarding efforts and strategies in KM of four organizations that have guided their research and influenced practice. This symposium will be beneficial for researchers and stakeholders interested in KM.

**Outline of the symposium**

**Introduction and background, participants (Tram; 10 minutes)**

Introduction of researchers and stakeholders

**Overview of mini-symposium content (format, learning objective, etc.)**

**KM in research: Sharing experiences (Nguyen, Ketelaar, Gorter, Novak, Morris; 60 minutes)**

Presenters will take turns presenting about efforts and strategies for KM and stakeholder engagement within their research group

Participants will discuss results for best practices, values, barriers, effective engagement strategies, and frameworks for KM based on their experiences

**Discussion with audience (All presenters; 20 minutes)**

Questions and take home messages

---

**MS-003**

Mini symposium

**Parallel session 1: MS 3 Muscle: the end organ in cerebral palsy**

**The End Organ in Cerebral Palsy**

A.P. Shortland, R. Lieber, J.J. Noble, M. Gough

1Guy's & St Thomas' NHS Foundation Trust, LONDON, United Kingdom

2Rehabilitation Institute of Chicago, CHICAGO, United States of America

**Objectives:**

To detail changes in muscle function at the molecular, cellular and organ level in individuals with cerebral palsy (CP).

To explain altered muscle development in terms of the original cerebral injury and subsequent motor and sensory development.

To propose and support an explanation of the loss of mobility in adolescence and adulthood in CP based on an altered trajectory of musculoskeletal development.

**Summary:**

A child enters the clinic room with her parents. She has cerebral palsy (CP). She walks unsteadily on her toes. Her parents are worried about her independence as an adult. Her doctor considers the factors that will determine her future mobility.

It is widely acknowledged that the extent and severity of the original brain injury in CP influences early neurological development. However, the acquisition of motor milestones, the development of functional movement and the maintenance of physical function in adulthood also depends on the properties of the musculoskeletal system, and particularly on skeletal muscle. In this symposium, we will attempt to integrate current knowledge in the area of muscle development in individuals with CP, and propose an explanation for the loss of mobility in adulthood.

**Outline:**

Presentations: 4x15 + 30 minutes discussion. Multidisciplinary panel including clinical imaging specialists, an orthopaedic surgeon and a muscle physiologist. Each member of the panel has contributed to the academic literature and they will provide a journey from the bench to the bedside with insights into the effects of surgery and medication on muscle development.

---

**MS-004**

Mini symposium

**Parallel session 1: MS 4 Mirror movements or not: should we care?**

**Mirror movements or not: should we care?**

I.M. Zielinski, B. Steenbergen, C. Simon-Martinez, K. Klingels, M. Staudt, C. Adler, E. Jaspers

1Radboud University Nijmegen, Nijmegen, The Netherlands

2Radboud University Medical Center, Nijmegen, The Netherlands

3KU Leuven, LEUVEN, Belgium

4Schön Klinik Vogtareuth; Clinic for Neuropediatrics and Neurorehabilitation, Vogtareuth, Germany

5ETH Zürich, ZURICH, Switzerland

---
Objectives
In typical development, mirror movements (MMs) gradually disappear during the first decade of life. Children with unilateral cerebral palsy (uCP), however, generally present with more pronounced and persistent MMs, especially during hand movements. Numerous studies have focussed on the underlying mechanisms and impact of these "pathological" MMs on upper limb function, though findings are not ubiquitous. The goal of this symposium is to give an overview of recent study results, to shed light on possible reasons of conflicting results, and to suggest directions for future (clinical) applications.

Summary
During this symposium, most recent work will be presented on the comparison of MMs between children with uCP and typically developing children, the relation between MMs and upper limb function in uCP, and the therapeutic implications of MMs in uCP. Furthermore, a novel quantitative assessment for MMs will be presented, the 'Windmill-task', and its relation with existing MMs assessments, its reliability, and clinical feasibility will be discussed. Finally, we will review the possibility of such quantitative assessments as a biomarker for assessing CST wiring in uCP.

Outline of the symposium
Theoretical background of MMs in typical development and uCP (Jaspers/Klingels)
Qualitative and quantitative measurements of MMs - introduction of the 'Windmill-task' (Steenbergen/Zielinski)
Comparison of MMs between typical development and uCP (Simon-Martinez)
The relation between MMs and upper limb function in uCP (Klingels)
MMs as a possible biomarker for CST wiring in CP (Jaspers)
Therapeutic implications of MMs in uCP (Staudt/Adler)

MS-005
Mini symposium
Parallel session 1: MS 5 Bumpy road, cooperation parents, health professionals, researchers

Going down a bumpy road together - drafting a roadmap to enhance cooperation between parents, healthcare professionals and researchers.
A.S. Loring1, K. van Meeteren2, S. Hilberink3, A. Parent Carer4, M. Homan5, M. Clem6, O. Verschuren7
1International Cerebral Palsy Society, BRENTFORD, United Kingdom
2University Medical Center Utrecht, De Hoogstraat Rehabilitation, UTRECHT, The Netherlands
3Applied Sciences Research Centre, ROTTERDAM, The Netherlands
4University of Exeter Medical School, EXETER, United Kingdom
5Experiential expert, HOOM, The Netherlands
6Association of People with Disabilities, UTRECHT, The Netherlands
7University Medical Centre Utrecht and Rehabilitation, UTRECHT, The Netherlands

Objectives
BOSK, Association of People with Physical Disabilities Netherlands, and ICPS International Cerebral Palsy Society acknowledge that most stakeholders who work with children with disabilities value partnership and co-production. However, many of them struggle to make this work in practice. We wish to draw together a diverse audience of people with disabilities, parents and professionals to consider two subjects, chosen by the BOSK parents, which they find of great concern and affect their daily lives. Processes that enable stakeholders to improve the impact of their work through cooperation, exchanging experiences, ideas, and sharing solutions together will be discussed.

Summary
Session 1 Involving people with disabilities and parents as meaningful partners in research.
This session will discuss collaborating in identifying research questions, writing protocols, being actively involved in "translating" research evidence into plain language and implementing the practical results.

Session 2 Encouraging and facilitating people with cerebral palsy to take part in sports.
Sport improves the well-being of all those who take part. Whether you do sport for fun or are a top-class paralympian, you rely on your supporting team where each member contributes their own expertise to achieve optimal results. This session focuses on these different roles, including aptitude, nutrition, training, attitude and sleep.

Outline of symposium
Each session will last 45 minutes thus giving ten minutes per speaker and 15 minutes disscussion. In copiling this programme attention has beern give to ensuring the participation of both parents and people with disabilities.

MS-006
Mini symposium
Parallel session 2: MS 6 The formula for health and well-being in individuals with cerebral palsy: physical activity, sleep and nutrition

The formula for health and well-being in individuals with cerebral palsy: physical activity, sleep and nutrition. From idea to practice
Objectives

The objectives of this mini symposium will be 1) to share information from the literature on physical activity and fatigue, sleep, and nutrition in individuals with cerebral palsy (CP), and 2) to demonstrate how this information can be implemented in a comprehensive manner in clinical settings.

Summary

Until now, physical activity promotion has been the main focus to optimize health in both clinical practice and research for individuals with CP. Given the heterogeneity of the disability, physical activity alone may not be enough for individuals with CP to improve health, specifically those more severely affected by CP. Together, physical activity promotion, consistent nutrition, and adequate sleep may form the formula to health and well-being in individuals with CP across the lifespan.

Outline

The first part (McPhee; 25 minutes) will present the findings pertaining to physical activity in children, adolescents and adults with CP. This presentation will also include the link between physical activity, fatigue and body mass index in young adults with CP. The second part (Verschuren; 25 minutes) will highlight/discuss the importance of proper nutrition and adequate sleep in individuals with CP. The implications of these behaviours on overall health and neurodevelopmental outcome will be discussed. The third part (Gorter; 25 minutes) will focus on knowledge translation into practice. Strategies for promotion of physical activity, and the inclusion of nutrition and sleep into clinical settings will be presented. In line with clinical recommendations, practical examples on healthy lifestyle promotion will be demonstrated.

Question time 15 mins

MS-007

Mini symposium

Parallel session 2: MS 7 Assessment of language comprehension in non-intelligible children with CP: The Future

Assessment of language comprehension in non-intelligible children with CP: The Future!

J.J.M. Geytenbeek¹, R.J. Vermeulen², A.I. Buizer³, K.J. Oostrom⁴

¹VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands
²Maastricht University, MAASTRICHT, The Netherlands

Objectives: The objective of this mini-symposium is to familiarize the audience with the theoretical background and etiology of language impairment in children with CP, to present state of the art measurement of spoken language comprehension in children with severe motor impairments, and to discuss parent and patient experience and implications for intervention programs. Summary: In the past years, our group developed the Computer-Based instrument for Low Motor Language Testing (C-BiLLT), a proven adequate and valid instrument for assessing spoken language comprehension in children who do not meet criteria for standardized language assessment. Using the C-BiLLT we found that white matter damage has an important role in language comprehension impairment in children with CP. We will discuss how MRI findings may contribute to the selection of early (communication) strategies. Outline of the symposium: J. Oostrom, PhD (clinical neuropsychologist): Theoretical background of communication disorders in children with CP (15 min.) J. Vermeulen, MD, PhD (pediatric neurologist): Pathophysiology of language disorders in children with CP (10 min.) J. Geytenbeek, PhD (speech language pathologist/clinical speech-language scientist): Does my child understand every word I am saying?: a professional & parent's perspective of a communication disorder (15 min.) Parent of a child with CP: How can my child participate best in daily communication? (10min.) A video presentation of language assessment in a non-speaking child with severe CP with "live" comment of the child being assessed (15min.) I. Buizer, MD, PhD (pediatric physiatrist): The role of language assessment in rehabilitation programs (10min.) Discussion with the audience (15min.)

MS-008

Mini symposium

Morning session 2: MS 8 Brain structure and Function in children with Cerebral Palsy: State of the Science

Brain structure and Function in children with Cerebral Palsy: State of the Science

R.N. Boyd¹, S. Fior², A. Guzzetta³, A.M. Pagnozzi⁴, K. Pannek⁵

¹The University of Queensland, SOUTH BRISBANE, Australia
²IRCCS Fondazione Stella Maris, PISA, Italy
³University of Pisa, Stella Maris Scientific Institute, PISA, Italy
⁴CSIRO, BRISBANE, Australia
⁵CSIRO, Australian e-Health Research Centre, BRISBANE, Australia

Objectives: This international multidisciplinary group will provide a scientific & clinical update on the evaluation of brain structure and function in children with Cerebral Palsy.

Summary: The Fiori semi-quantitative scale of brain lesion severity has reliability, validity (concurrent with dMRI)
and is related to gross motor, manual ability, communication, oropharyngeal dysphagia, school readiness and hip development. Complementarity of the Fiori scale and qualitative classifications of aetio-pathogenic categories (e.g. Krägeloh-Mann) will be discussed. Optimisation of the Fiori scale where scans will be quantitatively assessed in a fully automated fashion using the latest cloud computing technology will be presented.

Outline of the symposium:
Introduction (5mins)
Semi-quantitative sMRI scale for evaluating brain lesion severity in CP: application to clinical practice and practical demonstration (20mins SF)
Clinical utility of the Fiori scale (10mins RB)
Fully automated software platform for the quantitative assessment of periventricular white matter injury and cortical alterations as the next generation clinical decision support tools for CP (25mins AP).
Advanced Brain Imaging in CP: fMRI guided dMRI (15mins KP)
Panel discussion (15mins)

Key References:
Pagnozzi A et. al. Automated, quantitative measures of grey and white matter lesion burden correlates with motor and cognitive function in children with unilateral CP.

---

**MS-009**
Mini symposium
Parallel session 3: MS 9 PREMO Toolbox: Very Early Brain Structure and Function to predict Motor and Brain outcomes in infants born preterm

**PREMO Toolbox: Very Early Brain Structure and Function to predict Motor and Brain outcomes in infants born preterm.**
R.N. Boyd¹, S. Fiori², J. George¹, A. Guzzetta³, K. Pannek⁴
¹The University of Queensland, SOUTH BRISBANE, Australia
²IRCCS Fondazione Stella Maris, PISA, Italy
³University of Pisa, Stella Maris Scientific Institute, PISA, Italy
⁴CSIRO, Australian e-Health Research Centre, BRISBANE, Australia

**Objectives:** The mini-symposium will focus on the latest evidence and clinical applications of early brain development and outcomes in preterm born infants.

**Summary:** This multidisciplinary group will present the PREMO toolbox of early brain structure & function in infants born preterm. The team will present a clinically accessible valid and reliable sMRI scale of brain structure and growth at early (30-35 wks) and TEA in infants born <31 wks that predicts motor and cognitive outcome at 12 months. Relationships between brain structure and clinical assessments in the PREMO toolbox will be highlighted including: the General Movements assessment (GMs), Hammersmith Neonatal Neurological Examination (HNNE), NICU Neonatal Neurobehavioral Scale (NNNS), Test of Infant Motor Performance (TIMP) and visual assessment (Ricci). Serial advanced brain imaging macro/micro structural, volumetric, High Angular Diffusion Imaging (HARDI), quantitative T2 mapping, and perfusion imaging at 30 & 40 wksPMA will be presented. This multimodal approach has enabled the development of a PREMO toolbox of biomarkers linked to outcomes at 3,12 mths C.A.

Introduction (5mins RB)
Evaluation of early brain development in neonatal brain imaging: (20mins SF,AG);
Key elements of the PREMO toolbox: Relationships between very early brain structure and neuromotor, neurological and neurobehavioral assessments at 30 and 40 wks PMA (30mins JG)
Very early Advanced Brain Imaging in infants born preterm (20mins KP)
PREMO toolbox and fast tracking at risk infants to early interventions (Motor & Parenting) (10mins RB)
Panel Discussion (15 mins)

---

**MS-010**
Mini symposium
Parallel session 3: MS 10 Let's ride wheelchair skills training to stimulate participation

**Let's ride.... wheelchair skills training to stimulate participation**
M.A.T. Bloemen¹, K.J. van der Klooster², M.E. Sol¹, M. van der Krogt³
¹HU University of Applied Sciences Utrecht, UTRECHT, The Netherlands
²K-J Projects, Unlimited Abilities, MAARSSEN, The Netherlands
³Parent, ROTTERDAM, The Netherlands

**Objectives**
To explain the content, the first research findings and the parental perspectives of the newly developed wheelchair
skills training program for wheelchair-using children.

To discuss the potential benefit of this wheelchair skills training program in multidisciplinary pediatric rehabilitation.

**Summary**

Wheelchair-using children participate less than their ambulating peers in physical activity. Recent qualitative research analyzed both the children’s and parental perspectives of facilitators and barriers regarding participation in physical activity (first presenter, Bloemen). Several facilitators were identified, such as self-efficacy, role-models and wheelchair skills, which are addressed in the newly developed wheelchair skills training program for wheelchair-using children (second presenter, van der Klooster). The first qualitative and quantitative findings of this program are now available and show positive results (third presenter, Sol). Children and parents are overall very enthusiastic, not only about improving wheelchair skills, but also about learning how to be more independent and confident using a wheelchair in daily life (fourth presenter, van der Krogt). This multidisciplinary program offers major possibilities in pediatric rehabilitation (general discussion).

**Outline of the symposium**

General introduction (5 minutes).
First presenter: Bloemen, Clinical Health Scientist and pediatric physical therapist (15 minutes).
Third presenter: Sol, Rehabilitations Scientist and pediatric physical therapist (15 minutes).
Fourth presenter: van der Krogt, parent of a wheelchair-using child with spina bifida (15 minutes).
General discussion (20 minutes).<b/>

**Pain in cerebral palsy: implications, assessment and management**

D. Sharan, J.S. Rajkumar, J. Jose

RECOUP Neuromusculoskeletal Rehabilitation Centre, BANGALORE, India

**Objectives**

To understand the:
- Implications, prevalence, types, causes and risk factors
- Diagnostic strategies and clinical features
- Prevention
- Role of multidisciplinary management

of pain in persons with Cerebral Palsy (CP).

**Summary**

65 to 78% of persons with CP are reported by their caregivers to experience pain. Pain in persons with CP significantly impacts their participation in activities and quality of life, besides leading to impairments in body functions and structures, and difficulties in care giving. Pain in persons with CP is often under-recognised and under-treated. Due to cognitive impairments and difficulties in communication, assessment and effective treatment of pain in persons with CP remains challenging. This symposium will present an overview of the causes, assessment and diagnostic methods (objective and subjective), types of pain (nociceptive and neuropathic), clinical features, prevention and management strategies (pharmaceutical and non-pharmaceutical) of pain in persons with CP. Common causes of musculoskeletal pain such as hips displacement, muscle spasms, myofascial pain, metabolic bone disease, patellofemoral dysfunction and low energy fractures will be described. A sequenced, 4-phased, intensive, multidisciplinary, and multimodal rehabilitation approach will be discussed: Phase 1 (severe) – pain relief and re-activation, Phase 2 (moderate) – restoration of flexibility and oedema control, Phase 3 (mild) – strengthening and aerobic conditioning, Phase 4 (maintenance) – functional restoration. This symposium is directed at all medical and rehabilitation professionals who treat CP.

**Outline of the symposium**

Introduction, prevalence, causes: Jeena Jose (25 min)
Diagnosis and clinical features: Joshua Samuel (25 min)
Management: Deepak Sharan (25 min)
Discussion (15 min)

**Unilateral Cerebral Palsy: Intensive upper limb treatment modalities from 0 to 19 years in the Netherlands**

E.A.A. Rameckers¹, P.B.M. Aarts⁴, A. Verhaegh², B. Snijders⁵, M. Geerts³, M. Steenhoven¹, M. Helmus⁵, M. Dam⁵, N. Land⁶, A. Defesche⁷, Y.J.M. Janssen-Potten⁸, L. Speth⁹
Objectives To present the scope of intensive upper limb treatment possibilities in the Netherlands and the approach in the existing treatment modalities. To discuss with parents and participants about their experiences with these treatment modalities.

Target group PT, OT, parents, managers, researchers, physiatrists

Summary Evidence Based Intensive clinical upper limb treatments as CIMT, H-CIMT, BIMT, task-specific treatment without or after Botulinum Toxin-A are well organized in the Netherlands, especially in the Pediatric Rehabilitation Centers. Effects of these treatment modalities are proven on all levels of the ICF-CY and increasing evidence in different age area's is in progress. The pro and contra's for CIMT, H-CIMT, BIMT or the use of Botulinum Toxin-A led to different approaches in the Netherlands, however one aspect is overall respected, namely intensity of treatment during a restricted time area. The clinical reasoning (from treatment goals to intervention), the requirements in organization, the typical design (daycare, home based and camp), the experience of professional caregivers and the experience of the parents or ex-participants will be the main topics in this mini-symposium. The focus will be on three age groups: 0-4, 4-12, 12-19 y, mainly unilateral Cerebral Palsy.

Timeline 0-5 min Introduction (Rameckers MPPT) 5-25 min Intensive treatment from 0-4 y (Aarts OT, Verhaegh OT, Speth physiatrist, Janssen HMsc, parent) 25-50 min Intensive treatment from 4-12 y (Snijders OT, Geerts physiatrist, Steenhoven OT, parent) 50-75 min Intensive treatment from 12-19 y (Helms, Land physiatrists, Dam MSPT, Rameckers MPPT, Defesche OT, parent) 75-90 min forum discussion

MS-013
Mini symposium
Symposia: MS 13 Exercise and Musculoskeletal Health in Cerebral Palsy: Mechanisms to Prescription

Exercise and Musculoskeletal Health in Cerebral Palsy: Mechanisms to Prescription.
M.D. Peterson¹, L.A. Barber², S. Dayanidhi³
¹University of Michigan, ANN ARBOR, United States of America
²The Queensland University, BRISBANE, Australia
³Rehabilitation Institute of Chicago, CHICAGO, United States of America

Objectives
The purpose of this mini-symposium is to discuss current knowledge and new findings pertaining to the mechanisms of muscle and bone pathophysiology among individuals with cerebral palsy (CP), as well as the evidence for prescription of exercise for the preservation of musculoskeletal health throughout the lifespan.

Summary
Premature declines in function among adults with CP may occur as a result of early and accelerated muscle atrophy, decreased bioenergetics and reduced strength and anaerobic reserve, beyond that which is expected for typically-developed peers. Emerging evidence has revealed altered musculoskeletal growth and integrity during development and into adulthood among individuals with CP, thus placing them at heightened risk of frailty and chronic multimorbidity. This symposium will cover novel mechanisms of musculoskeletal pathophysiology in CP, with specific emphasis devoted to skeletal muscle mitochondrial function and energy requirements for exercise, bone density and marrow adiposity profiles, and muscle quality and growth patterns. Adaptations to exercise interventions and specific exercise prescription recommendations will be addressed.

Symposium outline
Mark Peterson, Ph.D. - 20minutes
- Risk factors for chronic disease and multimorbidity in CP.
- Bone density and marrow adiposity profiles among children with CP.
Lee Barber, Ph.D. - 25minutes
- Trajectories of skeletal muscle development among CP subtypes
- CP exercise training: Adaptations and prescription for musculoskeletal health
Sudarshan Dayanidhi, Ph.D. - 25minutes
- Skeletal muscle mitochondrial function in CP
- Energy considerations for rest and exercise participation in CP
Open forum Q&A, 15-20minutes
- Strategies for preservation of musculoskeletal health in CP
- Potential mechanistic targets for future trials

MS-014
Mini symposium
Symposia: MS 14 Mental Health and Well-Being of Patients with Cerebral Palsy and Their Families

Mental Health and Well-Being of Patients with Cerebral Palsy and Their Families

Weinberg Family Cerebral Palsy Center at Columbia University Medical Center, NEW YORK, United States of America

Objective – To discuss the interplay of social and physical factors in affecting the mental health and well-being of patients with CP and their families.

Summary – Children and adults with CP are identified to have psychiatric disorder as high as 25-57% as opposed to 12-15% in the general population. Increasing evidence shows that mental and social factors directly and intricately contribute to disease outcomes. The multidisciplinary expert panel will provide critical information on the current neglect of mental and social health, despite much higher reported prevalence of psychiatric symptoms in CP.

Outline of the course
A family’s experiences (10 minutes) - Shelby Nurse (Patient with CP) - Tom Nurse (Father of Shelby and an advocate for individuals with disabilities)

Common psychiatric comorbidities, evaluation and treatment (15 minutes) - Daniel Linhares, MD (Psychiatrist)

Effect of repetitive surgeries (10 minutes) - David P. Roye, MD (Orthopaedic Surgeon)

Well-being measured by Patient Reported Outcome — PROMIS (10 minutes) - Hiroko Matsumoto, PhD (Epidemiologist)

Families’ mental health and well-being (15 minutes) - Tracy Pickar, MSW (Social Worker)

Participation and activities for mental health and well-being (15 minutes) - Jan Willem Gorter, MD (Physiatrist)

Discussion (15 minutes)

MS-015
Mini symposium
Morning session 3: MS 15 A Global Perspective on Childhood Disability

A Global Perspective on Childhood Disability: Symposium on the unprecedented opportunities to make a difference in the lives of children with disabilities through a new collaborative professional network
H. Forssberg
Karolinska Institutet, STOCKHOLM, Sweden

Objectives:
1. Provide an update on global efforts and priorities for children with disabilities, with special emphasis on the first years of life
2. Describe the International Alliance of Academies of Childhood Disability (IAACD) and its global efforts.

Summary There is increasing international recognition of the importance of early childhood development (first 1000 days), but insufficient recognition of, or action to include, children with disabilities in these efforts. IAACD can play an important role in these emerging efforts.

Outline The United Nations’ Sustainable Development Goals (2015-2030) promote early childhood development (ECD) for all children, including the “most vulnerable”. This session will introduce (i) recent international initiatives on ECD, (ii) the new UNICEF-WHO collaboration with the World Bank to launch a global initiative to improve the life conditions for all children, and (iii) the potential role of IAACD in ensuring that all children with disabilities are included in these efforts. We will provide an update on the founding and activities of the IAACD, including establishment of new Academies in several continents. We will report from the Global Professional Education Programme (GPEP) Committee that has engaged nearly 1000 colleagues (94 countries) who shared their perceptions and needs. GPEP aims to promote high quality evidence-informed global teaching/training, and has proposed the creation of an accessible ‘curated library' of materials that will include concept papers about issues in disability, teaching materials for students and colleagues, measures and other open-access tools, urls (or videos) of keynote lectures, etc. We invite all to join these efforts.

MS-016
Mini symposium
Parallel session 4: MS 16 Enablers and challenges to inclusion and access to services for disabled children and young people in times of austerity

Enablers and challenges to inclusion and access to services for disabled children and young people in times of austerity: The experiences of families and professionals across Europe (EACD survey)
R. Dew, K. Horridge, A. Chatelin

British Academy of Childhood Disability, SUNDERLAND, United Kingdom

Member of steering group of EACD, La Fondation Mortrice, Paris, France

Objectives
The EACD want to make visible the experiences of families with disabled children and young people across Europe in times of austerity and the experiences of professionals who provide services for them.

**Summary**

Information will be presented about:

- Positive experiences and enablers of inclusion in everyday activities
- Challenges and barriers to inclusion in everyday activities
- Positive experiences and enablers of access to services and support
- Challenges and barriers to access to services and support
- Direct experience by families of impact of austerity cuts
- Indirect impact on families of impact of austerity cuts on the services their disabled child or children need

Information from each country will be presented in the context of the services and supports that are available.

**Outline of the symposium**

The findings of the surveys of professionals and families across Europe will be presented. There will be opportunities for audience participation in discussions about how EACD may best advocate for disabled children, young people and their families using the findings of the surveys as levers for positive change.

**MS-017**

Mini symposium

Parallel session 4: MS 17 Everything about us with us! Adolescents with cerebral palsy sharing their participation experiences

'Everything about us with us!' Adolescents with cerebral palsy sharing their participation experiences in society and in research

D.W. Smits¹, M. Willems-Op het Veld², S.C. Wintels¹, A. van der Leest³, L. Sluiter³, J. Water³, D.J.H.G. Wiegerink²

¹De Hoogstraat Rehabilitation, UMC Utrecht, UTRECHT, The Netherlands

²BOSK, UTRECHT, The Netherlands

³Adolescent-ambassador in research project Participation in Perspective, UTRECHT, The Netherlands

**Objectives:**

Adolescents with cerebral palsy (CP) share their experiences about participation in society

Adolescents with CP, their patients-association, and researchers share their experiences about collaborating in a research project

Discuss how to collaborate in research that focuses on experiences of adolescents with CP

**Summary:**

There is an increasing interest in participation in society of adolescents with a childhood disability such as CP. However, if we aim for truly understanding and optimizing their participation in society, it is necessary that adolescents with a disability are the starting point and that we let them speak. To achieve this, research projects in which the adolescents themselves play an active role are important. In this mini-symposium, adolescents with CP, their patients-association and researchers – working together in a participatory research project (http://www.perrin.nl/pip) – will share and discuss experiences. Two themes will be key: 1) personal experiences of adolescents with CP about participating in society, and 2) results of collaboration in our research project, that focuses on the participation domains school, sports and healthcare.

**Outline of the symposium:**

Introduction [5 minutes]: Diana Wiegerink (project manager at BOSK and clinical psychologist)

Sharing experiences about participation in society [20 minutes]: Anna van der Leest, Lauren Sluiter and Jesse van der Water (adolescents with CP)

Sharing different experiences about our participatory research [30 minutes]: Dirk-Wouter Smits (researcher), Marike Willems-Op het Veld (project manager at BOSK), and some of the adolescent-ambassadors involved in our research

Interactive part (30 minutes) with audience and presenters

Closing [5 minutes]

**OP-001**

Oral presentation

Parallel session 1: OS 1.1 Premature Brain

**White matter pathways of altered connectivity in dyskinetic cerebral palsy and their relation to clinical functions: a connectome-based study.**

J. Ballester-Plané¹, R. Schmidt², O. Laporta-Hoyos¹, E. Vázquez³, I. Delgado³, L. Zubiaurre-Elorza⁴, A. Macaya⁵, P. Poo⁶, E. Toro³, M.A. de Reus², M.P. van den Heuvel², R. Pueyo⁷

¹University of Barcelona, BARCELONA, Spain

²Brain Center Rudolf Magnus, University Medical Center Utrecht, UTRECHT, The Netherlands

³Hospital Universitari Vall d’Hebron, BARCELONA, Spain

⁴Facultad de Psicología y Educación, Universidad de Deusto, BILBO-BIZKAIA, Spain

⁵Harvard Medical School, Boston, MA, USA

⁶University of California, San Francisco, CA, USA

⁷University of California, San Francisco, CA, USA
This Early MRI scoring system is associated with motor outcomes at 12 months corrected age. Prediction of later development III (Bayley III) and Neurosensory Motor Developmental Assessment (NSMDA). Multivariable regression analyses included social risk and sex as covariates.

Results
Early MRI global scores were negatively associated (higher MRI scores indicate greater brain abnormality) with Bayley III motor (regression coefficient β=1.26; 95% confidence interval CI=2.36, -0.16; p=0.03) and NSMDA (β=1.72; 95%CI=3.17, -0.28; p=0.02), deep gray matter scores negatively associated with Bayley III motor (β=5.80; 95% CI=9.57, -2.03; p=0.01) and NSMDA outcomes (β=5.87; 95%CI=10.95, -0.80; p=0.02), and cerebellar scores negatively associated with NSMDA outcome (β=5.96; 95%CI=11.82, -0.11; p=0.046). Results were reconfirmed at TEA MRI.

Conclusion
This Early MRI scoring system is associated with motor outcomes at 12 months corrected age. Prediction of later motor outcomes is possible with early structural MRI.
Twelve-years-old children born after FGR with evidence of brain sparing do not have behavioral-, educational-, and neurocognitive problems above the population risk


1 Academic Medical Center, AMSTERDAM, The Netherlands
2 VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands

Introduction: Fetal growth restriction (FGR) has been associated with adverse behavioral and academic outcomes in childhood. Poor neurocognitive functioning has been suggested as well.

Aim: To study behavioral-, educational-, and neurocognitive outcomes (IQ, executive functions, attention) in 12.5-years-old children born FGR with evidence of brain sparing.

Patients and methods: Children born FGR to mothers with severe early hypertensive pregnancy disorders (n=96; mean gestational age 31.9 weeks, mean birthweight 1341 grams, mean ratio of the umbilical and middle cerebral artery 1.42) and a term comparison group with birthweight >2500 grams (n=35). Outcome measures: parent reported behavioral and educational outcomes, neurocognitive outcomes collected by both assessment and parent report.

Results: At 12.5 years, the parent reported attentional behavior score was increased (mean attention T-score 57.3 vs. term infants at discharge, in proportion to degree of prematurity at birth. Results support enhancing supportive experiences and minimizing painful experiences in the hospital to improve touch perception at home.
OP-005
Oral presentation
Parallel session 1: OS 1.1 Premature Brain

Quantitative brain lesion scoring on neuroimaging in children with and without a diagnosis of cerebral visual impairment
I. Franki, A. Fehrenbach, M.L. Peedima, E. Ortibus
KU Leuven, LEUVEN, Belgium

Introduction
In children with Cerebral Visual Impairment (CVI), associations between qualitatively evaluated structural magnetic resonance imaging (sMRI) and visual perceptual deficits have been identified. Nevertheless, the precise relationship with the specific brain lesion is unclear. The aim of this study was to compare the extent and location of brain lesions using a semi-quantitative scale (Fiori et al, 2014) between children with and without a final diagnosis of CVI.

Methods
The study included 23 children with and 51 children without CVI (52 males, 22 females; mean age 4y3m ± 2y11m), diagnosed using the L94 Visual Perceptual Battery, and who had sMRI available. The Mann-Whitney U test was applied to compare the total scores, global and hemispheric sub-scores as well as the subscores of every layer in each lobe, the lenticular, caudate, posterior limb of the internal capsule, thalamus and brainstem of both groups.

Results
The total score on the FIORI was not significantly different between both groups (mean 7.8 ± 6.9 versus mean 6.3 ± 5.8; p=0.55). Non-significantly higher scores in all global scores and hemispheric sub-scores, except for the cerebellar score, could be detected in the CVI group (p≤0.11). Furthermore, significant differences were found for the thalamic lesions (0.22 ± 0.581 versus 0.04± 0.196; p=0.048). Normal MRIs were present in 17.4% of children with CVI and in 21.6% of the children without.

Conclusion
The results show a high variability of brain lesion extent and location. Structural MRI was not sufficient for distinguishing between children with and without CVI.

OP-006
Oral presentation
Parallel session 1: OS 1.1 Premature Brain

Prediction of neurodevelopment using linear regression model and forward feature selection of near-term regional white matter microstructure in children born preterm with very-low-birth-weight
K. Schadl, R. Vassar, K. Cahill-Rowley, K. Yeom, D. Stevenson, J. Rose
Stanford University, STANFORD, United States of America

Introduction
Preterm children are at higher risk for cognitive and motor delay. Early identification is essential to guide early intervention at a time of optimal neuroplasticity. Advances in neuroimaging and computational methods may offer an opportunity for more accurate prognosis compared to standard techniques. This prospective, longitudinal study examined neonatal brain white matter (WM) microstructure in relation to neurodevelopment at 18-22 months in very-low-birth-weight (VLBW) preterm children. Patients and methods 102 VLBW preterm neonates were admitted at Stanford Lucile Packard Children’s Hospital and recruited to participate in a study of structural-MR and diffusion tensor imaging (DTI); 66/102 infants had DTI at near-term to assess WM microstructure integrity and 60 had follow-up neurodevelopmental evaluation with the Bayley Scales of Infant-Toddler Development, 3rd edition (BSID-III) at 18-22 months. Multivariate linear regression models with leave-one-out cross-validation (LOOCV) and forward feature selection were evaluated to find a set of five regions most predictive of cognitive and motor function.

Results
BSID-III Cognitive Composite score was predicted by near-term DTI values accounting for 39% of the variance in (R²=0.30, LOOCV-R²=0.39). BSID-III Motor Composite score was predicted by near-term values accounting for 41% of the variance in (R²=0.51, LOOCV-R²=0.41). 30% of the BSID-III Fine and Gross Motor subscore variances were explained (R²=0.40, LOOCV-R²=0.30 and R²=0.42, LOOCV-R²=0.30 respectively).

Conclusion
Results demonstrate high predictive value and warrant further study. Search in large feature spaces may more accurately identify neonatal neural correlates of developmental delay, and may ultimately inform neuroprotective treatment to improve quality of life for preterm children.

OP-007
Oral presentation
Parallel session 1: OS 1.1 Premature Brain

Classification of brain injury from structural MRI: Validation using automated approaches in children with unilateral cerebral palsy.
A.M. Pagnozzi¹, N. Dowson², J. Doecke¹, S. Fiori², A.P. Bradley³, R.N. Boyd⁴, S.E. Rose⁵
¹CSIRO, BRISBANE, Australia
²University of Pisa, PISA, Italy
Introduction
The early elucidation of brain injury from structural Magnetic Resonance Images (sMRI) is critical for the clinical assessment of children with cerebral palsy (CP). Although distinct aetiologies are categorised, these injuries are only assessed in a qualitative fashion. In this study, several automated and validated techniques to quantify these three classes of injury are presented.

Patients and methods
95 children with CP, aged 11.41 ± 3.08 years, (50 male, GMFCS I=57, II=38) and 44 TD, aged 11.73 ± 2.51 years (15 male) were scanned with T1- and T2-weighted MRI sequences. Biomarkers of injury were quantified using: a cortical shape analysis, a lesion segmentation approach, and a ventricular shape modelling approach. Regression models were constructed on a training set with multiple scores of patient function, and validated on the test set.

Results
Significant test set correlations were observed with motor function (r = 0.706, p < 0.01), cognitive function (r = 0.795, p < 0.01), visual function (r = 0.617, p < 0.05) and vocabulary (r = 0.682, p < 0.01). Measures of cortical shape and lesion burden were found to be independent for all clinical scores, while measures of ventricular enlargement were frequently discarded.

Conclusion
The significant correlations between brain injuries quantified from sMRI support the early characterisation of injury from preterm children. Furthermore, the observed models correspond with known structure-function relationships. These findings highlight the potential use of automated approaches to predict patient outcome from MRI, facilitating early interventions for patients, leading to improved long-term outcomes.

OP-008
Oral presentation
Parallel session 1: OS 1.1 Premature Brain

Understanding ADHD and ASD in very preterm children from a sensory processing perspective: A controlled neuropsychological study.
T. Bröring1, K.J. Oostrom1, E.M. van Dijk-Lokkart1, H.N. Lafeber1, J. Oosterlaan2
1VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands
2VU University Amsterdam, AMSTERDAM, The Netherlands

Introduction: Neurodevelopmental sequelae in very preterm children are generally considered to result from cerebral white matter damage and noxious effects of the neonatal intensive care unit (NICU) environment. Cerebral white matter damage is associated with sensory processing problems in terms of registration, integration and modulation. Literature review confirms that sensory processing problems are common in preterm children. In addition, preterm children have a two to threefold risk on developing attention deficit hyperactivity disorder (ADHD) and autism spectrum disorder (ASD). Interestingly, sensory processing problems are associated with ADHD and ASD. As preterm children are at risk for both cerebral white matter damage and ADHD and ASD, this study tested whether sensory processing problems explain the occurrence of ADHD/ASD symptoms in very preterm children. Patients and methods: 57 very preterms, aged 7-10, and 57 gender and age-matched term controls were included. ADHD/ASD symptoms were measured using parent/teacher behavioral questionnaires and a psychiatric diagnostic interview. Sensory registration, integration and modulation were assessed using neuropsychological tests and a questionnaire. Results: Parents and teachers of very preterms reported more symptoms of ADHD and ASD than parents and teachers of matched controls. Very preterm children performed worse on sensory registration and modulation than term controls. Data analysis suggests that sensory modulation problems mediated the relationship between prematurity and ADHD/ASD symptoms. Conclusion: Sensory processing problems may play a key role in understanding symptoms of ADHD/ASD in very preterm children.

OP-009
Oral presentation
Parallel session 1: OS 1.1 Premature Brain

Structural connectivity by diffusion MRI in childhood apraxia of speech
S. Fiori1, A. Guzzetta2, P. Cipriani1, J. Mitrà3, K. Pannek4, R. Pasquariello1, M. Tosetti1, S.E. Rose3, G. Cioni5, A. Chilosi1
1IRCCS Fondazione Stella Maris, PISA, Italy
2University of Pisa, Stella Maris Scientific Institute, PISA, Italy
3CSIRO, Commonwealth Scientific and Industrial Research Organization, BRISBANE, Australia
4CSIRO, Australian e-Health Research Centre, BRISBANE, Australia
5IRCCS Fondazione Stella Maris, University of Pisa, PISA, Italy

Introduction. Childhood apraxia of speech (CAS) is a paediatric speech sound disorder in which the precision and consistency of speech movements are impaired. To date, the aetiology and underlying neural mechanisms of
idiopathic CAS remain largely unknown, and most children with idiopathic CAS have normal structural brain MRI. Direct evidence on brain connectivity might be available by applying diffusion MRI (dMRI), which provides a non-invasive tool to explore white matter microstructure. We thus applied structural connectivity analysis in children with CAS.

Patients and methods. We enrolled 17 children with CAS and 10 age-matched controls for a connectome dMRI analysis. Whole brain probabilistic tractography with constrained spherical deconvolution was applied. Fractional anisotropy (FA) was used as a measure of connectivity and the connections with altered FA between the CAS and controls and their relationship with speech/language scores were determined.

Results. Three network components emerged with reduction of FA in CAS compared to controls, with some brain regions involved including the left superior and left middle temporal gyrus, the right supplementary motor area and the right superior temporal gyrus. Altered FA values correlated with diadochokinesis oromotor skills, expressive grammar and poor lexical production in children with CAS.

Conclusions. Our findings provide evidences of structural connectivity anomalies in children with CAS across specific brain regions. Altered connectivity might reveal possible epiphenomenon of complex pathogenic mechanisms in CAS involving speech/language networks.

**OP-010**

**Oral presentation**

Parallel session 1: OS 1.2 Life course perspective: adults with childhood onset disability

**Profiles of fatigue severity and variability among individuals with cerebral palsy**

L.B. Brunton¹, D. dr. Bartlett²

¹University of Calgary, CALGARY, Canada
²Western University, LONDON, Canada

**Introduction**: Individuals with cerebral palsy (CP) experience progressive changes in functional status with the development of secondary impairments such as fatigue. Detailed accounts of the fatigue experience in CP are lacking. This study describes the severity and variability of fatigue in CP using the Fatigue Impact and Severity Self-Assessment.

**Patients and methods**: This was a descriptive cross-sectional study surveying 130 (61 males) individuals (mean age 18 years, 11 months; SD four years, six months) with CP. Analyses comprised comparisons between two groups (Gross Motor Function Classification System (GMFCS) I and II-V), frequency counts and proportions.

**Results**: Significant differences exist between GMFCS groups for all fatigue severity questions. Thirty-eight percent of individuals classified as GMFCS level I reported their average fatigue as moderate to severe and 53% experienced fatigue on three or more days in the previous week. Seventy percent responded that they were fatigued at least a quarter of the average day or more. In addition, 68% percent of individuals classified as GMFCS II-V reported their average fatigue to be moderate to severe, with 78% were fatigued on three or more days in the previous week. On the average day, 92% indicated that they were fatigued at least a quarter of the day or more.

**Conclusion**: Fatigue is a highly individualized phenomenon with significant burden for individuals with CP regardless of functional ability. Individuals in GMFCS Levels II-V reported increased fatigue severity and would benefit from specific management interventions.

**OP-011**

**Oral presentation**

Parallel session 1: OS 1.2 Life course perspective: adults with childhood onset disability

**Patient and practitioners’ knowledge, attitudes and behaviors about gynecological and obstetric healthcare for women with cerebral palsy**

R. Byrne¹, D.P. Roye², J. Joseph³, T. Pickar², H. Matsumoto²

¹Cerebral Palsy Lanka Fundation, NEW YORK, United States of America
²Weinberg Family Cerebral Palsy Center at Columbia University Medical Center, NEW YORK, United States of America
³Columbia University Medical Center, NEW YORK, United States of America

**Introduction** The purpose of this study was to determine patient and provider knowledge, attitudes, and behavior in order to improve the quality of care for women with CP.

**Methods** A total of 226 women with CP were recruited to the study. An online patient survey was developed with 5 sections including demographic, adolescent sexual health, gynecology, mammography and reproductive health. Health care providers (n=210) were recruited via an electronic newsletter distributed to a network of obstetricians, gynecologists and primary care providers. The provider survey has a total of 37 questions.

**Results** 174 (77%) patients reported having a gynecological exam. Patients reported being most satisfied with external accommodations (handicap parking (52.3%) and ramps (76.6%)) and least satisfied with accommodations inside the office (accessible change area (36.5%), a height adjustable table (26.5%) and communication needs being met (10%)). Providers believed that physical accessibility created a barrier to care for women with CP, while 27.2% of patients felt that having ramps, elevators and/or wide doorways helped during visits (p<.001). Providers
Prospective changes in home life of young adults with cerebral palsy during transition to adulthood

M. van Gorp, S.S. Tan, L. van Wely, V. de Groot, M.E. Roebroeck, A.J. Dallmeijer

Believed that lack of appropriate equipment interfered with their ability to care for women with CP, while 45.7% of patients felt that having a height adjustable exam table would help during patient visits (p<0.001).

Conclusions Identifying ways to better accommodate women with CP and to improve their comfort during a pelvic exam is essential to improving the quality of care they receive. Accommodations needed include alternative positions, accessible change area, height adjustable exam tables and improved communication.

OP-012
Oral presentation
Parallel session 1: OS 1.2 Life course perspective: adults with childhood onset disability

Long-term deterioration of perceived health and functioning in adults with cerebral palsy

J.L. Benner, S.R. Hilberink
Erasmus University Medical Center, ROTTERDAM, The Netherlands

Introduction Adults with cerebral palsy (CP) experience health problems and functional limitations that continue throughout the lifespan. This study explored the longitudinal change in perceived health, health issues and functional level in adults with CP. Patients and methods Forty-nine adults with CP (male 55%; 35-45y; spastic 75%; intellectual impairment 22%), who completed baseline assessments in 1996 or 2000, participated in a follow-up in 2010. Self-reported outcomes included perceived health (adapted from SF-36 general health), presence of health issues such as pain or severe fatigue (dichotomized), and functional level (Barthel Index and walking performance). Longitudinal change was explored using generalized estimating equations (GEE) and proportions of change analyses. Results Over a 10-year period, an increasing proportion of adults with CP worried about their health (29-54%, p=0.008) or indicated that health problems limit their activities (19-45%, p=0.002). In the same period the majority continued to report to feel usually healthy (94-86%; p=0.148). Presence of some health issues increased over time, such as pain. Over a 14-year period, independence in mobility and self-care decreased (Barthel Index 17.1 (4.8) to 16.3 (5.6), p=0.007). A decreasing proportion walked indoors (85-71%, p=0.007) but walking did not change for long distances outdoors. Conclusion Despite that the vast majority of adults with CP continued to report generally good health, they perceived an increasing impact of CP. On the long term, specific health issues increased and functional level slightly deteriorated. Systematic assessment of individuals aging with CP is required to better understand the growing impact of this condition.

OP-013
Oral presentation
Parallel session 1: OS 1.2 Life course perspective: adults with childhood onset disability

Attitudes towards sexual health by professionals of Cerebral Palsy services in North of Portugal

D. Lopes, J.J.M. Alvarelhão
1Associação do Porto de Paralisia Cerebral, PORTO, Portugal
2Aveiro University, AVEIRO, Portugal

Adults and young adults with Cerebral Palsy (CP) have a high probability of receiving some kind of professional care even if inclusive trajectories are the standard of their life experience. Sexual health is an important area regarding independence and autonomy of persons with CP, and attitudes from professionals to the topic, play a major role in the individual’s sexual living. The aim of this study was to explore the attitudes of direct care staff of services for adults with CP in North of Portugal.

Four services from Oporto Cerebral Palsy Association participated in the study and 60 professionals, 48 women, aged between 22-50 years old (mean 35y 4mo, sd 6y 6mo), 16 with higher education, answered a structured questionnaire (score range 17-51, positive attitude higher score) about sexual health attitudes covering four domains: (i) discomfort in providing sexual health care, (ii) feeling uncertain about ‘s acceptance, (iii) afraid of colleagues’ negative response and (iv) lack of environmental support.

The results indicate an excellent internal consistency (α=0.92) with a mean of 39.4 (sd=8.8). The lowest scores were found in the domains of ‘discomfort in providing sexual health care’ and ‘feeling uncertain about person’s acceptance’. There were no differences between gender or number of years in the place of work but scores were associated with the level of education (r=0.27, p<0.05) and age (r=-0.30, p<0.05).

This study rises the need of discuss the attitudes of professionals about sexual health care provision in institutional context of specific services for adults with CP.

OP-014
Oral presentation
Parallel session 1: OS 1.2 Life course perspective: adults with childhood onset disability

Prospective changes in home life of young adults with cerebral palsy during transition to adulthood

M. van Gorp, S.S. Tan, L. van Wely, V. de Groot, M.E. Roebroeck, A.J. Dallmeijer
Introduction
In individuals with CP transitioning into adulthood, insight is needed in the development of participation. Home life is a life area where changes in housing situation may influence participation. We aimed to determine long-term development of home life participation in young adults with CP.

Patients and Methods
In 125 adults with CP aged 16-20 years (GMFCS I-V, without intellectual impairment), participation and housing situation were measured at three biyearly measurements and at 13 years after baseline. In addition, cross-sectional data was collected of 49 adults with CP (41% with intellectual impairment) aged 21-27. Home life participation was measured using the category housing (8 items) of the life habits assessment. Scores (range 0-10) reflect the level of accomplishment; score 10 indicates no difficulty or assistance. Multilevel modelling was used to determine development over time. Age, GMFCS level, intellectual impairment and the interaction of age and GMFCS-level were included as independent variables.

Results
An increase in individuals living independently from 1% under 20 years to 77% over 25 years and an increase in number of performed life habits was observed. Trajectories for age range 16-34, GMFCS levels I-IV, showed a decline of home life scores with increasing age. The decline was largest in GMFCS levels II and III, but not observed for V. Having an intellectual impairment effected the housing life habits score by -1.7.

Conclusion
In young adults with CP, the home life participation decreased during their transition to adulthood. This could indicate a need for guidance in independent living.

OP-015
Oral presentation
Parallel session 1: OS 1.2 Life course perspective: adults with childhood onset disability

Private Moments: Comparative narratives of young women with cerebral palsy in Sri Lanka and New Zealand.
S. Hettiarachchi¹, A. Hogan², S. Attanayake³, L. Daskon-Attanayake³
¹University of Kelaniya, RAGAMA, Sri Lanka
²Cerebral Palsy Society of NZ Inc, AUCKLAND, New Zealand
³Wheels-in-Motion, MÓNERAGALA, Sri Lanka

Introduction: Conversations on ‘disabled sexualities’ are arguably seldom heard or heard through muffled tones in the Global South, with the more dominant discourse addressing perceived stigma and explanatory models of disability. With the recent ratification of the United Nations Convention on the Rights of Persons with Disabilities by the Sri Lankan government in February 2016, the time for more comprehensive discussions on the rights of persons with disabilities, incorporating the right to relationships, sexuality and reproductive rights, is now. Patients and methods: This study compares the lived experiences of 3 young women with cerebral palsy in Sri Lanka and 3 young women with cerebral palsy in New Zealand using the methodology of narrative inquiry of interviews. This form part of a preliminary cross-cultural study of the experiences of young people with cerebral palsy. Results: In this paper, we will discuss the intersectionality between culture, gender, theories of ableism and disability. The narratives shed light on the pervasive nature of culture on relationships, disability and sexuality and the tensions between desire vs. perceived reality. Conclusion: Culture, including the ‘culture of disability’ influences the lived experiences, both joyous and frustrating, of young persons with disabilities across the two target countries of the Global North and South.

OP-016
Oral presentation
Parallel session 1: OS 1.2 Life course perspective: adults with childhood onset disability

Early predictors of participation of adults with cerebral palsy in interpersonal relationships
L. van Wely¹, M. van Gorp², J. van Meeteren¹, M.E. Roebroeck², A.J. Dallmeijer¹
¹VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands
²Erasmus University Medical Center, ROTTERDAM, The Netherlands

Introduction: Adults with cerebral palsy (CP) experience barriers in interpersonal relationships, such as romantic relationships. Knowledge about early predictors of adult participation in interpersonal relationships can be used to optimize the transition to adulthood. Objective of the study is to identify which factors assessed at childhood predict participation in interpersonal
relationships at adult age.

**Patients and methods:**
A thirteen-year follow-up including 64 adults with CP (GMFCS level I-V, mean age 24.7 SD 1.61 years). Adults represent 60% of the childhood/adolescent cohort (age 9-13 at baseline) of the previous four year follow-up study “PERRIN”. Adults were interviewed about their participation in interpersonal relationships using the Vineland Adaptive Behavior Scales (VABS, subdomain Interpersonal relationships). A multiple regression analysis was performed to predict interpersonal relationships using baseline characteristics, and the level of motor function (Gross Motor Function Measure-66 and VABS), daily living skills, communication and socialization at the age of 12 years (VABS) as independent variables (p<0.05).

**Results:** MACS level I, compared to MACS level III-V (p=0.02), a higher level of communication (p<0.001) and a higher level of socialization (p=0.009) at the age of 12 years were associated with higher participation in interpersonal relationships at adult age (explained variance R²=86%). The other variables showed no significant association.

**Conclusion:**
Children with CP with a better MACS level and higher levels of communication and socialization were associated with a higher level of participation in interpersonal relationships at adult age. This may guide interventions aimed at optimizing the transition to adulthood.

**OP-017**
Oral presentation
Parallel session 1: OS 1.2 Life course perspective: adults with childhood onset disability

**Validation of the Activ8 accelerometer: detection of body postures and movements in adults with cerebral palsy**

1McMaster University, HAMILTON, ON, Canada
2Erasmus University Medical Center, ROTTERDAM, The Netherlands

**Introduction**
The recently developed Activ8 accelerometer detects body postures and movements (P&M), provides user-feedback, and is unobtrusive and cost-friendly, offering potential use in rehabilitation research and clinical settings. The objective of this study was to evaluate the criterion validity of the Activ8 in the measurement of P&M in adults with cerebral palsy (CP) compared to direct video observation (reference method).

**Patients and Methods**
Fifteen adults with spastic CP [10 men; mean (SD) age, 35.7(13) years; Gross Motor Function Classification System distribution: level I (n=6), level II (n=5), level III (n=3), level IV (n=1)] performed a series of daily life activities, such as walking, stair-climbing, and folding laundry, in a laboratory setting while wearing Activ8 monitors on the thigh and being video recorded. Continuous Activ8 activity outputs, categorizing activity into six distinct P&M (lying, sitting, standing, walking, bicycling, running), were compared to synchronized video recordings. Percent difference [(video-Activ8 time)/mean time] and time difference were used to evaluate agreement.

**Results**
Percent difference was lowest for sitting (1.5%; 4790s [Activ8] vs 4719s [video]) and bicycling P&M categories (1.8%; 2855s [Activ8] vs 2803s [video]). Greater differences for standing (10.4%; 4610s [Activ8] vs 5118s [video]) and an activity (27.1%; 6351s [Activ8] vs 4834s [video]) were mainly observed in complex activities, including mapping and folding laundry. Pooling activity categories - sedentary and upright/active time - were detected with 1.49% and 0.48% difference, respectively.

**Conclusion**
Except during some complex activities, the Activ8 accelerometer has strong validity as a tool to objectively measure P&M in adults with spastic CP.

**OP-018**
Oral presentation
Parallel session 1: OS 1.3 Networks and integrated care

**The effectiveness of a knowledge translation intervention in changing allied health professional routine assessment practices for children with cerebral palsy**

1Australian Catholic University, FITZROY, Australia
2Queen's University Belfast, BELFAST, United Kingdom
3Cerebral Palsy Alliance, The University of Sydney, SYDNEY, Australia
4La Trobe University, BUNDOORA, Australia
5Kids Plus Foundation, GEELONG, Australia

The effectiveness of a knowledge translation intervention in changing allied health professional routine assessment practices for children with cerebral palsy


1Australian Catholic University, FITZROY, Australia
2Queen's University Belfast, BELFAST, United Kingdom
3Cerebral Palsy Alliance, The University of Sydney, SYDNEY, Australia
4La Trobe University, BUNDOORA, Australia
5Kids Plus Foundation, GEELONG, Australia
Introduction
This study investigated the effect of a knowledge translation intervention on routine use of valid and reliable assessment tools by allied health professionals working with children with cerebral palsy.

Patients and methods
Before-and–after controlled study conducted in five community disability service organisations. As part of a multi-strategy knowledge translation intervention, new routine assessment practices were introduced in four organisations (‘commencing KT’ group: 213 allied health professionals, 273 children). Routine assessment practices were mandated at the fifth organisation (comparison group; 142 allied health professionals, 942 children). Children’s clinical outcomes were recorded in an online database at baseline, 6, 12, 24 and 29 months. Actual assessment practices were compared to a pre-specified ‘minimum dataset’.

Results
1770 assessments were completed on 857 of 1215 children recruited. Commencing KT organisations recruited 34% of their eligible clients. The average number of routine assessments completed per child in the commencing KT group was 3.1, versus 1.6 in the comparison group. At baseline the comparison group completed double the proportion of minimum dataset items compared to the commencing KT group (68% [95% CI 65, 71] versus 35% [95% CI 33, 36]). Over time the commencing KT organisations increased the proportion of minimum dataset items completed, peaking at 12 months after study commencement (68%), whereas the proportion completed decreased slightly in the comparison (43% at 6; 45% at 12; 53% at 24 and 49% at 29 months).

Conclusion
The knowledge translation intervention increased routine assessment practices of allied health professionals working with children with cerebral palsy.

OP-019
Oral presentation
Parallel session 1: OS 1.3 Networks and integrated care

The AACPDM Sialorrhea Care Pathway: a multidisciplinary approach
K. van Hulst1, J.J.W. van der Burg2, C.P. Delsing1, L. Glader3
1Radboud University Medical Center, Nijmegen, The Netherlands
2St. Maartenskliniek, Nijmegen, The Netherlands
3Harvard Medical School, Boston Children’s Hospital, Boston, United States of America

Introduction
Sialorrhea occurs in approximately 40% of children with cerebral palsy (CP) and can have significant medical and psychosocial impact. Sialorrhea refers to drooling of saliva, in which we define anterior drooling and posterior drooling. Evaluation of sialorrhea needs a multidisciplinary approach because of the multifactorial origin of the problem. Treatment options are also diverse, conservative as well as invasive, and consensus is missing.

Patients and methods
An international multicentre study group was formed to develop an AACPDM (American Academy Cerebral Palsy & Developmental Medicine) Care Pathway for children/youth up to 25 years with CP who drool. Experts from multiple disciplines performed a literature review and described their ‘expert opinion’ on the assessment, treatment and management of children with sialorrhea.

Results
An AACPDM sialorrhea care pathway was developed. It consists of a practical summary, including an algorithm, of evidence informed guidelines for assessment and treatment of drooling in children/youth with CP, who drool. Experts from multiple disciplines performed a literature review and described their ‘expert opinion’ on the assessment, treatment and management of children with sialorrhea.

Conclusion
Assessment and treatment for sialorrhea needs a multidisciplinary approach. The Sialorrhea Care Pathway is easy accessible for both parents and professionals and provides them with up-to-date, evidence-based information on the assessment, treatment and management of sialorrhea.

OP-020
Oral presentation
Parallel session 1: OS 1.3 Networks and integrated care

The development of a Stroke in Childhood guideline using an evidence based collaborative approach (on behalf of the Stroke Association and Royal College of Paediatrics Guideline Development Group)
L.J. Wales
The Children’s Trust, Tadworth, United Kingdom

Introduction
Stroke in childhood is very different from adults and affects 5 out of every 100,000 children in the UK every year. The results of a stroke can be wide reaching and can present young people with challenges that persist as a lifelong condition. A joint venture between the Stroke Association and the Royal College of Paediatricians and Child
Health (RCPCH) was formed with the aim of producing an update to the previous Stroke in Childhood guideline (2004).

**Patients and Methods**

A Guideline Development Group (GDG) was established with stakeholders from all health professional groups and parent representatives. Subgroups were formed to concentrate on areas such as diagnosis, rehabilitation, information, and support. RCPCH supported each subgroup with literature reviews, quality review, data extraction, and synthesis. GDG facilitated two parent groups. Consensus from GDG and wider community using Delphi study.

**Results**

Systematic literature review carried out and research evidence summarised. Research evidence was combined with GDG expert consensus and parent feedback/experiences. GDG carried out Delphi study for topics of controversy. GDG is producing summary document with recommendations from diagnosis through rehabilitation to long term care and education.

**Conclusion**

The new Stroke in Childhood guideline will provide health, education, and social care professionals with a robust document to inform integrated intervention for this group of children/young people. Whilst the guideline will focus on young stroke survivors, many of the recommendations will be applicable to children and young people with other acquired brain injuries.

---

**OP-021**

Oral presentation
Parallel session 1: OS 1.3 Networks and integrated care

**Working with Romania’s abandoned children. What can be learnt?**

A. McCulloch¹, R. Gulati², C.M. Wood¹, M. Negoita¹

¹Foundation Programme, BOLLINGTON, United Kingdom
²Leeds Community Healthcare NHS Trust, LEEDS, United Kingdom

**Introduction**

Fifteen years after the fall of Romania’s brutal dictatorship, thousands of children are still living in institutions. The risk of being abandoned is higher for children with disabilities, due to persisting stigma and a lack of community services. The state of Romania’s orphanages was well known in the early 90s, but the fact that little has changed since then is very much hidden.

**Patients and Methods**

Volunteers from a British organisation (The Life Foundation) have been working in some of the state-run children’s homes for over ten years. In recent years the organisation has focused on sending ‘specialist’ volunteers including a consultant paediatrician (author RG).

**Results**

Benefits of this programme include multi-disciplinary assessments of the children, a training day for the staff at the institutions, and a learning opportunity for the clinicians. However, the programme also raises issues around clinical governance when working within a foreign healthcare system, and questions about sustainability and culturally sensitive practice. We also consider the impact on the morale of visiting clinicians.

**Conclusions**

This type of work is happening around the world, and we ask if it is always ethical considering that there is often limited supervision and follow up. We suggest setting achievable aims which both the host and visiting team agree on, involving the necessary stakeholders for higher level change, and ensuring sustainability so that the host staff are not receiving disjointed or conflicting advice. These findings are not only beneficial for this project but for many similar projects around the world.

---

**OP-022**

Oral presentation
Parallel session 1: OS 1.3 Networks and integrated care

**Monitoring and prevalence of Cerebral Visual Impairment (CVI) in children with Cerebral Palsy**

I. van der Steen¹, C. Bouwhuis¹, J.S. Kuilaars¹, D. Wezenberg¹, T.P.M. Vliet Vlieland²

¹Sophia Rehabilitation Centre, DEN HAAG, The Netherlands
²Leiden University Medical Centre, LEIDEN, The Netherlands

**Introduction:** Cerebral Visual Impairment (CVI) is frequently present in patients with Cerebral Palsy (CP) and can significantly influence patients functioning. The aim of this study was to determine both the percentage of children with CP tested for visual function and the prevalence of CVI in the tested group.

**Patients and methods:** Current retrospective medical record study, included all children with CP, aged 4-18 years, of a large rehabilitation centre in the Netherlands. Medical records were searched for tests for visual function and/or
Results: In total 170 out of 279 children on record met the inclusion criteria. Of these 170 children, a visual expertise centre tested 43.5% for visual function and 10.6% for visual perception. Of all tested children, 32.4% had signs of CVI, of which visual field defects (56.0%) and problems of visual attention/crowding (52.0%) were most common. Testing of visual function was related to the severity of CP, defined by GMFCS score, as children with GMFCS5 were most often tested (86.7%) and with GMFCS1 the least (23.8%). In contrast, prevalence of CVI in the tested group was not related to the severity of CP, as 31.6% of children with GMFCS1 and 23.1% of GMFCS5 had CVI. Conclusion: Results confirm that CVI is common in CP. However, current data clearly shows that in the majority of children there was no information available regarding visual function. This might entail that visual disorders like CVI are often not diagnosed and ought to be more properly monitored.

OP-023
Oral presentation
Parallel session 1: OS 1.3 Networks and integrated care

Rehabilitation status of children with cerebral palsy in rural Bangladesh - Findings from the Bangladesh Cerebral Palsy Register (BCPR) study
G. Khandaker1, T. Karim2, M. Muhit2, H. Smithers-Sheedy1, C. Jones1, N. Badawi1
1University of Sydney, WESTMEAD, Australia
2CSF Global, Bangladesh, DHAKA, Bangladesh

Introduction: Limited information is available on rehabilitation status of children with cerebral palsy (CP) in Bangladesh which is important for effective program development and services. We aimed to define the rehabilitation status of children with CP in rural Bangladesh from a population based CP surveillance (i.e. BCPR).

Patients and methods: All children with CP aged <18 years from a rural sub-district of Bangladesh (i.e. Shahjadpur, child population ~ 226,114) were assessed and recruited into the BCPR study. Standard record forms were used to collect information on their socio-economic status, nature of disability and rehabilitation.

Results: Since January 2015, 749 children with CP (61.4% males, median age 7.2 years) have been recruited. Over two third(68.1%) of the children never received any rehabilitation services, most commonly due to lack of awareness(48.7%) and financial constraints(10.3%). Among those who received rehabilitation services, 26.4% received physical therapy and 3.3% ever received any assistive devices. The mean age at which the children first received rehabilitation services was 4.4 years. Significant difference was observed between males (35.0%) and females (27.0%) receiving rehabilitation services(p=0.05). Moreover, parents education, monthly family income, age of the child at CP diagnosis and Gross Motor Function Classification System (GMFCS) level were significantly associated with availing rehabilitation services(p<0.005).

Conclusion: Further research is needed to explore the barriers to provision of services to these children. Large scale national programs need to be developed through government and NGO collaboration, and international support to ensure assistive devices and therapy to all children with CP in Bangladesh.

OP-024
Oral presentation
Parallel session 1: OS 1.3 Networks and integrated care

Is minimal motor disability in children with cerebral palsy associated with specific, etiological risk factors?
T. Vik1, S.J. Hollung2, R.B. Jahnsen3, G.L. Andersen2
1Norwegian University of Science and Technology, TRONDHEIM, Norway
2Vestfold Hospital Trust, TØNSBERG, Norway
3Oslo University Hospital, OSLO, Norway

Introduction
Our aim was to explore if specific etiological risk factors are associated with minimal motor disability (MMD).

Patients and Methods
Information on CP was retrieved from the Cerebral Palsy Register of Norway. Information on pregnancy and delivery was obtained from the Medical Birth Registry of Norway. A child who had abilities corresponding to GMFCS level I, MACS level I and Viking Speech Scale 1 was defined as having MMD. We compared the findings in this group with findings in the group of children with severe motor disability (SMD), defined as GMFCS level >=4, MACS level >=4 and Viking level 4.

Results
Among 1040 included children, 293 (20%) had MMD, while 160 (11%) had SMD. Among those with MMD, 9% had Apgar score <= 3 at 1, and 2% at 5 minutes, whereas among those with SMD, 40% had low Apgar score at 1, and 26% at 5 minutes (p<0.001). Mean gestational age was slightly lower in the MMD (mean: 36.2 weeks; SD: 5.0), than in the SMD group (mean 37.4 weeks; SD: 4.6; p=0.014), but the proportions born prematurely did not differ. A number of other maternal, pregnancy and perinatal risk factors did not differ between the groups.

Conclusion
We could not identify specific risk factors associated with MMD, although children with MMD were unlikely to have suffered from perinatal asphyxia. In contrast, every fourth child with SMD had low Apgar scores at five minutes, suggesting that perinatal asphyxia is a significant etiological component in this group.

**OP-025**
Oral presentation
Parallel session 1: OS 1.3 Networks and integrated care

**Time trends of children with cerebral palsy in Norway; a national register-based study**
S.J. Hollung¹, T. Vik², G.L. Andersen¹
¹Vestfold Hospital Trust, TØNSBERG, Norway
²Norwegian University of Science and Technology, TRONDHEIM, Norway

**Introduction**
The objective of this study was to explore time trends on children born 1996-2009, recorded in The Cerebral Palsy Register of Norway.

**Patients and methods**
2,165 children with CP (58% boys) were categorized into 3 time periods based upon birth years; PI: 1996-1999, PII: 2000-2004 and PIII: 2005-2009. Chi-Square statistics were used to explore differences in proportions, while an independent-sample nonparametric test was used to compare median age at diagnosis over time.

**Results**
The proportion of children with a cerebral MRI scan increased from 62% in PI to 86% in PIII (p<0.001). In contrast, there was no change in median age at diagnosis (p=0.268), which remained stable at 16 months. There was a decrease in the proportion of children with spastic bilateral CP (PI:51%-PIII:43%), while spastic unilateral increased (PI:33%-PIII:44%; p<0.001). Similarly, the proportion with epilepsy decreased (PI:38%-PIII:28%; p=0.001). There was no change in the distribution of GMFCS (p=0.083) and Viking speech levels (p=0.176), nor in the proportion of gastrostomy tube feeding (p=0.602).

**Conclusion**
Changes in proportions of children with uni- and bilateral CP, and decrease of epilepsy may be explained by better neonatal care. However, this is not obviously supported by the lack of trends regarding GMFCS and Viking speech levels and gastrostomy tube feeding. Our finding that nearly 90% of children with CP born 2005-2009 had an MRI suggests that diagnostic workup has improved. However, median age at diagnosis did not decrease, thus efforts to improve early diagnosis of CP are warranted.

**OP-026**
Oral presentation
Parallel session 1: OS 1.3 Networks and integrated care

**Parental socioeconomic status and risk of cerebral palsy in offspring**
I. Forthun¹, D. Moster¹, T. Petersen², K.S. Strandberg-Larsen², T. Vik³, M. Tollånes¹
¹University of Bergen, BERGEN, Norway
²University of Copenhagen, COPENHAGEN, Denmark
³Norwegian University of Science and Technology, TRONDHEIM, Norway

**Introduction**
Cerebral palsy (CP) is the most common cause of physical disability in children, affecting about 2 per 1000 live-born. The objective of this study is to investigate whether risk of CP differs by parents' socioeconomic background in a Norwegian and a Danish cohort.

**Patients and methods**
We will conduct parallel studies in Norway and Denmark using data on all live births from 1967-2009 in the Norwegian Medical Birth Registry and all live births from 1981-2007 in the Danish Medical Birth Registry. All births have been linked to data from Statistics Norway and Statistics Denmark, respectively, to retrieve information on parents’ education, income and ethnicity. In Norway, the diagnoses of CP were collected from the National Insurance Scheme and the Norwegian Patient Registry, while in Denmark, the diagnoses were collected from the Cerebral Palsy Registry. We will conduct analyses separately in the Danish and Norwegian cohort using log-binominal regression models and derive a pooled estimate by use of meta-analysis.

**Results**
Preliminary analysis within the Norwegian cohort shows a higher risk of CP for parents with a lower level of education. We want to investigate whether the same socioeconomic gradient can be found within the Danish cohort, and whether the association differs by different measures of socioeconomic status. As we have data across several decades we want to further investigate whether the association has changed over time.

**Conclusion**
The study can provide knowledge on whether some of the risk factors for CP are socioeconomically mediated and might give important etiological clues.
OP-027
Oral presentation
Parallel session 2: OS 2.1 Muscle function

Muscle function in young adults with cerebral palsy walking uphill and downhill.
J. Gillett, G.A. Lichtwark, R.N. Boyd, L.A. Barber
The University of Queensland, SOUTH BRISBANE, Australia

Introduction Walking uphill and downhill poses a challenge to individuals with spastic Cerebral Palsy (CP). This study investigated the function of the medial gastrocnemius muscle-tendon unit (MGmtu) and fascicles (MGfas) during uphill and downhill walking in young adults with CP compared to typically developed (TD) individuals.

Patients and methods Eight individuals with CP, aged 24 ± 3 years, (5 male, GMFCS I=6, II=2) and 10 TD, aged 24 ± 4 years, walked uphill (7%) and downhill (-7%) on an instrumented treadmill while 3D kinematics and ultrasound images were acquired. Group differences were compared using a two-way ANOVA (p<0.01).

Results Uphill walking, during mid-stance, CP MGfas lengthened by 1.31 ± 0.66 mm and TD MGfas shortened by 1.58 ± 0.57 mm, p<0.01. During terminal-stance MGmtu and MGfas shortened less in the CP group, CP=31.23 ± 2.49 mm; TD=49.99 ± 2.16 mm; CP=3.39 ± 0.62 mm, TD=5.97 ± 0.54 mm, p<0.01, respectively. Downhill walking, during mid-stance, CP MGfas lengthened by 1.93 ± 0.74 mm and TD MGfas acted isometrically. During terminal-stance MGmtu shortened less in the CP group, CP=24.26 ± 2.72 mm, TD=38.14 ± 2.30 mm; but MGfas was similar between groups, CP=2.68 ± 0.69 mm, TD=3.47 ± 0.58 mm.

Conclusion Fascicle lengthening during mid-stance in CP individuals is indicative of eccentric muscle contraction. Reduced late-stance CP MGfas shortening walking uphill, and similar shortening walking downhill compared to TD indicates differential fascicle behaviour in CP individuals, arising in part from the structural and functional adaptations of muscle mechanical properties in CP participants.

OP-028
Oral presentation
Parallel session 2: OS 2.1 Muscle function

Knee joint mechanics and semitendinosus muscle morphology in spastic paresis after medial hamstring lengthening
1VU University Amsterdam, AMSTERDAM, The Netherlands
2University Children’s Hospital Basle, BASLE, Switzerland
3VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands

Introduction
To improve gait by an increase of knee extension, the semitendinosus muscle (ST) amongst other hamstring muscles is frequently lengthened by surgery in children with spastic paresis, but with variable success. Little is known how knee joint mechanics and ST morphology change after this surgical intervention.

Patients and methods
Knee joint mechanics and ST morphology were determined in six children with spastic paresis (age 13y10m±2y8m; GMFCS II&III) selected for hamstring lengthening before and 8-20 months after surgery. Muscle belly length, tendon length, muscle-tendon unit (MTU) length and muscle volume of ST at the knee angle corresponding to 4 Nm knee flexion moment (θknee) in an imposed hip position of 70° flexion were assessed by 3D ultrasound.

Results
θknee was 56±12° (pre) and 41±16° (post) (p=0.071). After surgery, muscle belly length normalized for femur length was 33±6% lower (p<0.001), tendon length was 85±30% higher (p<0.001) and MTU length was 10±7% higher (p=0.044). Muscle volume was 34.8±19.7 cm³ before surgery and 19.5±16.1 cm³ after (p=0.058).

Conclusion
Our results show that after hamstring lengthening there was a tendency towards a more extended knee at an equal passive flexion moment. ST MTU was longer after surgery with a longer tendon, but had a reduced muscle belly length. ST volume was reduced in the majority of children indicating muscle atrophy, which likely reduces force generating capacity of ST and thereby impairing active hip extension during gait. These effects should be counterbalanced to gain in knee extension when hamstring lengthening is considered.

OP-029
Oral presentation
Parallel session 2: OS 2.1 Muscle function

Muscle stem cells are required for sarcomere addition and recovery from contractures
S. Dayanidi1, M.C. Kinney, P.B. Dykstra2, J.J. Mccarthy2, C.A. Peterson2, R. Lieber1

S. Dayanidi1, M.C. Kinney, P.B. Dykstra2, J.J. Mccarthy2, C.A. Peterson2, R. Lieber1

S. Dayanidi1, M.C. Kinney, P.B. Dykstra2, J.J. Mccarthy2, C.A. Peterson2, R. Lieber1
Introduction: Children with cerebral palsy (CP) develop muscle contractures that show: a) a reduced number of muscle stem cells, i.e. satellite cells (SC), required for postnatal growth and b) a decreased number of serial sarcomeres, required for longitudinal muscle growth. Using a muscle stem cell specific knockdown transgenic mouse model we tested the hypothesis that reduced SC number could impair sarcomere addition and hamper recovery from a contracture.

Methods: Transgenic mice (Pax7CreER+/;Rosa26DTA+) were casted in plantarflexion for 2 weeks such that the soleus loses serial sarcomeres, treated with either Tamoxifen (treatment) or Vehicle (control) for 5 days. Subsequently, casts were removed and animals allowed to recover their ankle range and sarcomere number over 4 weeks. The mice were sacrificed and soleus muscles were used for analysis of serial sarcomere number.

Results: The Tamoxifen group had 65-75% ablation in SC number, similar to children with CP and were unable to recover their ankle dorsiflexion range of motion (maximal angle -16° vs. 31°, p<0.05), i.e. remained in a contracture. Correspondingly, sarcomere number did not recover (-13% vs. -3%, p<0.05). Importantly, a strong association (p<0.05, r²=0.99) was observed between the degree of contracture and serial sarcomere number. Soleus tendon length increased in the Tamoxifen casted side, which allowed some recovery.

Conclusions: Reduced SC number in children with CP could be responsible for reduced serial sarcomere number. Importantly, with a reduced SC number, recovery from a shortened position by sarcomere addition is significantly impaired and associated with contracture development.

OP-030
Oral presentation
Parallel session 2: OS 2.1 Muscle function

Is calf muscle stiffness protective against spasticity in children with spastic cerebral palsy?

L. Bar-On1, B.M. Kalkman2, F.L. Cenni3, G. Holmes1, A. Bass1, G. Barton1, C. Maganaris1, S.H. Schless1, G. Molenaers1, T. O’Brien1, K. Desloovere1
1KU Leuven, PELLENBERG, Belgium
2Liverpool John Moores University, LIVERPOOL, United Kingdom
3Alder Hey Children’s NHS Foundation Trust, LIVERPOOL, United Kingdom

Introduction

There is doubt whether calf muscle spasticity (velocity-dependent hyperactive stretch-reflex) mediates movement impairment in children with cerebral palsy (CP). Recent research highlighted muscular alterations that increase the passive stiffness of the calf muscles in CP. Detailed assessments of muscle and tendon are required to better understand the mechanisms that contribute to stiffness and trigger spasticity, and to explain the variability reported among patients.

Patients and methods

Fifteen children with CP (11±3yrs, 7 hemiplegia 8 diplegia, GMFCS 9I 6II) participated. Children lay prone while their ankle was passively rotated through the full ROM slowly and as fast as possible. Ultrasound, synchronized with 3D motion-analysis, was used to calculate relative muscle and tendon excursion. Surface-EMG was collected from calf muscles. Muscles were categorized depending on their levels of measured spasticity and stiffness. Angular and muscle lengthening velocities 30ms prior to EMG onset were compared between groups.

Results

30ms prior to EMG onset, angular velocity did not differ between groups but muscle lengthening velocity was twice as high in muscles categorized only with spasticity (p=0.03). Latency between maximum muscle lengthening velocity and EMG onset was shortest and least variable in spastic muscles (spastic: 30.7±8.9ms, stiff&spastic: 44.5±20.2ms, stiff: 70±38.9ms).

Conclusions

This study shows that the stretch-reflex is modulated by passive muscle-tendon mechanics, and not the joint. Since stiff muscles may not elongate fast enough to evoke a stretch-reflex, muscle stiffness may be protective against spasticity. The large variability among muscles warrants investigating whether treatment based on quantitative stiffness parameters improves outcome.

OP-031
Oral presentation
Parallel session 2: OS 2.1 Muscle function

Medial gastrocnemius fascicle function during walking in children with cerebral palsy following gastrocnemius lengthening surgery

L.A. Barber1, C. Carty2, J. Walsh3, R.N. Boyd4, G. Lichtwark1
1The University of Queensland, BRISBANE, Australia
Introduction
The medial gastrocnemius (MG) muscle contracts eccentrically during walking in children with cerebral palsy (CP) and equinus gait. Gastrocnemius lengthening surgery is used to improve equinus gait however lower limb muscle function during walking following this surgical intervention remains unknown. This study investigated the function of the MG muscle prior to and following recovery from gastrocnemius lengthening surgery for an equinus gait pattern in children with CP.

Participants and methods
Seven children with CP (age 11±1 years, 5 males, hemiplegia=5, diplegia=2, GMFCS I=4, II=3) underwent full body 3D gait analysis and simultaneous B-mode ultrasound images of the MG fascicles during level walking prior to gastrocnemius lengthening surgery, and following surgery and the recovery period. Fascicle lengths were analysed using a semi-automated tracking algorithm. Paired-sample t-tests were used to compare differences pre- and post-surgery, (p<0.05).

Results
Post-surgery MG fascicles lengthened less during mid-stance, 1.2(1.1)mm versus 2.5(1.0)mm, p=0.04. Although fascicle shortening during late stance was greater post-surgery, 2.3(1.2)mm versus 0.1(0.4)mm, normalised ankle power during push-off was significantly less, 0.5(0.1)W/kg versus 0.8(0.1)W/kg, p=0.01.

Conclusion
A decrease in magnitude of MG muscle fascicle lengthening during mid-stance gait following gastrocnemius lengthening surgery is consistent with reduced ankle passive stiffness and may reduce muscle damage and soreness associated with repeated eccentric contractions. The greater contribution to force generation from increased muscle contraction during late-stance may be lost during force transfer through altered muscle and tendon tissue following surgery, and impede ankle push-off power.

OP-032
Oral presentation
Parallel session 2: OS 2.1 Muscle function

The alteration of lower limbs’ muscle size during growth in ambulant children with cerebral palsy
A. Massaad1, A. Assi2, Z. Bakouny3, W. Skalli3, I. Ghanem4
1Sesobel, KESERWAN, Lebanon
2Faculty of medicine, BEIRUT, Lebanon
3Institut de biomécanique Georges Charpak, Arts et Métiers, ParisTech, PARIS, France
4Hotel Dieu de France, BEIRUT, Lebanon

Introduction
Children with CP could lose their walking abilities during growth due to a decreased muscle force, that has shown to be proportional to the cross sectional area (CSA)1 and muscle volume2.

Research question
Does lower limbs’ muscle size increase with age in ambulant children with CP?

Methods
18 spastic children with CP (Hemiplegia N=7, Diplegia N=11, GMFCS I: N= 10, II: N=8; age: 12±3.8 years) and 18 age-matched typically developing (TD) children underwent MRI exam for the lower limbs in order to reconstruct 17 thigh and shank muscles bilaterally3. A partial correlation was performed between muscle size (volume and CSA) and age while controlling for BMI.

Results
Normalized volume and CSA were decreased in children with GMFCS II for all the reconstructed muscles compared to TD children, while it was decreased only for rectus femoris (5.5±1.9cm³.kg⁻¹.m⁻² vs6.3±2 cm³.kg⁻¹.m⁻²) and anterior tibialis (1.7±1.5 cm³.kg⁻¹.m⁻² vs 3.4±2 cm³.kg⁻¹.m⁻²) in children with GMFCS I compared to TD children. While TD children have shown a significant correlation between age and all the reconstructed muscles’ volume and CSA (r ranged between 0.5 and 0.8, p<0.05), the group of children with GMFCS II didn’t show a significant correlation between the age and hamstrings, adductors, gastrocnemii and soleus volume and CSA (p>0.05).

Discussion
Muscle volume and CSA of the main walking muscles were shown not to increase with age in children with GMFCS level II. This could explain the deterioration of their walking abilities during growth.

References

OP-033
Oral presentation
Parallel session 2: OS 2.1 Muscle function

Contribution of muscle and tendon to the increased range of movement following passive stretching in children with cerebral palsy
Introduction

Stretching is often used to increase/maintain joint range of motion (ROM) in children with cerebral palsy (CPC). An acute bout of stretching can increase ROM in CPC \(^1\), but during passive joint rotation the tendon lengthens more and muscle less in CPC than typical \(^1\). This reduced stretch stimulus to the muscle could explain why responses to long-term stretching interventions are so variable \(^2\). Therefore, this study aimed to determine which structures contribute to the increased ROM after an acute bout of stretching in CPC.

Patients and methods

Eleven CPC (age: 12.1±3y, 5/6 hemiplegia/diplegia, GMFCS level: 7/4, I/II) participated. Children received 3 sets of 5x20 seconds dorsiflexion stretches separated by 30-sec rest, and 1-minute rest between sets. Pre- and post-stretching, ultrasound synchronized with 3D motion analysis was used to measure medial gastrocnemius muscle, fascicle and tendon lengthening over the full and a common ROM.

Results

ROM increased by 9° after stretching (p=0.016). This caused a significant increase of 3.0mm in fascicle lengthening (p=0.007) and a non-significant increase of 2.6mm in muscle lengthening over the full ROM (p=0.101). Tendon lengthening did not change (p=0.886). No differences were found in any parameter over the common ROM.

Conclusion

We conclude that the increased ROM observed in CPC acutely after stretching is achieved by an increased tolerance to stretch and not by any changes in muscle properties. The results show that while fascicle length can be increased, it remains unclear whether this is sufficient to induce any long term changes.

\(^1\) Theis et al. 2013.
\(^2\) Wiart et al. 2008.

OP-034

Oral presentation

Parallel session 2: OS.2.1 Muscle function

Reduced lower limb muscle growth in relation to body mass in a cross-sectional study of ambulant individuals with bilateral cerebral palsy aged 10 to 23

J. Noble\(^1\), E. Chruscikowski\(^2\), N.R.D. Fry\(^1\), A.P. Lewis\(^1\), M. Gough\(^1\), A.P. Shortland\(^1\)

\(^1\) Guy's & St Thomas' NHS Foundation Trust, LONDON, United Kingdom
\(^2\) King's College Hospital NHS Foundation Trust, LONDON, United Kingdom

Introduction

To investigate the relationship between lower limb muscle volume and body mass in young people with bilateral cerebral palsy (CP) and their typically developing peers (TD).

Patients and methods

25 participants with bilateral CP (14.7±3.0 years, GMFCS level I-III) and 25 of their TD peers (16.8±3.3 years) took part in this study. None of the participants had undergone orthopaedic surgery, botulinum toxin injections in the previous year. All participants underwent Magnetic Resonance Imaging of both lower limbs. Nine major muscles of each lower limb were individually manually segmented and the muscle volumes calculated and summed. Linear regression was used to investigate the relationship between muscle volume and body mass. Analysis of co-variance (ANCOVA) was employed to investigate whether there was a significant difference in the slopes of the relationship between muscle volume and body mass between the groups.

Results

Muscle volume and body mass were significantly linearly related in both the CP (R\(^2\) = 0.75, p<0.001) and TD (R\(^2\) = 0.77, p<0.001) groups. There was a significant difference between the slopes of lower limb muscle volume against body mass between the groups (p=0.007).

Conclusions

These results suggest that the lower limb muscles in individuals with cerebral palsy may grow less in relation to body mass than their TD peers. These results support the need for a longitudinal study of muscle size to investigate whether reduced muscle growth relative to body mass may in part explain the reported decline in mobility in adolescence and early adulthood in this patient group.

OP-035

Oral presentation

Parallel session 2: OS.2.1 Muscle function

Relationship between plantar flexor muscle volume and gait quality on the Edinburgh Visual Gait Score in ambulant children with cerebral palsy
Introduction: Children with cerebral palsy (CP) present with altered gait patterns and reduced power during stance and push-off. Smaller lower limb muscles in children with CP impair force generation and may influence gait. The aim of this study was to investigate the relationship between calf muscle volume and gait quality, measured by the Edinburgh Visual Gait Score (EVGS), in children with CP.

Patients and Methods: Twenty-nine ambulant children with spastic CP (18 males, mean(SD) age 7y0m(2y8m), GMFCS I=17, II=12) participated. The plantar flexor muscle (PF) volume (medial + lateral gastrocnemius volumes) of both limbs were assessed using freehand 3D ultrasound and normalised to body mass. 2D gait videos were captured and evaluated using the EVGS. For the more and less impaired limbs, a linear regression was used to determine the relationship between normalised PF volume and EVGS, p<0.05. Results: A significant linear relationship was found between normalised PF volume and EVGS for the more (F(1,27)=6.62,p=0.02,R²=0.20) and less (F(1,27)=10.69,p=0.03,R²=0.28) impaired limbs. The difference between regression intercepts approached significance (F(1,55)=3.79,p=0.057) and the slopes were not different. Conclusion: As muscle volume increases, gait quality improves for both limbs of children with CP. For an equivalent PF volume, gait was worse on the more impaired side compared to the less impaired side. In conjunction to muscle volume, neural components of reduced activation and agonist-antagonist co-contraction further unfavourably influence gait quality in the more impaired limb. Treatments to improve muscle volume, neural drive and coordination should be implemented to enhance gait quality in CP.

OP-036
Oral presentation
Parallel session 2: OS 2.2 Early intervention

Developmental profiles and trajectories, including ‘developmental setback’, from 1 to 3 years of age in children with severe visual impairment (VI): OPTIMUM cohort

UCL Great Ormond Street Institute of Child Health, LONDON, United Kingdom

Introduction
Developmental progress is highly vulnerable in young children with congenital VI with risk of severe delays and plateauing/ingression regression (‘developmental setback’) (Dale and Sonksen 2002). This study sets out to prospectively investigate developmental status and progress in a representative national cohort (OPTIMUM) of children with ‘simple’ congenital disorders of the peripheral visual system (CDPVS).

Patients and methods
69 infants (mean 13 months) were assessed on Sensorimotor Understanding (SMU), Verbal Comprehension (VC) and Expressive Language-Structure (EL-S) subscales of the Reynell Zinkin Scales at baseline (T1), twelve (T2) and twenty four months later (T3). Raw scores were transformed to age equivalents (VI norms) and converted to developmental quotients (DQ), which were analysed in the context of total sample and vision level group.

Results
The majority (72-77%) were in the VI adjusted ‘normal’ DQ range (>80) at each time point but the PVI showed significantly more delay (30% partial, 20% global delay T3) (p<0.5). 50% of total sample showed deceleration in SMU T1-T2, but more steady state trajectory in all subscales T2-T3 (58% SMU, 75% VC, 68% EL-S). 8% showed ‘developmental setback’ from T1-T3(30% PVI, 2% SVI).

Conclusion
Developmental status and rates of change were vulnerable in infants and young children with VI, particularly in SMU with challenge in developing object concepts in the first to second year of life. The PVI were most at risk of delays, deceleration in SMU and developmental setback. The vulnerability of developmental progress highlights the need for early intervention to support development in this clinical population.

OP-037
Oral presentation
Parallel session 2: OS 2.2 Early intervention

LEARN 2 MOVE 0-2 years: outcome of a randomized controlled trial on early intervention in infants at very high risk for cerebral palsy including process analysis

T. Hielkema1, E.G. Hamer1, A.G. Boxum1, S. la Bastide-van Gemert1, C.G.B. Maathuis1, H.A. Reinders-Messelink2, J.H.B. Geerzen1, M. Hadders-Algra1
1University Medical Center Groningen, GRONINGEN, The Netherlands
2Revalidatie Friesland, BEETSTERZWAAG, The Netherlands

Introduction: Studying effects of early intervention in infants at risk for cerebral palsy is challenging, due to low prevalence, large heterogeneity and variation in natural course. Assessment of contents of intervention may improve understanding of working mechanisms. Therefore, we compared effects - including analyses of contents of physiotherapy - of COPCA (COPing with and Caring for infants with special needs) and Typical Infant Physiotherapy
OP-038
Oral presentation
Parallel session 2: OS 2.2 Early intervention

The impact of vision level on the way that young children who are visually impaired use their hands: a cross-sectional study

J.A. Smyth1, J. Richardson2, A.T. Salt3
1Great Ormond Street Hospital for Children NHS Foundation Trust, LONDON, United Kingdom
2Kingston and St George’s University of London, LONDON, United Kingdom
3UCL Great Ormond Street Institute of Child Health, LONDON, United Kingdom

Introduction: Vision is critical to early childhood development and children with the most profound visual impairment (PVI) are at risk of developmental stasis and regression. Many children with visual impairment (VI) become tactile learners, requiring early intervention to support effective hand use and developmental progress. However, research in this area is limited.

Patients & Methods: This study aimed to investigate the influence of vision level on hand use in childhood VI. The cross-sectional, historical case note review included an observational survey of hand skills. It used video footage of 19 children with severe VI (SVI, form vision) and 12 children with PVI (light perception at best), between 0–36 months of age.

Results: On average, the SVI group used 80.2% (95% CI: 75.0–87.5) of observed hand skills, whilst the PVI group used 57.1% (95% CI: 46.4–67.9) of these skills. Vision level and hand use were positively and significantly correlated: rs= 0.564 (95% CI: 0.263–0.765), p<0.01. This correlation was stronger than the relationship between developmental level and hand use: rs=0.364 (95% CI: 0.012–0.636), p<0.05.

Furthermore, 15.8% (95%CI: 0.0–31.6) of the SVI group and 66.7% (95%CI: 41.7–91.7) of the PVI group were reluctant to touch objects (p<0.05).

Conclusion: In this study, as vision level decreased the children demonstrated less exploratory hand use. Furthermore, vision level appeared to have a greater influence on hand use than development. Tailoring early intervention to support hand use according to vision level may ensure the most appropriate provision for young children with VI.

OP-039
Oral presentation
Parallel session 2: OS 2.2 Early intervention

Safety and effectiveness of botulinum toxin injection in children younger than 2 years old: a systematic review

J.S. Bourseul1, A. Molina2, M. Lintant1, L. Houx1, E. Chaléat-Valayer3, C. Pons1, S. Brochard1
1CHRU Brest, BREST, France
2CHU Rouen, ROUEN, France
3Croix-Rouge Française, LYON, France

Introduction
Botulinum toxin injection is increasingly used in children with musculoskeletal disorders. The literature supports the hypothesis that the earlier the injection is carried out the better the efficacy is. The aim of this study was to systematically review the literature reporting on the safety and effectiveness of botulinum toxin injection in infants (younger than 2 years old).

Methods
From 942 articles extracted from 5 databases, fourteen articles including data available for children younger than 2 years was included in the systematic review (9 articles included specifically children younger than 2 years). Results Data from 433 infants with cerebral palsy (N=88), brachial plexus palsy (N=87), clubfoot (N=257) were analyzed.
Adverse effects did not appear to be more severe or more frequent than in older children. The risks were not related to the age but more to the severity of the disability and associated impairments. The first studies exhibiting an effectiveness of the botulinum toxin injections were of low grade of evidence (2 RCTs). There were scarce descriptions of the injection protocol. Recommendations based on the lowest age and highest doses reported are made according to the different pathologies for clinical practice.

Conclusions:
In 433 infants with various musculoskeletal disorders, botulinum injection toxin injection does not present specificities in term of safety compared to older children. More randomized control trials are needed to assess the efficacy of early botulinum injection in infants with musculoskeletal disorders.

**OP-040**
Oral presentation
Parallel session 2: OS 2.2 Early intervention

**Optimising nutrition to improve growth and reduce neurodisabilities in infants with suspected or confirmed cerebral palsy**

*M. J. Andrew*
University of Oxford, OXFORD, United Kingdom

**Introduction**
Docosahexaenoic acid (DHA), choline and uridine-5-monophosphate (UMP) form brain phosphatidylcholine. DHA, choline and UMP supplementation increases rodent brain phospholipids, synaptic components, functional brain connectivity and cognitive performance. Data from supplemented neonates with risk factors for neurodevelopmental impairment suggests improved cognitive and language performance (Dolphin 1). This study (Dolphin 2) supplemented infants with suspected or confirmed cerebral palsy (CP) with DHA, choline and UMP during early brain development to investigate supplementation effect on neurodevelopmental outcome.

**Patients and methods**
This was a double blind randomised control trial. Infants aged 1-18 months with suspected or confirmed CP were recruited from UK child development centres. Stratification was by gender, age at recruitment (1–5 months, 6–12 months, 13–18 months), visual impairment and motor disorder severity (4 limb involvement or other). Participants received daily supplementation (treatment or control) for 24 months. Primary outcome measure was composite cognitive score of the Bayley Scales of Infant Development-III (BSID-III) at 24 months. Secondary outcomes included BSID-III composite language score and BSID-III motor composite score. Local Ethics Committee approval was granted.

**Results**
40 infants were recruited. After 24 months mean treatment group cognitive score was 77.7 (SD 19.2), 72.2 (SD 19.8) in controls ($\chi^2(1) = 1.94, p = 0.16$). Mean treatment group language score was 78.5 (SD 25.6), 69.8 (SD 19.7) in controls ($\chi^2(1) = 1.88, p = 0.17$). There was no treatment effect on motor score.

**Conclusion:** Combination micronutrient supplementation of infants with suspected or confirmed CP may improve cognitive and language outcomes; multicentre trial exploration is warranted.

**OP-041**
Oral presentation
Parallel session 2: OS 2.2 Early intervention

**Motor, cognitive, and language development from age 5 to 6 years in very preterm children: associations with educational support and health care interventions.**

*S. van Veen1, C.S.H. Aarnoudse-Moens1, J. Oosterlaan2, L. van Sonderen1, T.R. de Haan1, A.H.L.C. van Kaam1, A.G. van Wassenaer-Leemhuis1*
1Academic Medical Center, AMSTERDAM, The Netherlands
2VU University Amsterdam, AMSTERDAM, The Netherlands

**Introduction**
Very preterm (VP) birth (< 30 weeks of gestation) is associated with multiple developmental problems in early childhood. The special health care and educational support rate received for these problems has only been scarcely examined. This study charted motor, cognitive, and language disabilities, as well as health care interventions and educational support, in VP children at 5 and 6 years of age. It also compared changes in motor, cognitive, and language function between VP children who received special support and VP children who did not.

**Patients and methods**
Data were collected as part of the neonatal follow-up program of the Academic Medical Centre, Amsterdam. Differences in motor (M-ABC-2), cognitive, and language (WPPSI-III-NL) scores between ages 5 and 6 years, in VP children with and without special support, were calculated.

**Results**
At age 5 years, 59% of the 64 VP children had a disability and 41% had multiple disabilities. Six VP children attended special education. Eighty-five of the 64 VP children attended mainstream education, of whom 34 (59%) received special support. A cognitive and/or language disability was associated with receiving extra educational support. Multiple disability rate decreased between 5 and 6 years, because of a decrease in motor disabilities observed both in VP children with and without support.

**Conclusions**
A large majority of VP children has a developmental disability for which they receive special support at 5 years of age. Between 5 and 6 years of age, cognitive and language function remain stable, while motor function improves.
Psychometric study on segmental assessment of trunk control in infants from 4 to 9 months of age

T.W. Pin¹, P. Butler², H.M. Cheung³, S.L.F. Shum³
¹The Hong Kong Polytechnic University, KOWLOON, Hong Kong
²Manchester Metropolitan University, MANCHESTER, United Kingdom
³Prince of Wales Hospital, SHATIN, Hong Kong

Introduction:
Healthy preterm infants show poor trunk control. The Segmental Assessment of Trunk Control (SATCo) assesses segmental trunk control. The present study was to examine the reliability, validity and responsiveness of the SATCo in young infants.

Patients and methods:
Full-term (FT) and preterm (PT) infants born ≤30 weeks of gestation were assessed using the SATCo monthly from 4 to 9 months (corrected for PT infants). At 4 and 8 months, the infants were tested using the Alberta Infant Motor Scale (AIMS).

Results:
20 FT (GA= 38.7 wks; BW= 3019.9g) and 20 PT infants (GA= 27.2 wks; BW= 989.6g) were recruited. The inter and intra-rater reliability of the SATCo levels on FT infants was fair to very good (Kappa = 0.35-1.0) and good to very good (Kappa= 0.69-0.85) respectively. At 8 months, the SATCo static, active and reactive levels were significantly correlated with the AIMS prone, sit, and/or stand sub-scores and/or total score of the FT infants (Spearman’s rank= 0.50-0.62). The PT infants scored significantly lower in the reactive trunk control than the FT infants at 8 months (Mann Whitney U= 102.0, p= 0.022). A significant developmental trend was shown in the static, active and reactive trunk control of the FT infants (Chi-square= 81.4, 75.6 and 79.5 respectively, all p< 0.001).

Conclusion:
The SATCo was reliable, valid and responsive in assessing trunk control in young infants. The SATCo correlated with motor skills in upright positions and could differentiate the reactive trunk control between the PT and FT infants at 8 months.

Neurodevelopmental outcome of very preterm or very low birth weight infants born in the last decade: a systematic review

A. Pascal¹, P. Govaert¹, C. van den Broeck²
¹Ghent University, GENT, Belgium
²University of Ghent, GENT, Belgium

Introduction
As a consequence of prematurity and its complications preterm infants develop remarkably more neurodevelopmental problems. This review investigates the current state of prevalence of neurodevelopmental impairment and cerebral palsy (CP) in very preterm or very low birth weight (VLBW) infants.

Patients and methods
In consistency with the PRISMA guidelines, a systematic literature search was performed in Embase, MEDLINE, Web of Science and CINAHL in August 2016. Cohort studies reporting the prevalence of CP, motor or cognitive outcome until six years of age of very preterm or VLBW infants born after 2006 were included. Pooled averages of extracted data were calculated.

Results
Forty studies were retained. In total, 11531 preterm infants were included with a follow-up varying between 4 months and 5.5 years. Until 2 years of age, pooled averages of mild and moderate to severe cognitive impairment were respectively 15.8% and 9.6%. Mild motor impairment was observed in 17.6% and moderate to severe delay in 11% of the subjects. Only 5 included articles reported outcome from 3 until 5.5 years old. The prevalence of CP decreased with increasing gestational age: 11% and 9.3% in respectively extremely and very preterm infants. In VLBW infants a similar prevalence rate was found (9.3%).

Conclusion
Despite the fact that neonatal intensive care improved tremendously over the last decades, still a wide range of neurodevelopmental disabilities in varying degrees resulting from preterm birth are reported. Adequate follow-up and treatment strategies should be ensured for those infants.
Excitability of motor cortex in children diagnosed with arterial ischemic stroke

S. Kamal¹, A.K. Kaelin-Lang¹, S.K. Kornfeld¹, R.E. Regula², J.D. Rodriguez¹, M. Steinlin¹, S. Grunt¹
Inselhospital, BERN, Switzerland
²Center for Cognition, Learning and Memory, CCLM, University of Bern, BERN, Switzerland

Background
The development of rehabilitation strategies to improve hand function after arterial ischemic stroke (AIS) in children relies on a better understanding of the mechanisms underlying motor recovery. Non-invasive techniques like transcranial magnetic stimulation (TMS) can identify operating mechanisms resulting in novel approaches to motor rehabilitation. We aimed to investigate whether cortical excitability and interhemispheric inhibition (IHI) in children diagnosed with AIS (with and without hemiplegia) differ from healthy controls (HC).

Methods
14 (12.7 ± 4.9 years) and 15 (13.4 ± 4.63 years) stroke patients (SP) with and without hemiplegia respectively, were recruited and compared with 30 HC (14.27 ± 5.36 years). Motor evoked potentials (MEPs) were recorded from the abductor pollicis brevis muscle. Cortical excitability over both hemispheres was assessed by single pulse TMS with different intensities (120%, 130% and 140% of resting motor threshold [rMT]). Paired pulse TMS was performed to assess IHI.

Results
Resting motor threshold was reduced in HC compared to SP with hemiplegia (p<0.01) and without hemiplegia (p<0.01). Recruitment curves of affected hemisphere (hemisphere projecting to the dominant hand in HC) showed significant increase of mean change in MEP (meanMEP) with increasing stimulator intensity in all subgroups (p<0.01). For all three intensities, meanMEPs were higher in HC compared to SP with hemiplegia (p<0.01) and without hemiplegia (p<0.01). IHI didn't differ between all subgroups.

Conclusion
Cortical excitability in children after AIS is reduced and depends on the level of functional impairment. The results of the study can lead to an adjustment of intervention in the rehabilitation settings after pediatric AIS.

Improving the participation of youth with physical disabilities: the effectiveness of the PREP intervention

D. Anaby¹, L. Avery², A. Majnemer¹, D. Feldman³, M. Law⁴
¹McGill University, MONTREAL, Canada
²Avery Information Services Ltd, ORILLIA, Canada
³University of Montreal, MONTREAL, Canada
⁴CanChild Centre for Childhood Disability Research, HAMILTON, Canada

Introduction
Little evidence exists about effective intervention strategies to promote participation of youth with physical disabilities in community activities. Developed by CanChild, the PREP approach (Pathways and Resources for Engagement and Participation) aims to enhance participation by removing environmental barriers and coaching youth/parents. This study examined the effectiveness of the PREP intervention.

Patients and Methods
Twenty-eight youth (50% female), ages 12 to 19 years (mean=14.6, SD=1.8) with moderate to severe physical disabilities (on average), participated in a 12-week PREP intervention. An Interrupted Time Series design with multiple baselines was employed replicating the intervention effect across 3 chosen goals and across participants. An occupational therapist worked individually with youth/parents to identify and implement strategies to remove environmental barriers that impede participation in selected activities. Goal performance was repeatedly measured using the Canadian Occupational Performance Measure (COPM) at baseline, intervention and follow-up (20-weeks). For each goal, a trajectory representing change in performance was analyzed using visual inspection. Segmented regression combined with mixed-effects modeling approach was used to statistically estimate the overall effectiveness of the intervention within and across 79 goals.

Results
A clinically and statistically significant improvement (p<0.001) of more than 2 points on the COPM scale was observed across goals. Levels of performance were maintained during follow-up.

Conclusions
Findings illustrate that participation can be improved by changing the environment only. This further support emerging therapeutic approaches that are activity-based, goal-oriented and ecological in nature, offering a broader range of intervention options in pediatric rehabilitation.
Learning from personal experiences of adolescents with CP: What supports their participation?

S.C. Wintels¹, D.W. Smits¹, D.J.H.G. Wiegerink², M. Willems-Op het Veld², M. Ketelaar³

¹De Hoogstraat Rehabilitation, UMC Utrecht, UTRECHT, The Netherlands
²BOSK, UTRECHT, The Netherlands
³De Hoogstraat Rehabilitation, UTRECHT, The Netherlands

Introduction

It is known that, for adolescents with cerebral palsy (CP), it can be quite a challenge to participate in society. However, where some adolescents struggle, others overcome barriers. The aim of this study is to explore supportive factors for participation, as personally experienced by adolescents with CP.

Methods

Thirty adolescents (12-17 years) with CP will share their participation experiences, with a focus on supportive factors. Participants are being recruited from existing cohorts that started when they were 2-7 years old. At this moment, 18 interviews have been conducted, transcribed, and qualitatively analysed.

Results

First results from 18 adolescents (11 male, 7 female) with GMFCS level I (83.3%) and II (16.7%) revealed various supportive factors, mostly in terms of external and personal factors. External factors were low-stimulus environments, small number of pupils, assistive devices, and supportive relationships. Concerning assistive devices, adolescents mentioned, for example, that they felt less fatigue and walked better with splints or specialized shoes enabling them to participate in activities. Concerning supportive relationships, adolescents described, for instance, how peers convinced them to join sports clubs and made them feel accepted. Personal factors were, being persistent, having self-confidence, and being open about their disability.

Conclusion

Asking adolescents with CP about their experiences revealed various external and personal supportive factors. Present study has learned that adolescents with CP are able to share their experiences. This is a helpful finding for developing recommendations and applications in the future: let’s hear their voices!
Can therapists predict outcomes for children/youth with severe acquired brain injuries in residential rehabilitation?

G. Kelly¹, J. Shanley², C. Dunford²
¹The Children's Trust, TADWORTH, United Kingdom
²Coventry University, COVENTRY, United Kingdom

Introduction

Every child/youth responds differently to acquired brain injury (ABI) making it difficult for therapists to provide realistic information regarding expectations for recovery of function. This study reviewed goals set using goal attainment scaling light (GAS) for children/youth in residential rehabilitation following a severe ABI. It enabled evaluation of therapists' accuracy in predicting outcomes in areas which children and their families have identified as being important to them. Patients and method

All children/youth admitted to a residential rehabilitation programme following a severe ABI between September 2012-2015 (n= 93) were included. Goal setting interviews were held between the child and/or parent, and treating therapist. Expected levels were set by therapists. All goals were retrospectively mapped onto the International Classification of Functioning, Disability and Health. Results

Goals were similar over the three years, majority being within mobility, self-care or communication domains. Goals achieved at the expected level rose slightly over the 3 year period (41% in 2012-13, 43% in 2013-2014, 47% in 2014-2015). Goals that were either significantly over or under achieved reduced through the three years (25%, 12% and 10%). Conclusions

Mobility, self-care and communication are consistently identified as the most important areas for children and their parents. The therapists' ability to predict outcomes for these children/youth has improved over 3 years of use of GAS, however remains at under 50% for achievement at the exact level. This degree of uncertainty needs to be acknowledged when discussing outcomes with children/youth and their families.

Participation of children with spina bifida: a scoping review

B.I. Bakaniene, P.A. Prasauskiene, V.N. Vaiciene-Magistris
Lithuaniane University of Health Sciences, KAUNAS, Lithuania

Introduction

Participation is a key outcome in health for all children. The purpose of this review is to examine what is known about the experience of participation and the factors that influence the participation of children with spina bifida (SB).

Patients and methods

For this review, the methodological framework of the Joanna Briggs Institute was applied. A literature search in CINAHL, Medline, PsychINFO and ERIC databases retrieved 136 papers, 12of which met inclusion criteria and were relevant for analysis. Synthesis of results of general participation as well as factors influencing participation of children with SB was conducted.

Results

Of the 12 relevant papers, 7 specifically examined the participation of children with SB. The remaining studies included children with SB as a portion of the sample. All the research was non-experimental, using cross-sectional, population-based or qualitative methodologies. Three studies examined the general participation, while others focused on separate participation domains, such as leisure, school, or community. Findings from studies clearly demonstrate that children with SB experience greater participation restriction than their typical peers or children with other disabilities. Few studies suggest that participation decreases as children reach adolescence. The most important factors for participation were personal qualities and environment. Inconsistent findings have been noted for the relationships between pathology (level of lesion, hydrocephalus, neurogenic bladder and bowel) and participation in children.

Conclusion

Research in the participation of children with SB is limited. Future research must consider factors that influence participation across all life situations at child, occupation and environment levels.

Participation in physical activities - a multilevel challenge for adolescents with autism spectrum disorders

S. Arnell¹, K. Jerlinder², L.O. Lundqvist¹
¹University Health Care Research Center (UFC) Region Örebro County, ÖREBRO, Sweden
Introduction
Physical inactivity is one of the biggest current public health problems. Few adolescents with autism spectrum disorder (ASD) achieve the recommendation of daily physical activity (PA). The reasons for not being physically active depend on several complex factors, yet not comprehensively described from the adolescents’ point of view. The absence of their perspective means that intervention strategies for health enhancing physical activity may not encompass the experiences of the adolescents themselves. Therefore the purpose of this study was to develop an understanding of the perceptions, experiences and reflections of adolescents with ASDs’ participation in PA.

Participants and methods
Twenty-four adolescents, diagnosed with ASD without a co-occurring intellectual disability, aged 12-16 years, participated in the study. Data was collected using qualitative interviews and inductively analyzed using qualitative content analysis.

Results
Adolescents with ASD were a heterogeneous group in regard to their current PA habits and preferences. Their willingness to participate in PA was conditioned regarding; what, where, when and with whom. They described challenges in the activity and the social context during PA, especially during the mandatory physical education. Perceived demands, freedom of choice, physical ability and sense of control affected their PA participation.

Conclusion
Findings indicate that the adolescents’ willingness to participate was associated with interacting and individual-related conditions, which can be misinterpreted as unwillingness to participate in PA. Thus aspects of autonomy and knowledge about individual conditions and needs have to be recognized when intervention strategies for health enhancing physical activities are planned for this population.

OP-051
Oral presentation
Parallel session 2: OS 2.3 Participation and Autonomy

Changes in impact of drooling after submandibular Botulinum Toxin treatment in 160 children with neurodevelopmental disabilities
J.J.W. van der Burg, K. van Hulst, C. Erasmus, P.H. Jongerius
St. Maartenskliniek, UBERGEN (NIJMEGEN), The Netherlands
Radboud University Medical Center, NUMEGEN, The Netherlands

Introduction
Reduction of drooling after Botulinum Toxin (BoNT) injections in salivary glands has been documented in several studies. We investigated changes in impact of drooling on daily life and care, social interaction and self-esteem after BoNT injections in submandibular glands.

Patients and methods
From our database, 160 children with neurodevelopmental disabilities were included. Before BoNT injections and after 8 and 32 weeks, the Drooling Quotient (DQ5) was determined and parents completed a questionnaire on the severity and impact of drooling. ANOVA was used to evaluate drooling severity over time and differences in daily care and social interaction were investigated by paired t-tests.

Results
Drooling severity significantly reduced at 8 and 32 weeks after injections (F=48.96, df=2,307, p<.001). Daily care (frequency of wiping the chin (F=20.02, df=2,235, p<.001) and changing bibs (F=13.77, df=2,276, p<.001)) decreased significantly. The frequency of parents prompting the child to swallow also decreased significantly at 8 weeks after treatment but returned to baseline at 32 weeks. There was a significant decrease in damage to furniture (t(159)=3.81, p<.001 CI 0.6-0.20), and to computers (t(159)=2.27, p<.001 CI 0.5-0.18). We also found a significant decrease in number of parents that reported the child to be avoided by peers and adults by 8 weeks but not at 32 weeks. There were only anecdotic reports on changes in self-esteem.

Conclusion
A reduction of drooling severity after submandibular Botulinum Toxin treatment was accompanied by reduced impact on the child and family at 8 weeks, and to a lesser extent at 32 weeks follow-up.

OP-052
Oral presentation
Parallel session 2: OS 2.3 Participation and Autonomy

Occupational therapy home programmes for children with unilateral cerebral palsy using bimanual and modified constraint induced movement therapies: a critical review
Y. Milton, S.A. Roe Mba
Covetnry University, COVENTRY, United Kingdom

Notes:
Home programmes involve a family focused approach to ensure best practice and meaningful participation in specific intervention activities. The aim of the critical review was to gain a deeper understanding of how bimanual therapy and modified constraint induced movement therapy or constraint induced movement therapy methods are used within occupational therapy home programmes (OTHPs) from an occupational perspective.**Methods:** A literature search focussing on children with unilateral cerebral palsy was conducted using health research e-databases; five studies met the inclusion criteria. These were critically appraised and analysed according to the relevant supports and barriers of the Person-Environment-Occupation conceptual model of practice.**Results:** Family collaboration, strategic use of outcome measures, construction of the programme within the home environment and occupation-focused goals and activities emerged as commonly used methods. Enhanced descriptions of intervention context, the child’s voice in defining goals and challenges in optimising occupational balance surfaced as gaps in the programmes.**Conclusion:** This review is the first to use a conceptual model of practice to identify how motor approach methods are applied within OTHPs for children with unilateral cerebral palsy. Bimanual therapy and/or CIMT or m-CIMT methods are used in different ways within OTHPs and occupational performance is enhanced through collaboration, parental support/education, occupation-focused goal-setting and the use of outcome measures. Implications for practice and research include combining motor and non-motor approaches, using core occupational therapy skills, working within individual contexts, valuing family preferences; using child specific goal setting instruments would strengthen the child’s voice and promote participation within a wider range of occupations.

**Evaluation of the added value of botulinumtoxin in combined treatment with intensive functional physiotherapy to improve impaired body function and structure in childhood spastic cerebral palsy**

1 Erasmus University Medical Center, ROTTERDAM, The Netherlands
2 Rijndam Rehabilitation, ROTTERDAM, The Netherlands
3 VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands

**Introduction**

Botulinumtoxin injections (BoNT-A) followed by a period of intensive physiotherapy (iPT) and, if necessary, casting or ankle-foot orthoses, form a widely used treatment combination for ambulatory children with spastic cerebral palsy (CP). The added value of BoNT-A for improving body function and structure has not been explicitly studied, however.

**Patients and methods**

A comparative effectiveness multi-center trial was performed. Children with spastic CP, aged 4-12 years, GMFCS levels I-III, were either randomised to BoNT-A+iPT or only-iPT, or allocated to their preferred treatment group. Outcomes for effectiveness were related to body function and structure, and were assessed at baseline, 12 and 24 weeks. We performed intention-to-treat analysis with linear mixed models.

**Results**

A total of 65 children participated (40% randomized); 41 children received BoNT-A+iPT and 24 received only-iPT. Participants were equally distributed over GMFCS levels, their mean age was 7.3 years. We did not find any statistically significant differences in treatment effects between groups, except for gait-analysis-measured knee angle during midstance while wearing footwear at 12 weeks, which was in favour of only-iPT (4.8 degrees difference between groups, 95%CI[-0.29.2], p=0.036), and gait-analysis-measured maximum knee angle during swing while barefoot at 24 weeks, which was in favour of BoNT-A+iPT: (3.4 degrees difference, 95%CI[-0.4:1.05], p=0.035).

**Conclusion**

At the group level, BoNT-A injections did not add to clinical effectiveness in combined BoNT-A+iPT treatment. This suggests that prescription and use of BoNT-A for improvement of outcomes concerning impaired functioning has to be critically reconsidered in this CP age and severity subgroup.

**Treadmill perturbations to evoke stretch reflexes during gait in children with cerebral palsy**

M.M. van der Krogt, L.K. van Capelleveen, J.J. van der Heijden, J. Harlaar, A.I. Buizer, L.H. Sioot
1 VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands
2 VU University Amsterdam, AMSTERDAM, The Netherlands
3 Wyss Institute, Harvard University, CAMBRIDGE, United States of America

**Introduction**
Spasticity, i.e. exaggerated velocity-dependent stretch reflex activity, is one of the key impairments in neurological diseases, but its effect on gait is unclear [1]. Our aim was to investigate whether treadmill accelerations can be used to quantify stretch reflexes during gait in typically developing (TD) children and children with cerebral palsy (CP), as recently shown for healthy adults [2].

**Patients and methods**

14 TD children (10.8±3.1y) and 4 children with CP (9.8±1.3y/GMFCS-II, data collection ongoing) walked on a split-belt instrumented treadmill at self-selected fixed walking speed, for 6 minutes. Treadmill accelerations and decelerations of three different intensities were applied just after initial contact, 10 times each in random order. 3D kinematics and EMG were measured, and analyzed following [2].

**Results**

In TD, perturbations resulted in increased ankle dorsiflexion, which increased with intensity up to 3.7±1.7° (p<.001). This caused an increasing stretch velocity of gastrocnemius and soleus, and bursts of increased muscle activity in these muscles up to twice the normal value (p<.001). Reactions in CP were more variable, with 3 out of 4 subjects showing enhanced activity in either gastrocnemius, soleus and/or peroneus muscles compared with TD.

**Conclusion**

Stretch reflexes can be evoked using treadmill perturbations in both TD and CP. The enhanced reflex activity in CP indicates that treadmill perturbations are a promising method for assessing spasticity during gait in a clinically applicable manner, which could be part of future clinical gait analysis.

[1] Van der Krogt et al. 2010
[2] Sloot et al. 2015

**OP-055**

Oral presentation
Parallel session 2: OS 2.4 (Innovations) in mobility interventions

**Real time visual feedback to improve gait in children with cerebral palsy**

A.T.C. Booth1, F. Steenbrink2, J. Harlaar1, A.I. Buizer1, M.M. van der Krogt1
1VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands
2Motekforce Link, AMSTERDAM, The Netherlands

**Introduction** Real-time feedback may be useful for enhancing clinical gait analysis and gait training in children with cerebral palsy (CP). Although it has been shown children with CP can improve knee/hip extension in response to feedback [1], a clinical application, using feedback on a range of gait parameters is required to accommodate the range of gait limitations associated with CP.

**Patients and methods** An avatar-based feedback game was developed for an integrated treadmill system with virtual reality environment and motion capture (Motekforce link, Amsterdam), allowing real-time feedback on a range of gait parameters affected in CP. Four children with CP (Age: 9.8±1.3yrs/GMFCS-II) were included in an ongoing study. Three trials were carried out with feedback on a single parameter including; knee extension at initial contact, ankle power at push-off and a further patient specific parameter (step length, pelvis tilt or foot progression).

**Results** Peak knee extension around initial contact improved by 12.3±4.8°. Peak ankle power at push off improved by 47.5±30.3%. With patient specific feedback, children were able to achieve improvements in mean pelvis anterior tilt (reduced by 5°), step length (increased by 13.3%), and a modest improvement of foot progression during stance (2.4° reduced during gait).

**Conclusion** This study demonstrates the feasibility of real-time feedback to drive clinically relevant improvements [2] of a range of key gait parameters in children with CP. The adaptability of gait in children with CP shows the potential of feedback as a tool for targeted gait training. Patient specific compensations that may have clinical importance were observed during some trials.

**OP-056**

Oral presentation
Parallel session 2: OS 2.4 (Innovations) in mobility interventions

**Robot-assisted gait training in children with cerebral palsy: first results from the Advanced Robotic Technology Integrated Centers (ARTIC) Network**

H.J.A. van Hedel1, A. Meyer-Heim1, J.V. Graser1, P. Bonato2, E. Fabana3, S. Berweck3, S. Schröder4, T. Egan5, D. Gaebler-Spira2

1University Children's Hospital Zurich, AFFOLTERN AM ALBIS, Switzerland
2Spaulding Rehabilitation Hospital, BOSTON, United States of America
3Department of Neuropaediatrics and Neurological Rehabilitation, VOGTAREUTH, Germany
4Dr. von Haunerschen Kinderspital, MUNICH, Germany
5Rehabilitation Institute of Chicago, CHICAGO, United States of America

**Introduction**

Robot-assisted gait training (RAGT) is increasingly applied to complement conventional therapies in children with cerebral palsy (CP). The Advanced Robotic Therapy Integrated Centers (ARTIC) Network was initiated to increase
the evidence of RAGT. The aim of this study was to investigate changes in gait capacity and achievement of gait-related goals in children with CP who received Lokomat training.

**Patients and methods** The ARTIC Database contains various patient characteristics, outcome assessments [e.g. the 10 Meter Walk Test (10MWT) and Goal Attainment Scaling (GAS)] and training parameters. We selected data from children with CP, who had at least a pre and post assessment of the 10MWT or a GAS. For patients with multiple rehabilitation stays, we included only data from the first period.

**Results** One-hundred-thirty-eight children fulfilled the criteria (62 girls; 10.2±4.4 years old; 123 with spastic bilateral CP). Most children had a Gross Motor Function Classification System (GMFCS) level II (n=25), III (n=60), or IV (n=50). The 10MWT improved significantly between 8-11% for children with GMFCS levels II (preferred speed), III (preferred and maximum speed) and IV (maximum speed). Of the 45 children with completed GAS, 71% achieved their goal. Most goals considered gait-endurance and gait-quality.

**Conclusion** These preliminary findings show that many children with CP improve gait capacity and seem to reach their therapeutic goals when receiving RAGT. Future aims are to investigate whether we find a dosage-response relationship. Comparative therapy and alternative robotic trials are necessary to determine how to maximize mobility outcome for children with CP.

---

**OP-057**

Oral presentation

Parallel session 2: OS 2.4 (Innovations) in mobility interventions

**Functional brain connectivity in children with bilateral cerebral palsy (CP) in response to intensive rapid reciprocal leg training**

L. Damiano¹, S. Yoshida², J. Stanley¹, S. Mor², J. Pekar², V. Faria², A. Hoon², E. Stashinko³, K. Alter³

¹National Institutes of Health, BETHESDA, United States of America

²Johns Hopkins University, BALTIMORE, United States of America

³National Institute of Health, BETHESDA, United States of America

**Introduction:** Far less is known about brain reorganization and plasticity in bilateral versus unilateral CP. Intrinsic networks identified by resting state or functional connectivity represent those activated by tasks or disrupted by pathology. fMRI results from a RCT of 2 novel locomotor training devices in CP are reported, hypothesizing decreased connectivity across hemispheres after 12 weeks reciprocal leg training, that relates to motor outcomes.

**Patients and Methods:** Pre/post 3T MRI images from 10 children; 11.5±4.0 years, with bilateral CP, GMFCS I-III, randomly assigned to Motomed (5) or elliptical (5). MRI analyzed using registration and segmentation procedures from Faria 2012. A 46X46 correlation (connectivity) matrix created from 19 age-related controls provided z-score matrices for participants with CP. Largest baseline differences were selected as ROIs for examining pre-post changes. Connectivity changes after training were correlated with changes in voluntary device cadence, PODCI Scores.

**Results:** Reciprocal coordination, measured by increased device cadence, improved in this sample (p<0.05). ROIs included: pre and post-central and 8 other gyri. Homotopic correlations in all gyri in CP showed greater baseline connectivity than controls that may subserve greater limb synchrony vs. reciprocation in bilateral CP. 9/10 showed decreased connectivity after training, 1 significantly. Decreased connectivity in multiple gyri related to motor improvement, e.g. decreased post-central gyrus connectivity with increased elliptical cadence (r=-0.70) and decreased cingulate gyrus connectivity with improved PODCI Transfers score (r=-0.65).

**Conclusion:** This is the first study demonstrating excessive hemispheric connectivity in bilateral CP that responds to, and correlates with improvements after, reciprocal leg training.

---

**OP-058**

Oral presentation

Parallel session 2: OS 2.4 (Innovations) in mobility interventions

**Analyzing the Effect of Individually Structured Trunk Training on Trunk, Upper and Lower Limb Motor Function in Children with Spastic Cerebral Palsy.**

A. Numanoglu Akbas¹, M. Kerem Günel²

¹Abant Izzet Baysal University, BOLU, Turkey

²Hacettepe University, ANKARA, Turkey

**Introduction:** The purpose of this study is to investigate the effect of individually structured trunk training (ISTT) on motor function in children with Cerebral Palsy (CP).

**Patients and methods:** 38 children with bilateral spastic CP (10 girls, 28 boys, mean age=9.6±4.1) were recruited for this study. Motor functions, activity and participation levels assessed with Trunk Control Measurement Scale (TCMS), Gross Motor Function Measurement (GMFM), Quality of Upper Extremity Skills Test (QUEST), Modified Tardieu Scale (MTS), 1 Minute Walk Test (1MW), Functional Independence Measure for Children (WeeFIM) and Child Health Questionnaire (CHQ-PF 50) at baseline and after 8 weeks. 20 children received ISTT two times a week addition to their routine physiotherapy program (two times a week). ISTT includes trunk targeted strengthening
exercises and neurodevelopment treatment. 18 children set as control group and continued their routine physiotherapy program twice a week.

**Results:** According to the results; there were no significant difference between groups at baseline (p>0.05). After 8 week intervention the children in ISTT group showed 7 points improvement in TCMS, 4.3 percent in GMFM, 6.5 percent in QUEST, and 1.6 meters in 1 MWT and 4.3 points in WeeFIM (p<0.05). There were no significant difference for MTS and CHQ-PF 50 values (p>0.05). In control group there was no significant difference for all of the measurements.

**Conclusions:** This results show that ISTT in addition to the routine physiotherapy could be use for improving trunk, upper and lower extremity motor functions and activity levels of children with bilateral spastic CP.

**OP-059**
Oral presentation
Parallel session 2: OS 2.4 (Innovations) in mobility interventions

**A comparative study on the effectiveness of two different devices for virtual reality based therapy on children with cerebral palsy post single event multilevel surgery**

J. Jose, D. Sharan, J.S. Rajkumar, R. Balakrishnan, L. Elluru, S. Tiwari
RECOUP Neuromusculoskeletal Rehabilitation Centre, BANGALORE, India

**INTRODUCTION**
Virtual reality based therapy (VRBT) refers to the use of interactive simulations to present users with opportunities to perform neuromuscular reorganization in virtual environments that appear, sound, and less frequently, feel similar to real-world objects and events. This study compared the effects of 2 off-the-shelf gaming system devices on standing balance and weight shifting for children with Cerebral Palsy (CP) following single event multilevel lever arm restoration and anti-spastic surgery (SEMLARASS).

**PATIENTS AND METHODS**
A prospective experimental study was conducted among 50 CP post SEMLARASS aged 5-15 years and randomly assigned into Group A (n=25): received the VRBT with Xbox 360 with Kinect (XwK) and Group B (n=25): received the VRBT with Nintendo Wii with Balance Board (WwB). The study duration was 5 weeks with 30 minutes of intervention per day for 6 days per week in each group. A total of 3 games (5 choices) were played per session supervised by a physiotherapist. Paediatric Balance Scale (PBS) and Dynamic Gait Index (DGI) were the primary outcome measures, performed at baseline, 5 weeks after the treatment and follow ups after 1 month and 3 months.

**RESULTS**
Both the groups improved significantly after the intervention. However, Group A showed significant difference in PBS (P<0.01) and DGI (P<0.05) when compared to group B. The obtained outcomes were maintained at 1 month and 3 months follow up.

**CONCLUSION**
While both devices were found effective, VRBT with XwK was superior to WwB for improving standing balance and weight shifting in CP after SEMLARASS.

**OP-060**
Oral presentation
Parallel session 2: OS 2.4 (Innovations) in mobility interventions

**Agreement on gross motor function of children with cerebral palsy; classified by parents and (pediatric) physical therapists**

E.L. Kraaijeveld, M. Ketelaar
De Hoogstraat Rehabilitation, UTRECHT, The Netherlands

**Introduction** To determine the agreement of gross motor function classification (GMFCS) by families of children with CP and their therapists. **Patients and methods** Families of 59 children with CP between 6 and 12 years old of two schools for special education were asked to fill in the GMFCS-Family Report Questionnaire (GMFCS-FR). The (pediatric) physical therapists of the participating children were asked to classify the GMFCS, using the GMFCS-Expanded & Revised (GMFCS-E&R). Agreement on GMFCS was calculated using a cross table and a quadratic weighted kappa. **Results** Parents of 35 children returned the questionnaire. For 3 children parents marked none or more than one classification and therefore agreement could not be assessed. In 18 of the 32 children (56%), absolute agreement between parents and physical therapists was obtained. A difference of 1 level between parents and therapists was found in 11 of the 32 children (34%) and 2 levels difference in 3 children (9%), with a weighted kappa of 0.84 (95% BI 0.74-0.95). In case of disagreement between parents and therapists, parents classified the GMFCS level systematically higher (less functioning) than the therapist. **Conclusion** In general, classification of gross motor function by parents of children with CP (using GMFCS-FR) and therapists (GMFCS) is sufficiently consistent. The finding that, in case of differences, parents classify their child systematically at a lower level of functioning may be related to different contexts. The GMFCS-FR provides an excellent tool to discuss gross motor function of the child with parents.
The impact of structural brain damage on upper limb movement patterns in children with unilateral cerebral palsy.


1KU Leuven, LEUVEN, Belgium
2ETH Zürich, ZURICH, Switzerland

Introduction

In children with unilateral cerebral palsy (uCP), upper limb three-dimensional movement analysis (UL-3DMA) has not yet been employed to investigate the relation between brain lesion characteristics and UL performance. This study aimed to determine the impact of lesion timing, location and extent on UL movement patterns in children with uCP.

Patients and methods

We measured 48 children with uCP (age 10.4±2.7 years; 29 boys; 21 right-sided; 33 periventricular white matter (PWM) lesions; 15 cortical deep grey matter (CDGM) lesions) using 3DMA during reach-to-grasp a cylinder, and scored lesion location and extent using a semi-quantitative MRI scale. Parameters extracted from the 3DMA included spatiotemporal parameters (duration, (timing of) maximal velocity and trajectory straightness), the total amount of movement pathology (Arm Profile Score, APS) and the amount of movement deviation of the wrist, elbow, shoulder, scapula and trunk (Arm Variable Scores, AVS).

Results

The CDGM group showed more aberrant spatiotemporal parameters (p<0.03), higher APS (p=0.003) and more movement deviations of wrist flexion/extension (p=0.01) than the PWM group. Lesion location and extent were more strongly correlated with UL kinematics in the CDGM group (r=0.34-0.65) compared to the PWM group (r=0.35-0.42). Regression analysis exposed damage to the temporal lobe with lesion timing as interactor (27%, p=0.002) and the PLIC (7%, p=0.04) to explain 34% of the variance in APS.

Conclusion

UL kinematics are more influenced by lesion location and extent in the CDGM group than in the PWM group. The PLIC was a significant predictor for UL movement pathology independent of lesion timing.

Asymmetry of Upper Limb Activity in Children with unilateral cerebral palsy: Validation of a Triaxial Accelerometer Approach

G. Sgandurra, I. Braito, M. Maselli, E. Beani, F. Cecchi, E. Sicola, P. Dario, G. Cioni, R.N. Boyd

1IRCCS Fondazione Stella Maris, University of Pisa, CALAMBRONE (PI), Italy
2IRCCS Fondazione Stella Maris, CALAMBRONE (PI), Italy
3Scuola Superiore Sant'Anna, PISA, Italy
4The University of Queensland, QUEENSLAND, Australia

Introduction

In unilateral cerebral palsy (UCP) quantitatively measurement of the asymmetry in the use of upper limbs (ULs) could overcome the limitation of many outcome measures in which scores are dependent on the experience and training of the therapist. The main aim of this study was to determine the validity of Actigraph GXT3+ to measure asymmetry in use of the two ULs during the Assisting Hand Assessment (AHA) in patients aged 5-19 years with UCP, compared to age-matched typically developing subjects (TD). Patient and methods. 24 UCP (mean age 10.16±5.46) and 15 TD (mean age 9.13±4.14) subjects were assessed with AHA while wearing actigraphs on their both wrists. The mean activity of each hand (dominant DH and non dominant NDH) and the asymmetry index (AI: difference between the mean activities of the two arms) were calculated. Results. In both groups the mean activity of the DH was higher than the NDH, but the difference was statistically significant only in the UCP group. Moreover, the differences between TD and UCP groups for the NDHs were highly significant while those for the DHs were not significant. The difference between the AI of the TD and UCP groups was statistically significant; the UCP group values were remarkable higher than those of the TD group. In addition, AI values were highly correlated with the AHA scores. Conclusions. The obtained results suggest further use of Actigraphs for the assessment of ULs in clinical research.
Dynamic motor control before and after selective dorsal rhizotomy in ambulant children with cerebral palsy

1L.M. Oudenhoven1, M.M. van der Krogt1, J. Harlaar1, N. Dominici2, E.A.M. Bolster1, P.E.M. van Schie1, A.I. Buizer1
2VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands

Introduction: Selective dorsal rhizotomy (SDR) is a neurosurgical treatment to reduce spasticity in children with cerebral palsy (CP). While some patients show long-term improvement in gross motor function after SDR, others show less or no improvement. Recently, it has been proposed that dynamic motor control (DMC) expressed as the variance accounted for (VAF) by a certain number of synergies during gait, can be predictive for SDR outcomes. The aim of the present study was to investigate whether muscle synergies change after SDR treatment and if we can use VAF pre-SDR to predict long-term outcomes in gross motor function after SDR.

Patients and methods: Clinical gait analyses of 38 ambulant children with CP (GMFCS I to III) were analyzed before SDR and two to five years post-SDR. Synergies were calculated from EMG of five leg muscles, using non-negative matrix factorization. In addition, 26 children fulfilled the 66-item Gross Motor Function Measure (GMFM-66).

Results: No significant changes in DMC were observed for VAF by one synergy two years (p=0.462) or five years post-SDR (p=0.598). VAF by two synergies decreased significantly two years post-SDR (p=0.026). No correlation was found between VAF pre-SDR and changes in GMFM-66 percentiles post-SDR (p=0.349).

Conclusion: Muscle synergies can slightly change after SDR treatment, but this change is not necessarily reflected in VAF by one synergy. Although a promising new tool, DMC cannot be used as a single instrument to predict GMFM-66 changes after SDR and further research is recommended to explore contributions of other factors involved.

OP-064
Oral presentation
Parallel session 3: OS 3.1 Clinical movement analysis

The temporal organization of fidgety movements and cerebral palsy outcome in high-risk infants from three continents

1Norwegian University of Science and Technology, TRONDHEIM, Norway
2Ann & Robert H. Lurie Children's Hospital of Chicago, CHICAGO, United States of America
3Norwegian University of Science and Technology, St. Olav's Hospital, TRONDHEIM, Norway
4University Hospital of North Norway (UNN), TROMSØ, Norway
5Oslo University Hospital, OSLO, Norway
6University of Chicago (Uoc), CHICAGO, United States of America
7Levanger Hospital (LEV), LEVANGER, Norway
8Christian Medical College (CMC), VELLORE, India
9St. Olavs Hospital (STO), Trondheim University Hospital, TRONDHEIM, Norway

Introduction: Identification of fidgety movements (FMs) using the general movement assessment (GMA) is considered the most accurate method for prediction of cerebral palsy (CP). Temporal organization is a way of classifying FMs. The aim of this study was to calculate the accuracy of GMA for prediction of CP in a large, multinational sample of high-risk infants. Patients and methods: 728 infants were included in three countries (Norway, USA, India). Inclusion criteria differed between centers and comprised very-low-birthweight (VLBW) infants (BW≤1500g; CMC, India), preterm infants (GA≤31 weeks/BW≤1500g) who required oxygen at birth (UoC, USA), preterm infants (GA≤30 weeks), infants with imaging abnormalities, prolonged hospitalization or cardiac surgery during the neonatal period (LCH, USA) and infants enrolled in a follow-up program at discharge from the NICU (RH, UNN, STO, Levanger, Norway). Infants were videotaped during the FMs period (10-15 weeks post term age) and abnormal (absent, sporadic or exaggerated) and normal (intermittent or continual) FMs were classified by two GMA-certified observers. CP status was assessed between 18 months and 4 years. Results: The prevalence of CP was 45% (6%) of 728 infants. Of 149 infants with abnormal FMs, 31 had CP (positive predictive value 21%). Of 579 infants with normal FMs, 14 developed CP (negative predictive value 98%). Among 71 infants with absent FMs, 28 (39%) developed CP, whereas only 3 (4.5%) of 66 with sporadic FMs had CP. Conclusion: Intermittent or continual FMs are highly predictive of a non-CP outcome. Classification of sporadic FMs as abnormal is not supported by this study.

OP-065
Oral presentation
Parallel session 3: OS 3.1 Clinical movement analysis

Ankle foot orthosis stiffness alters trunk movement and walking energy cost in Cerebral Palsy.

Y.L. Kerkum1, P. Meyns2, M.A. Brehm3, A.I. Buizer4, J.G. Becher4, J. Harlaar7
1OIM Orthopedie, ASSEN, The Netherlands
2MOVE Research Institute Amsterdam, VU University Medical Center, AMSTERDAM, The Netherlands

Introduction: Ankle foot orthosis (AFO) stiffness alters trunk movements and walking energy cost in Cerebral Palsy (CP). Where some patients show long-term improvement in gross motor function after AFO, others show less or no improvement. Recently, it has been proposed that dynamic motor control (DMC) expressed as the variance accounted for (VAF) by a certain number of synergies during gait, can be predictive for CP outcomes. The aim of the present study was to investigate whether muscle synergies change after AFO treatment and if we can use VAF pre-AFO to predict long-term outcomes in gross motor function after AFO.

Patients and methods: Clinical gait analyses of 38 ambulant children with CP (GMFCS I to III) were analyzed before AFO and two to five years post-AFO. Synergies were calculated from EMG of five leg muscles, using non-negative matrix factorization. In addition, 26 children fulfilled the 66-item Gross Motor Function Measure (GMFM-66).

Results: No significant changes in DMC were observed for VAF by one synergy two years (p=0.462) or five years post-SDR (p=0.598). VAF by two synergies decreased significantly two years post-SDR (p=0.026). No correlation was found between VAF pre-SDR and changes in GMFM-66 percentiles post-SDR (p=0.349).

Conclusion: Muscle synergies can slightly change after AFO treatment, but this change is not necessarily reflected in VAF by one synergy. Although a promising new tool, DMC cannot be used as a single instrument to predict GMFM-66 changes after AFO and further research is recommended to explore contributions of other factors involved.
Introduction

Ankle-foot orthoses (AFOs) are prescribed to normalize lower limb kinematics during walking in children with cerebral palsy (CP). Varying AFO stiffness can lead to clinical changes in lower limb kinematics and walking energy cost in CP. However, AFOs can also change trunk movements during gait. As abnormal trunk movements significantly affect walking energy cost, we hypothesized that varying AFO stiffness alters trunk movements and walking energy cost.

Patients and method

15 children with spastic CP (11 boys/4 girls, 10±2 years, GMFCS-level I-II), walking with excessive knee flexion, were prescribed with a spring-hinged AFO (Neuro Swing®, Fior & Gentz). Stiffness was set rigid (3.8Nm-deg-1), stiff (1.6Nm-deg-1) and flexible (0.7Nm-deg-1). 3D-gait analysis (3D trunk range of motion[deg], walking speed[m-min-1]) and walking energy cost tests (netEC[J-kg-1-min-1]) were performed at comfortable speed for each condition. Differences between conditions were analyzed using GEE. Pearson’s correlations were used to determine the association between trunk range of motion and netEC.

Results

Trunk lateroflexion and rotation significantly increased in all AFO conditions compared to shoes-only (p<0.001), and they respectively decreased and increased with increasing stiffness. All AFOs decreased netEC similarly compared to shoes-only. Trunk tilt and lateroflexion were significantly correlated to netEC (p=0.419, p<0.001; p=0.576, p<0.001, resp.).

Conclusion

Tuning AFO stiffness has a significant impact on trunk movements during walking in CP. Additionally, abnormal trunk movements while walking with AFOs are related to increased netEC. Therefore, trunk kinematics should be included when assessing the AFO’s efficacy and when interpreting increased walking energy cost in children with CP.

References

OP-066

Oral presentation
Parallel session 3: OS 3.1 Clinical movement analysis

Gait characteristics, balance performance and falls in ambulant adults with cerebral palsy

P.E. Morgan†, J.L. Mcginley‡, A.T. Murphy§, A. Opheim¶
†Monash University, FRANKSTON, Australia
‡The University of Melbourne, PARKVILLE, Australia
§Monash Health, CHELTENHAM, Australia
¶Sunnaas Rehabilitation Hospital, NESODDTangen, Norway

Introduction:

Increased attention to lifespan health-care needs of those with cerebral palsy (CP) has raised awareness of potential mobility changes and falls. Adults with CP may fall frequently, with adverse physical and mental health consequences. Measures of gait speed and gait variability predict falls risk in older adults. The relationship between spatiotemporal gait variables, balance performance and falls history was investigated in ambulant adults with CP.

Patients and Methods:

Participants completed a single assessment of gait using instrumented walkway, balance performance testing (Balance Evaluation Systems Test; BESTest), and self-reported falls history.

Results:

Seventeen ambulatory adults with CP, mean age 37 years, participated. Ten participants walked at preferred gait speed of <1.0 m/sec. Participants demonstrated short stride length and high cadence relative to speed. There was a significant, large positive relationship between preferred gait speed and BESTest total (r=0.57, p<0.05), and fast gait speed and BESTest total (r=0.65, p<0.01). There was a significant large negative relationship between double support time at both preferred and fast speeds and BESTest total (preferred: r=-0.61, p<0.05; fast: r=-0.67, p<0.05). Fallers took significantly shorter stride lengths than non-fallers, at preferred (0.56m, 0.85m, p=0.032) and fast gait speeds (0.61m, 0.97m, p=0.025). Comparisons between gait variability and falls history failed to reach significance.

Conclusion:

A falls history was associated with slower gait speed and shorter strides. Future exploration of implications of these features on falls and community access, and potential prognostic value of stride length and gait speed on identifying falls risk in adults with CP is recommended.

OP-067

Oral presentation
Parallel session 3: OS 3.1 Clinical movement analysis

Gait pattern of children with bilateral lower limb spasticity due to HIV encephalopathy and CP - Is there a difference?
Children with HIV encephalopathy (HIVE) often present with bilateral lower limb (BLL) spasticity and abnormal gait. Management of gait abnormalities is well established in children with Cerebral Palsy (CP), but still unclear in HIVE. The aim of this study was to compare (i) differences in gait pattern and (ii) change in gait pattern after one year, in children with BLL spasticity due to HIVE versus CP.

**Patients and methods** Children were recruited from state hospitals and special schools in Cape Town, South Africa. Based on three-dimensional gait analysis (3DGA; Vicon) of six-gait cycles (three left, three right sides) gait parameters were calculated resulting in Gait Deviation Index (GDI). Mann Whitney- and Wilcoxon tests were used for statistical analyses.

**Results** Twenty children with BLL spasticity due to HIVE (mean±standard deviation age: 8.9±2.1 years; eight boys) and nine children with CP (8.4±2.0 years; six boys) were included. Baseline GDI for the HIVE and CP group was not different (median (interquartile ranges): 71.0 (61.8-77.3) versus 68.0 (59.0-77.0)). After one year the HIVE group showed a significant change (57.5 (57.0-75.3), p<0.0001), while no progress was reported in the CP group (74.0 (62.0-83.0); p=0.30).

**Conclusions** Although the HIVE- and CP groups had similar baseline values, only the HIVE group showed deterioration in their gait pattern. Nevertheless, GDI is an overall score and more detailed interpretation of 3DGA data and physical examination is needed to be able to establish evidence-based management guidelines for optimizing secondary gait abnormalities in children with BLL spasticity due to HIVE.

**OP-068**

**Oral presentation**

**Parallel session 3: OS 3.1 Clinical movement analysis**

**Toe walking is accompanied by increased stretch reflexes and co-activation at foot-strike in both Cerebral Palsy and typically developing children.**

J. Lorentzen, H.M. Hülle Larsen*, M.S. Willerslev-Olsen*, J.B. Nielsen*

*Elsass Institute, University of Copenhagen, CHARLOTTENLUND, Denmark

**Introduction:**
Children with cerebral palsy (CP) often have reduced walking abilities primarily caused by reduced muscle strength in plantar- and dorsi-flexor muscles, increased stiffness and decreased range of motion of the ankle joints. Toe-walking appear to be a common strategy to overcome these deficits. Early stretch reflex activity in the plantar-flexor muscles (SRPF) and co-activation at foot-strike is currently seen as a contributor to the reduced walking abilities and toe walking making it a target for treatment. In this study we investigated the SRPF and co-activation during walking in CP and typically developing children (TD).

**Patients and methods:**
10 children with CP (GMFCS 1-2) aged 7-12, identified as toe walkers, and 10 age matched TD were included in the project. Gait analysis were made by 3-D kinematic analysis (Qualisys) and EMG recordings of Soleus and Tibialis anterior muscle activity on all children at their preferred walking speed on a treadmill. The children with CP used their normal walking strategy like the TD children, but the TD children were also tested when walking on their toes only.

**Results:** The preliminary results show that SRPF were not active during foot strike for the TD children when walking using their typical strategy. SRPF at foot strike were present in most participants in both groups when walking on their toes. Co-activation also was similar for toe-walking in the two groups. **Conclusions:** These findings indicate that SRPF and co-activation likely may be a consequence of toe walking rather than a symptom leading to toe walking.

**OP-069**

**Oral presentation**

**Parallel session 3: OS 3.2 Communication, cognition and behaviour**

**Assessing functional vision skills for communication in children with severe cerebral palsy: findings from a practical structured history taking and assessment approach**

J.C. Sargent, T. Griffiths, K. Bates

Great Ormond Street Hospital for Children NHS Foundation Trust, LONDON, United Kingdom

**Introduction**
Children whose movements are restricted due to cerebral palsy experience activity limitations which reduce opportunities to learn through direct experience. Poor hand skills and bulbar involvement limit gesture and vocalisation, creating expressive communication difficulties. For such children, the use of vision is critical for sensory
input (watching others’ actions partially compensates for limited experience), and for communication output (controlled gaze can act as a selection method (sometimes called eye-pointing) within augmentative communication systems.)

**Patients/methods**

Our previous work has demonstrated that children’s use of gaze may be poorly described by parents and therapists, despite these observations being key to assessing communication. A structured history taking approach was therefore devised in order to elicit basic descriptions of the child’s looking skills, including fixation quality, fixation shifts, and confidence in determining fixation target during choice-making. Functional visual assessment then followed.

Of 124 children referred in a 2 year period to a specialist communication clinic, the 33 children reported as using eye-pointing, or referred with explicit questions about functional visual skills or the use of eye-gaze access technology, were assessed.

**Results**

Parents provided descriptive information about their child’s patterns of fixation. In 22/33 children assessment findings largely matched parental descriptions. However, in a notable proportion of these cases, clinical findings conflicted with skills reported by referring therapists.

**Conclusion**

In children with limited movement, a structured history yields descriptions of functional visual skills for communication which assessment can investigate. Such history taking could be a useful tool for the therapist.

---

**OP-070**

*Oral presentation*

**Parallel session 3: OS 3.2 Communication, cognition and behaviour**

**Describing eye-pointing in children with cerebral palsy**

M.T. Clarke1, R. Cooper2, A. Woghiren3, G. Panesar2, L. Croucher1, T. Griffiths2, K. Price1, J.C. Sargent2, J. Swettenham1

1University College London, LONDON, United Kingdom

2Great Ormond Street Hospital for Children NHS Foundation Trust, LONDON, United Kingdom

**Introduction**

For children with cerebral palsy affecting their whole body who have little or no functional speech, the use of looking skills is a major way in which to communicate. For example, by pointing with their eyes to an object (i.e. looking between an object and a communication partner) they might signal interest in that object. Looking skills can also be used as a response modality in language and cognitive assessment. However, there is often a lack of agreement concerning which looking skills represent pointing and which may not.

In order to support clinicians to describe looking skills in relation to eye-pointing, our aim has been to establish a descriptive scale. In this presentation, the clinical and theoretical issues underpinning eye-pointing will be outlined; the descriptive scale will be presented, and its applications discussed.

**Participants and methods**

The scale has been developed through the following procedures: (i) a literature review on eye-pointing was undertaken to identify current definitions; (ii) focus group discussions were conducted to develop the descriptive scale’s content, form and ease of use; (iii) enhancement of the scale was carried out through an online survey using purposive sampling; (iv) the inter-rater and test-retest reliability of the scale is being tested with 80 children developmentally aged 9 months to 6 years.

**Results**

The five-point scale was successfully established and current tests show excellent levels of reliability.

**Conclusion**

The new eye-pointing scale has significant potential to support assessment and clinical decision making for non-speaking children with severe cerebral palsy.

---

**OP-071**

*Oral presentation*

**Parallel session 3: OS 3.2 Communication, cognition and behaviour**

**IDD Classification Algorithm - A Reliable Method to Recommend Communication Assistive Devices**

D.P. Roye, Jr.1, H. Matsumoto1, S. Maier1, J. Yoshimachi1, Z. Bloom1, H.E. Kim2, J.P. Dutkowsky2, B.S. Snyder3

1Weinberg Family Cerebral Palsy Center at Columbia University Medical Center, NEW YORK, United States of America

2Columbia University Medical Center, NEW YORK, United States of America

3Boston Children’s Hospital, BOSTON, United States of America

**Introduction:** Individuals with intellectual and developmental disabilities (IDD) are often limited by physical and/or cognitive disabilities to operate electronic Patient-Reported Outcome (PRO) interfaces. The IDD Classification Algorithm (IDD-CA), a clinical flowchart developed by expert consensus, stratifies patients into 1 of 11 groups to
identify patients physically unable to self-report computer based patient reported outcomes (PRO). This study assessed the reliability of the IDD-CA among raters of varying expertise levels.

**Patients and Methods:** Prospective cohort study at 2 academic medical centers to test the IDD-CA reliability among 3 levels of raters: I=physician; II=resident/ NP/RN/PA; III=medical student/administrator. Patients 8-21 years old with cerebral palsy were recruited. The ‘IDD-CA Present’ group evaluated patients using the IDD-CA, while the ‘IDD-CA Absent’ group evaluated patients without the IDD-CA. Unweighted kappa analysis was conducted to compare agreement between the levels of raters, and to compare between the ‘IDD-CA Present’ and ‘IDD-CA Absent’ groups.

**Results:** In total, 27 raters evaluated 152 patients. The ‘IDD-CA Present’ group evaluated 102 patients (GMFCS I:15%, II:23%, III:15%, IV:18%, V:29%), while the ‘IDD-CA Absent’ group evaluated 50 (GMFCS I:44%, II:32%, III:8%, IV:36%, V:20%). Among all levels, the ‘IDD-CA Present’ group had nearly perfect inter-rater reliability (0.885-0.945), while the ‘IDD-CA Absent’ raters had only fair (0.364) to the low-end of substantial (0.407-0.645) agreement.

**Conclusion:** Our study demonstrates the excellent reliability of the IDD-CA among clinicians of all levels. It is a reliable methodology, and will be instrumental in recommending appropriate assistive devices to give a voice to those previously unheard.

**OP-073**

**Oral presentation**

**Parallel session 3: OS 3.2 Communication, cognition and behaviour**

**Sleep disorders in children with a motor disability: a comparative population-based study**

D. Jacquier, C.J. Newman
University Hospital of Lausanne, LAUSANNE, Switzerland

**Introduction:**
Children with motor disabilities (MD) such as cerebral palsy or neuromuscular diseases present more sleep disorders than their healthy peers. However, research on these populations has always been performed using historical normative datasets or controls such as siblings. We assessed the sleep quality of children with MD and of a large contemporary and regional general population sample.

**Participants and methods:**
A questionnaire on demographic and medical characteristics, along with the Sleep Disturbance Scale for Children (SDSC) was sent to parents of children aged 4 to 18 years followed in our tertiary pediatric neurorehabilitation clinic, and to school-aged children of a representative sample of regional primary and secondary schools. Healthy participant data allowed us to set pathological sleep score thresholds (T-score ≥ 70).

**Results:**
We collected 245 MD and 2891 general population responses (response rates 37% and 26%). Children with a MD had significantly more frequent pathological sleep in the SDSC total score (7% vs 1.9%, OR 3.98, CI95% 2.17-7.27, p<0.001) and in the SDSC subscores (disorders of sleep-related breathing, 9.9% vs 2%, OR 5.30, CI95% 3.23-8.69, p<0.001), except for disorders of arousal. Non-walker status, tube feeding, drug-resistant epilepsy and severe/profound intellectual disability all had a positive significant association with a pathological sleep in the MD population.

**Conclusion:**
This population-based study provided a robust estimation of the prevalence of sleep disorders in children with MD. If sleep disorders were significantly more frequent in children with MD, consistent with earlier studies, these frequencies were lower than previously reported.

**OP-072**

Oral presentation
Parallel session 3: OS 3.2 Communication, cognition and behaviour

**Relationship between executive function and white matter microstructure in dyskinetic cerebral palsy**

O. Laporta-Hoyos¹, K. Pannek², J. Ballester-Plané³, E. Vazquez², I. Delgado³, L. Zubiaurre-Elorza⁴, A. Macaya⁵, P. Pnn⁶, M. Melendez-Plumed³, C. Junqué⁵, R.N. Boyd⁶, R. Pueyo³
¹University of Barcelona, BARCELONA, Spain
²CSIRO, Australian e-Health Research Centre, BRISBANE, Australia
³Hospital Universitari Vall d’Hebron, BARCELONA, Spain
⁴Universidad de Deusto, Facultad de Psicología y Educación, BILBO-BIZKAIA, Spain
⁵Vall d’Hebron Institut de Recerca, Universitat Autònoma de Barcelona, BARCELONA, Spain
⁶Servei de Neurología, Hospital Universitari Sant Joan de Déu, BARCELONA, Spain
⁷Faculty of Medicine, University of Barcelona, BARCELONA, Spain
⁸Old Cerebral Palsy and Rehabilitation Research centre, BRISBANE, Australia

**Introduction:** There are no previous studies of executive function (EF) in persons with dyskinetic CP. This study aimed to identify brain regions where white matter (WM) microstructure is related to EF in this CP subtype.
OP-074

Oral presentation
Parallel session 3: OS 3.2 Communication, cognition and behaviour

Sleep Problems in Children with Down Syndrome.
O. S. Ipsiroglu1, E. Tse2, A. Marwaha1, N. Beyzadei1, M. Berger1, M. Chan1, D. Mckenna2, P. Hanbury3, S.S. Stockler1
1University of British Columbia, VANCOUVER, Canada
2University of Toronto, TORONTO, Canada
3Down Syndrome Research Foundation, BURNABY, Canada

Introduction: Individuals with Down syndrome commonly experience sleep problems, including sleep disordered breathing (SDB), parasomnias, and insomnia. We investigated sleep problems in individuals residing in British Columbia (BC), Alberta (AB) and Ontario (ON).

Patients & Methods: An anonymous online REDCap survey for parents/caregivers of individuals with DS was conducted in 2015. The survey was comprised of 80 questions in 5 parts: (i) demographics, (ii) diagnoses, medications and supplements, (iii) development, (iv) sleep/wake-behaviours, and (v) feedback/testimonials. We analyzed the sleep/wake-behaviour results with focus on categorical diagnoses provided by professionals versus descriptive symptoms reported by caregivers.

Results: 346 responses from BC, AB, and ON were received; 311/346 responded to the sleep sections specifically and 22% reported sleep problems (BC: 19%; AB: 36%; ON: 21%). Percentages of categorical diagnoses and descriptive symptoms (2, 3, 4+) for SDB: BC 16/(66, 43, 21); AB 31/(71, 51, 22); ON 17/(56, 41, 11); parasomnias: BC 4/(17, 5, 0); AB 2/(11, 2, 2); ON 3/(7, 4, 0); and insomnia (1+, 2): BC 15/(53, 18); AB 22/(56, 13); ON 7/(41, 4).

Conclusion: Across the three provinces, the number of reported symptoms was significantly higher than the frequency of diagnosed sleep disorders among individuals with DS. While SDB requires a formal sleep study for diagnosis, the diagnosis of insomnia and parasomnias is based on capturing descriptive symptoms. These results underline the necessity to bridge information gaps regarding sleep problems in the healthcare system in order to overcome under-diagnosis. We suggest bridging the gaps by enabling parents to share observation-based symptoms in a structured way with involved professionals using a Down syndrome medical care app.

OP-075

Oral presentation
Parallel session 3: OS 3.2 Communication, cognition and behaviour

Similarities and differences in visual-motor deficits among children with Developmental Coordination Disorder with and without Autism Spectrum Disorder
H. van Waelvelde, J. Debrabant
Ghent University, GENT, Belgium

Introduction. The interrelatedness of motor difficulties in children with autism spectrum disorder (ASD) and developmental coordination disorder (DCD) remains unraveled. This study compared unpredictable and timed visual-motor reaction times together with outcomes on a standard clinical developmental test of visual-motor integration.

Patients and methods. Children with DCD (n=20), children with ASD and DCD (ASD+; n=25), children with ASD without DCD (ASD-; n=21) and typically developing children (TD, n=23) were evaluated with M-ABC-2; Beery VMI entailing a grapho-motor copy, visual discrimination and drawing task; and a visual-motor reaction time test (VRT) entailing an unpredictable pacing condition (random stimulus interval) and a predictive pacing condition (fixed stimulus interval).

Results. Overall, similar performance decreases were observed across the DCD and ASD+ group relative to the TD and ASD- group for M-ABC-2 and VMI tasks. VMI visual discrimination task showed only impaired performance in
the DCD group. Between-group differences did occur with regard to VRT response speed, the ASD+ group was unable to achieve an average RT as fast as the other groups. TD children responded significantly faster at predictive relative to unpredictive stimuli unlike the ASD and DCD groups, with the ASD+ group being affected the most. Significant associations presented between predictive encoding and grapho-motor skills in children with ASD- and controls only.

Conclusions. At the behavioral level children with ASD+ and DCD encounter similar visual-motor deficits but underlying mechanisms seem to be not identical. Differences in therapeutic needs between both groups have to be investigated.

OP-076
Oral presentation
Parallel session 3: OS 3.2 Communication, cognition and behaviour

The relationship between object recognition difficulties and motion coherence in children with and without cerebral visual impairment
E. Ortibus
KU Leuven, LEUVEN, Belgium

Introduction:
Children with Cerebral Visual Impairment (CVI) have a variety of visual perceptual problems, among which impaired object recognition and motion coherence perception are very common. Whereas motion perception is a mid-level visual function, object recognition requires higher visual processing. The objective of this study was to evaluate the relationship between object recognition difficulties as assessed by the L94 visual perceptual battery and motion coherence perception in children with and without CVI.

Methods:
One hundred and forty five children (100 children with diagnosed CVI and 45 without this diagnosis) were assessed with both the subtests of the L94 (visual matching, noise, overlapping figures, Devos series and unconventional viewpoints), used for CVI diagnosis, and the motion coherence tests (structure from motion, speed, coherence and biological motion). The subtest results of both groups were compared and correlations within and between the subtasks of both tests were measured.

Results:
Correlation analysis showed only a significant, moderate correlation between form from motion and visual matching of the L94 (r=0.243; p=0.043) in children without CVI. In children with CVI, a strong significant correlation between the biological motion coherence task and overlapping figures of the L94 was found (r=0.427; p=0.048).

Conclusion:
There was no straightforward relationship between motion perception and object recognition abilities in children without CVI, nor in those with the diagnosis. Further investigation into the real life correlates of motion perception difficulties is warranted.

OP-077
Oral presentation
Parallel session 3: OS 3.2 Communication, cognition and behaviour

Long-Term Response to Botulinum Toxin Injections in Sialorrhrea in Cerebral Palsy
P. Diaz Borrego1, M.R. Lepe Evora1, J.A. Conejero Casares2, V. Cruz Guisado2, M. Rodriguez-Piñero Duran1, B. Romero Romero2
1Servicio Andaluz de Salud, SEVILLE, Spain
2University Hospital Virgen Macarena, SEVILLE, Spain

INTRODUCTION
Drooling is a severe problem in children with neurological deficits. It occur in up to 33% of children with cerebral palsy secondary to oral-motor dysfunction. The aim was to assess the long-term response to botulinum toxin A ultrasound-guided injections (BTXA-I) on drooling in cerebral palsy children (CP).

METHOD
Retrospective-descriptive survey. Period study: 2015-2016. Inclusion criteria: CP patients under 18 years with severe drooling. Measure units: demografic data, Gross Motor Function Classification System (GMFCS), Manual Ability Classification System (MACS), Intensity and frequency drooling scale (IFDS), daily changes of bibs/tissues and visual analogic scale of parents satisfaction (VAS) before and 1 month after ultrasound guided injection.

RESULTS
18 children. Female 61%. Mean age: 8 years. GMFCS IV-V 90%. MACS IV-V 82%. Initial data: 56% severe drooling (4) and 78% constant drooling (4), Daily bibs changes average: 8. BTXA-I dosage average: Parotid-20UI/submaxilar-17UI. BTXA-I sessions average per child: 4. Non-response to toxin injection in one of the treatment sessions: 50% cases (22% in second session). Side-effects: 11% thickened saliva. Post-injection data: 39% moderate drooling (3) and 50% occasionally drool (2). Parents satisfaction VAS mean 8. Daily bibs changes post-injection average: 5. Good results after re-injection post non-response session.
CONCLUSIONS
BTXA-i in CP having severe drooling, demonstrates clinical improvement in reduction of saliva. Some children failed
to respond to the treatment in some moment of the multiple injections. Probably, secondary to toxin resistance or
structural gland modifications. Good results after re-injection post non-response session probably reflect reduction
antibodies or normalization gland’s histology.

OP-078
Oral presentation
Parallel session 3: OS 3.3 Family focused intervention

Giving parents a voice: A systematic program evaluation of family-centred service delivery
J.W. Gorter¹, P. Rosenbaum¹, R. Teplicky¹, U. Williams¹
¹McMaster University, HAMILTON, Canada
²McMaster Children’s Hospital, HAMILTON, Canada

Introduction: Family-centred service is considered best practice in rehabilitation service delivery for children with
disabilities. Systematic and effective evaluation of parents’ experiences with service delivery, however, is lacking. In
2015, CanChild began offering a service to assist rehabilitation programs with their evaluation of family-centred
service.

Patients and methods: Between May 2015 and April 2016, CanChild conducted an evaluation for a province-wide,
government-based program for children with autism. The Measure of Processes of Care (MPOC) was used to
evaluate parents’ perceptions of the extent to which services are family-centred. Parents from 13 agencies were
given the choice of completing the survey online or on paper. Data were analyzed descriptively and reports were
prepared for the agencies.

Results: Responses were received from 3450 of the 6372 families (54%). MPOC scale scores ranged from 5.45
(SD=1.46) out of 7 on “Providing General Information” to 6.25 (SD=0.84) out of 7 for “Respectful and Supportive
Care”. Descriptive analysis of the demographics suggests that families who received services at home perceived
their services to be more family-centred than those who received services at the agency.

Conclusion: The results show that a systematic and large-scale evaluation can provide comparative data on parents’
perceptions of family-centred care. While parents perceive services to be highly family-centred, “Providing General
Information” is an area in which the agencies have the most room for improvement. The high response rate and
overall number of responses across a province-wide program provide a high level of confidence in these findings.

OP-078A
Oral presentation
Parallel session 3: OS 3.3 Family focused intervention

Fulbari Program: an integrated approach at rehabilitating and empowering the child and family of children
with developmental disability in Nepal
R. Thapa
Self help group for cerebral palsy, LALITPUR, Nepal

Introduction
Facilities for rehabilitation of disabled children is scarce and inaccessible to most people in Nepal. This study aims to
assess usefulness of a program called “Fulbari” to overcome this limitation in context of underdeveloped country as
Nepal.

Patients and Methods
In this institution and community based cross-sectional study, 48 mothers (8 families at a time) of children (2-14
years) diagnosed with various non-progressive developmental disorder were invited free of cost by Home Visitors of
Self-help Group for Cerebral Palsy (SGCP) Nepal, for one month from 8 districts of Nepal for “Fulbari” program. In
this intensive camp like program, parents and the children were trained for pedagogy, livelihood earning skills and
vocational training and received medical treatment, physiotherapy, speechtherapy, occupational therapy, orthotics,
assistive devices, hygiene & first-aid training.

Basic screening was done at the beginning and again nine months later regarding Knowledge, Attitude and
Practice (KAP) and mental health of the parents while Activities of Daily Living (ADL) & Quality of Life (QoL) of the
children. Descriptive statistics and inferential statistics were used to describe and assess relationship between
variables.

Results
After the program, there was a significant improvement in KAP and both physical/mental health of the parents while
ADL, school integration, and QoL of the children. This progress was more than the progress made in the districts or
in the specialized center alone.

Conclusions
Intensive camp like training program for parents and children with developmental disorder can be effective
alternative in developing countries as Nepal.
Sibling relationships and life satisfaction from the perspective of children and adolescents with cystic fibrosis
G. Renner, K. Boß
Ludwigsburg University of Education, LUDWIGSBURG, Germany

Introduction:
Research on sibling relationships in families with chronically ill children has almost exclusively focused on well-being and adjustment of the healthy sibling. The present study aimed at presenting first data on the quality of sibling relationships from the perspective of children and adolescents with cystic fibrosis (CF).

Patients and Methods:
75 children/adolescents (aged 10-18) with CF from German-speaking countries participated in an online survey and completed the “Students Life Satisfaction Scale” (SLSS) and the “Questions on Life Satisfaction for adolescents and adults with cystic fibrosis” (FLZM-CF). 50 participants who had one sibling were additionally given the “Sibling Relationship Questionnaire” (SRQ-Deu) and a new questionnaire focusing on illness-related aspects of sibling relationships.

Results:
Compared to normative data life satisfaction was significantly reduced (p < .001, d = -0.52). Participants with and without siblings did not differ on SLSS and FLZM-CF. SRQ factors Warmth/Closeness (p = .02; d = 0.35) and Rivalry (p = .02; d = 0.34; indicating perceived parental partiality in favor of the sibling with CF) were significantly elevated. Warmth/Closeness correlated positively with SLSS and FLZM-CF (both r = 0.30, p = .04). Most participants described positive CF-related emotional support.

Conclusion:
Most children and adolescents with CF have a positive view of their sibling relationships and experience warmth and closeness. Although having a sibling per se did not have an impact on well-being in our sample, the quality of sibling relationships may contribute to general and CF-related life satisfaction.

Proxy Quality of Life surveys; parental perceptions and impressions.
S. Petersen, F. Newall, S. Lima, D. Reddihough, A. Harvey
Royal Children's Hospital, MELBOURNE, Australia

Introduction:
Quality of life (QOL) tools are commonly used in cerebral palsy (CP) research and clinical practice to measure outcomes of interventions and to determine the impact of chronic illness on a child, a parent or a family. QOL tools are difficult to design and validate, but provide a time efficient quantitative measure of what is essentially qualitative data. There is a paucity of research that measures the impact of completing proxy QOL surveys for parents of children with CP.

Patients and Methods:
Qualitative interviews with 10 parents of children with CP were conducted. Parents were asked for their perceptions on commonly used QOL survey tools. The data from the interviews was analysed and themed.

Results:
Parental perceptions on completing proxy QOL tools was rich and nuanced and reflected individual parent’s opinions. QOL tools were perceived as a reflective experience, an opportunity to think about the impact of CP. Parents discussed feeling uncomfortable and guilty when completing the tools, concerned about how their responses might be interpreted by researchers or clinicians. Parents reflected that they found it easier to complete surveys about interventions or goals for their child. Less focussed goals made completing the QOL tools a challenging experience.

Conclusion:
Asking parents to complete proxy QOL tools is common in clinical practice and CP research. However, completing the surveys may produce unanticipated reactions from parents. The impact of these commonly used tools should be considered as part of research and clinical project design.

OP-081
Oral presentation
Parallel session 3: OS 3.3 Family focused intervention
MiYoga - A Randomized controlled trial of an embodied mindfulness yoga program to enhance attention for child-parent dyads with unilateral and bilateral cerebral palsy
C.K. Mak, K. Whittingham, R. Cunnington, R.N. Boyd
The University of Queensland, SOUTH BRISBANE, Australia

Introduction
Fifty percent of children with cerebral palsy (CP) have cognitive difficulties. Yet, there are limited interventions addressing this. Mindfulness-based interventions improve cognitive abilities in the adult population. This study investigates the effectiveness of an embodied mindfulness-based yoga program, MiYoga, in a waitlist randomized controlled trial targeting sustained attention in children with bilateral or unilateral cerebral palsy.

Patients and methods
Forty-two child and parent dyads (57.1% males; mean age 9y 1mo, SD 3y; GMFCS I=22, II=12, III=8; mean Full-scale IQ: 84.6, SD 20.4) were randomized to either the 8 weeks MiYoga group (n=21) or 8 weeks Waitlist control group (n=21). The primary outcome was children’s sustained attention measured by variables from the Conner’s Continuous Performance Task (CPT) - the Hit Reaction Time Block Change (HitRT block change) as well as the Omissions and Commissions Block Change variables.

Results
Children in the MiYoga group demonstrated significantly better sustained attention post intervention compared to the control group on the HitRT Block Change variable of the CPT (attention was better sustained for the duration of the task) F(1,33) = 4.98, p = 0.03, partial eta squared = 0.14 (ANCOVA). Further analysis confirmed that the MiYoga group demonstrated ability to focus and maintain attention on task across the blocks in the treatment group post MiYoga. The same was not found for the waitlist control group.

Conclusion
MiYoga, a family focused lifestyle intervention, was associated with improvements in sustained attention for children with unilateral and bilateral CP.

OP-082
Oral presentation
Parallel session 3: OS 3.3 Family focused intervention

Coping among mothers of children with cerebral palsy: A mixed method approach
P. Tiwari1, U.D. Ranjit2, R. Thapa3
Janamaitri foundation institute of health sciences, KATHMANDU, Nepal
Maharajgunj Nursing Campus, KATHMANDU, Nepal
Self help group for cerebral palsy, LALITPUR, Nepal

Introduction
Amidst all the sorrows in everyday living, families with a child with disability have been successful in weaving their lives around the successes of their lives. The objective of the study was to assess coping among mothers of children with CP by adopting an embedded mixed method design.

Patients and Methods
Cross-sectional descriptive design was employed in the quantitative design where Family Crisis Oriented Personal Evaluation Scale (FCOPES) was utilized to collect data from a convenient sample of 40 mothers of children with CP who were under regular follow up by home visitor of Self-help Group for Cerebral Palsy while embedded qualitative design was used to explore the coping of mothers of CP affected children. From the parent population of quantitative sample, 4 mothers were chosen for in depth exploration, regarding their coping by means of case study method.

Results
The mean level of coping was 104.52 ± 9.18 with 12.5% having low level of coping. Significant association was found between sex of the child and reframing (p=0.002), seeking spiritual support (p=0.008) and mobilizing family to acquire and accept help (p=0.021) subscale of coping which were further supported by qualitative findings.

Conclusion
Thus, one eighth of the mothers still had very low level of coping. As a health care provider it is very important that we identify the existing coping strategies of the family immediately after diagnosis of the child and tailor therapeutic interventions according to the need of the family and help them cope better.

OP-083
Oral presentation
Parallel session 3: OS 3.3 Family focused intervention

Food insecurity in US households that include children with disabilities
S.L. Parish1, R. Sonik1, S. Ghosh2
Brandeis University, WALTHAM, United States of America
Tata Institute, MUMBAI, India
Introduction: Food insecurity refers to inadequacies of nutritionally adequate food, and it is typically associated with constrained financial resources. Two cross-sectional studies have found that households including children with disabilities have higher odds of food insecurity than other households. However, neither study controlled for adult disability status, despite its demonstrated relationship to food insecurity.

Patients and Methods: We examined the association between children’s disability status and food insecurity with data from the 2004 and 2008 panels of the Survey of Income and Program Participation, a nationally representative survey of US households collected by the US Census Bureau (n= 24,741 households). The Survey is representative of the non-institutionalized US civilian population. The sample included 12.9 million US households (weighted) that include at least one child with a disability. By examining a range of indicators, we assessed the presence of a child with a disability as a predictor of household food insecurity, controlling for socio-demographic factors including adult disability status. Multivariate analyses were conducted, appropriately adjusting for covariates and the complex sampling design of the Survey.

Results: Households that included children with disabilities experienced greater prevalence of very low food security as compared to households in which no children had disabilities. Families raising children with disabilities were more likely to receive Food Stamp (SNAP) benefits.

Conclusion: Food Stamp benefits are insufficient to eliminate food insecurity in many families raising children with disabilities. More robust policy measures are warranted.

OP-084
Oral presentation
Parallel session 3: OS 3.3 Family focused intervention

Exploring the benefits of workshops aimed at empowering parents and carers of children with autism to manage their child’s sensory needs in everyday family life.
L.E. Mcquillin, S. Armitage, J. Featherstone
Sheffield Children's NHS Foundation Trust, SHEFFIELD, United Kingdom

Introduction:
Many children with autism have sensory needs that can be challenging for parents to manage, restricting family engagement in daily activities. One NHS Trust delivers “parent sensory workshops” as an intervention. The workshops aim to empower parents by helping them to identify their child’s sensory needs and providing strategies to manage these in everyday life.

Patients and Methods:
Parents of children with autism and sensory difficulties attended the workshops. After the workshops, parents completed a questionnaire to identify: i) their child’s sensory needs; ii) the use of the workshops in relation to these needs; iii) the overall helpfulness of the workshops.

Qualitative questionnaire data was analysed and grouped under common themes occurring from the responses. A framework was used to categorise data into theoretical domains of sensory needs and parent perceived benefits of the workshops. Quantitative data was analysed descriptively.

Results:
Eight workshops were delivered in 2015 to 75 families. Sixty-one questionnaires were returned. Themes of sensory needs, (such as ‘sleep’, ‘daily tasks’), were identified through categorisation of parent reported concerns. Sixty-one percent of parents felt that the workshops would “really help” them to address their concerns and 33% felt they would “help a bit”. Parent feedback on what was most useful from the workshop was categorised into three key themes: ‘social support’, ‘belief about capabilities’ and ‘knowledge’.

Conclusions:
Common themes relating to parent concerns about their children’s sensory needs have been identified. Sensory workshops can empower parents with to manage these needs in everyday life.

OP-085
Oral presentation
Parallel session 3: OS 3.3 Family focused intervention

Developing an acuity/dependency tool to assess and safeguard nursing and care provision for children and young people (CYP) with complex needs in a specialist residential care setting
J. Grove, R.M.T. Oliver, K. Davis
The Children's Trust, SURREY, United Kingdom

Introduction
Creating an environment to deliver high-quality care is the responsibility of the whole team but falls to healthcare managers (HCM) to facilitate. Acuity/dependency tools measure patient demand examining illness severity, nursing and care need intensity. Planned approaches to staffing is linked with better patient outcomes, staff satisfaction and retention. Several tools exist across different healthcare settings but are lacking for CYP with complex neurodisabilities within residential settings. The development of a judicious tool will enable team managers to assess and
monitor staffing levels, support professional judgment, strengthen nursing leadership and augment the quality/ safety of healthcare provision.

Patients and methods
Mixed method, interactive action research study.

Three stages of enquiry;
Literature review
Audit of Work-flow timed-task activities & Nursing Quality Indicator (NQI) data
Development and piloting of acuity tool

Results
Initial 24hr work-flow audit- allocated care time per CYP across 3 houses(H)
H1. Mean=868mins (n=11)
H2. Mean=1,104mins (n=7)
H3. Mean=1,121mins (n=9)
Baseline NQI for H3:
Total Nursing Dependency Score (NPDS) (Mean)=65.9 (62-73) (NPDS>25= 'High Dependency' - 2 carers for most care activities)
Unrestricted Care=1,145 (930-1,425)mins
Restricted Care=604 (555-660)mins

Conclusion
Describing and planning staffing levels in a specialist residential setting is complex. The development of an appropriate acuity measure is needed to support HCM’s decision-making and facilitate critical reflection of nursing dependency, skill mix and staffing ratios. We found collective 24hr work-flow data was strongly associated with high-dependency care levels with baseline acuity/quality data indicating 5 acuity categories (A-E) predictive of adequate staffing levels

OP-086
Oral presentation
Parallel session 4: OS 4.1 Motor learning

The effects of modified constraint-induced movement therapy combined with intensive bimanual training (mCIMT-BiT) in children with obstetric brachial plexus palsies: a retrospective data base study
I.M. Zielinski1, R. van Delft2, J. Voorman3, A.C.H. Geurts1, B. Steenbergen1, P.B.M. Aarts1
1Radboud University Nijmegen, NijMEGEN, The Netherlands
2De Trappenbergen, HUIZEN, The Netherlands
3Merem - Rehabilitation Center De Trappenberg, HUIZEN, The Netherlands
4Radboud University Medical Center, NijMEGEN, The Netherlands
5Sint Maartenskliniek, NijMEGEN, The Netherlands

Introduction: Developmental disregard, the non-use of the affected upper limb despite residual capacity which is originally described in children with unilateral cerebral palsy (uCP), is sometimes also observed in children with obstetric brachial plexus palsies (OBPP). The combination of modified constraint-induced movement therapy with intensive bimanual training (mCIMT-BiT) is frequently applied to overcome developmental disregard. In the current study the effects of mCIMT-BiT on spontaneous upper limb use and bimanual performance is investigated in children with OBPP and compared to children with uCP. We hypothesized that children with OBPP would also benefit from this therapy.

Patients and methods: Data of 19 children with OBPP (M age: 4.1years) and 18 with uCP (M age: 4.5years) were compared. Spontaneous use (AHA) and bimanual performance (ABILHAND-kids, COPM) were assessed at three time points (pre-treatment, post-treatment, follow-up). Outcome measures were analyzed using repeated measures analysis with group as between-subjects factor.

Results: Children with OBPP showed significant improvements on all outcome measures following mCIMT-BiT with sustained effects at follow-up. Improvements on bimanual performance (ABILHAND-kids, COPM) were comparable to those in uCP. Contrary to uCP, children with OBPP showed additional improvement of spontaneous use (AHA) at follow-up (M=69.47) compared to post-treatment assessment (M=68.05; t(18)=2.156, p=0.045).

Conclusion: The results indicate improved bimanual performance in children with OBPP following mCIMT-BiT, comparable to the improvement in uCP, suggesting that mCIMT-BiT is effective in OBPP. Additionally, in children with OBPP spontaneous affected upper limb use further improved after therapy. This implies that these children have effectively overcome their developmental disregard following mCIMT-BiT.

OP-087
Oral presentation
Parallel session 4: OS 4.1 Motor learning

Cognitive-motor relations in children with Developmental Coordination Disorder (DCD): Intersecting growth curves
P.H. Wilson1, B. Steenbergen2, D.A. Sugden3, J. Piek4, S. Ruddock1

1, 2, 3, 4, 5
Introduction: Recent data show delayed development of executive function (EF) in children with Developmental Coordination Disorder (DCD). In this study we modeled the co-development of EF and (online) motor control functions in both DCD and typically developing children (TDC). For both groups, we predicted parallel growth curves until middle childhood but divergence into older childhood.

Participants and Method: 200 children (aged 6-12 years) were tested every 6 months over a 2-year period; 36 had DCD. Working memory was assessed using the Groton Maze Learning Task (GMLT) and a 1-back memory task. The GMLT consists of an 8 x 8 grid of locations presented on a tablet PC. Using defined rules, children find a hidden pathway through the maze over repeated trials. Online motor control was measured using a double-jump reaching task. A parallel growth curve analysis was conducted for each group.

Results: For the TDC group, growth trajectories for the working memory and online motor control tasks both showed linear trends, with moderate covariation between growth functions during middle childhood and divergence into older childhood. The growth pattern for children with DCD was similar but of reduced fit, overall.

Conclusion: Both DCD and TDC show evidence of linear growth in both EF and motor control over childhood. Differentiation of growth functions is also evident after middle childhood, despite some persistent delays in both EF and motor control in DCD. Results are discussed in the context of a hybrid, multilevel account of DCD, together with implications for intervention design.

OP-088
Oral presentation
Parallel session 4: OS 4.1 Motor learning

Improvement in corticospinal tract fibers of children with cerebral palsy following motor skill training: a DTI study
Y. Bleyenheuft¹, L. Dricot², D. Ebner-Karestinos², J. Paradis², A. Renders¹, A. de Volder¹, R. Araneda², A.M. Gordon¹, K.M. Friel²
¹Université catholique de Louvain, BRUSSELS, Belgium
²Université Catholique de Louvain, BRUSSELS, Belgium
³Columbia University, NEW YORK, United States of America

Introduction: Wallerian dysgenesis has been found in the corticospinal tract (CST) of children with unilateral cerebral palsy (UCP) measuring fractional anisotropy (FA) with diffusion tensor imaging (DTI). The extent to which these fibers may be restored with training is unknown. This study assesses changes in the CST following Hand-Arm-Bimanual-Intensive-Therapy-Including-Lower-Extremity (HABIT-ILE).

Patients and methods: 45 children with UCP participated in this study. All children underwent 2 DTI sequences, either before and after 90 hours of HABIT-ILE (treatment group) or twice within the same scanning session (control group). The FA was measured by establishing planes, centered on the CST fibers (mid pons). Group x time ANOVAs with repeated measures on time were used.

Results: The groups did not differ at the first DTI session. FA significantly increased after therapy in the CST emerging from the non-lesional hemisphere (CST-NLH) in the treatment group (p=0.011), but not in the control group. In the CST emerging from the lesional hemisphere (CST-LH), FA increased in children with a contralateral or bilateral organization in the treatment group, but not in the control group (interaction, F=7.696, p=0.009). No change was observed in the CST-LH of children with an ipsilateral organization. A correlation was found between the changes in the Jebsen-Taylor-Test-of-Hand-Function in the paretic hand and the changes in FA in the CST-LH (R=0.643, p<0.001) and the CST-NLH (r=0.468, p=0.02).

Conclusion: HABIT-ILE induced an increase of FA in the CSTs in children with UCP. This change is related to the improvement in unimanual dexterity during the intervention.

OP-089
Oral presentation
Parallel session 4: OS 4.1 Motor learning

Neuroplastic changes following motor skill training (HABIT-ILE) in children with unilateral spastic cerebral palsy: an fMRI study
R. Araneda
Université Catholique de Louvain, BRUSSELS, Belgium

Background: Intensive motor learning interventions have demonstrated efficacy for improving function in children with unilateral spastic cerebral palsy (USCP). Improving motor function has been associated with neuroplastic changes mainly in the sensorimotor cortex. However, these changes may also include the extensive cortico-frontoparietal network involved in motor skill learning. This study aimed to determine neuroplastic changes following Hand-
and-arm-bimanual-intensive-therapy-including-lower-extremities (HABIT-ILE) in the motor skill learning network and to correlate these changes with functional assessments.

**Methods:** 25 children with USCP participated in fMRI sessions before and after participating in a HABIT-ILE intervention. Brain activity changes were monitored while they manipulated and differentiated different objects using the dominant-hand, more-affected hand or both. A random-effect group analysis was performed at the whole-brain level using a q(FDR)<0.01 in combination with a cluster size threshold adjustment. A region of interest analysis (ROI) was performed to compare the brain activity before and after HABIT-ILE.

**Results:** A common cortico-fronto-parietal network was highlighted before and after therapy. The ROI analysis showed significant differences in the activation of the lesional hemisphere areas, mainly while manipulating with the more-affected hand or with both hands. Depending on the initial stereognosis, two patterns of activation change were observed: either an increased activation in children with a low baseline score or a decreased activation when baseline score was higher. Both patterns correlated with functional assessments (stereognosis and dexterity).

**Conclusion:** Extensive neuroplastic changes are induced by HABIT-ILE. The 2 different patterns observed depending on initial ability in the task could represent different phases of functional recovery.

**OP-090**
Oral presentation
Parallel session 4: OS 4.1 Motor learning

**Sensory Processing & Functional Performance in Children with Cerebral Palsy: A Systematic Review**
K. Dimitropoulou¹, A. Sarafian²

¹Occupational Therapy Program, Columbia University, NEW YORK, United States of America
²Columbia University, NEW YORK, United States of America

Sensory processing and sensation deficits affect motor performance and functional abilities in children with CP. In our project, we examined evidence through a systematic literature review to better understand: a) sensory processing problems in children with CP; b) the relationship of sensory processing, motor performance and function; c) the assessment of sensory processing in children with CP. We searched four databases: PubMed, Medline, Psychinfo, Cinahl. We searched for articles that presented visual, proprioceptive, somatosensory, tactile, vestibular, sensation and sensation problems in children with CP. We reviewed 2,027 that met the search criteria. We eliminated duplicates and conducted an abstract review with .S agreement. Forty-nine articles were fully reviewed. Results show significant deficits in vision and visual perceptual skills; visual acuity, nystagmus, constriction of visual fields, ocular motor control problems, visual discrimination issues. These issues affect movement, spatial negotiation and sequencing skills. Touch sensation and tactile registration have been associated with errors in grasp patterns, ability to identify differences in tactile stimulation such as properties of objects when vision is occluded. Position sense errors (due to poor proprioception) on affected and less affected or unaffected segments of the body create variability in calibration that affects efficiency and timing of movement. Compensatory strategies to accomplish the goal directed actions arise to make up for errors in calibration and timing. Vestibular and proprioceptive problems appear to lead to asymmetry (in quiet stance) and faster sway (in walking) for children with hemiplegia, increased trunk sway laterally in children with diplegia, thus affecting balance control.

**OP-091**
Oral presentation
Parallel session 4: OS 4.1 Motor learning

**Profiling motor learning in children with unilateral Cerebral Palsy**
D. Green¹, J. Rudisch¹, P.B.M. Aarts², J. Butler¹, H. Izadi¹, B. Steenbergen³, D. Birtles⁴

¹Oxford Brookes University, OXFORD, United Kingdom
²Sint Maartenskliniek, NJMEGEN, The Netherlands
³Radboud University Medical Center, NJMEGEN, The Netherlands
⁴University of East London, LONDON, United Kingdom

**Introduction:** Children with unilateral Cerebral Palsy (uCP) have difficulties acquiring functional bimanual skills with little temporal cooperation between hands during bimanual tasks. Little is known about the nature and rates of change in bimanual skill acquisition. This study investigates how time series of performance data can model individual motor-learning processes.

**Patients and Methods:** Children diagnosed with uCP (n=37; 20 males; age 10.9±/2.6 years, MACS I-III) performed a bimanual task requiring opening a box with one hand and pressing a button inside with the other, across phases of an intensive bimanual intervention. Different mathematical models were used to fit task specific performance changes. Nonlinear, exponential and sigmoid functions were fitted to data using Levenberg-Marquardt algorithm. Standard errors of residuals(σ) were calculated; the model with the smallest σ considered to provide best fit. Inflection points (IP) of sigmoid functions mark the time-point of direction change reflecting midpoint of performance change.

**Results:** No single function ubiquitously provides best fit. Sigmoid function provided best fit in most cases (> 50% highest σ). Average IPs were at day 3 (e.g.16 hours; range 2 to 5 days). In some individual cases exponential or
Mirror Motor Activity in Children with Unilateral Cerebral Palsy and Its Effect on Upper Limb Function.

H. Yasmin1, M. Silva2, J.J. Noble1, A. Gordon1, M. Gough1, A.P. Shortland1
1King’s College Hospital NHS Foundation Trust, LONDON, United Kingdom
2Guy’s & St Thomas’ NHS Foundation Trust, LONDON, United Kingdom

Introduction: Upper limb (UL) mirror movements (MM) may contribute to poor bimanual performance (BP) in children with unilateral cerebral palsy (UCP). An index of mirror motor activity (MMAI) was computed from the activations of the muscles of both forearms in children with UCP and compared to the results of tests of bimanual performance. We hypothesised that mirror motor activity during a unilateral task with the paretic limb is greater than in the non-paretic limb, and that the MMAI will be inversely related to BP.

Patient and methods
Ten children with UCP (9 male, 13.6±3y) attending for instrumented movement assessment were included. Activity of the flexor carpi ulnaris, brachioradialis, finger flexor and extensor muscles in both ULs were recorded using surface electromyography during repetitive unilateral reach and grasp tasks. MMAI was calculated as the ratio of the total muscle activity across both limbs during a unilateral task using the affected limb to the total activity during the same task using the unaffected limb (equation 1). The relationship of MMAI with Assisting Hand Assessment (AHA) was investigated using a Pearson’s correlation.

\[
\text{MMAI} = \frac{\text{Affected} (L+R)}{\text{Unaffected} (L+R)}
\]

Results
Children with UCP demonstrated a MMAI=3.42±1.26 (p<0.001, One Sample t-test). There was a significant strong, negative correlation between MMAI and AHA units, r=−0.82, n=7, p=0.02, with increased MMAI associated with poorer bimanual performance.

Conclusion
We observed greatly increased muscle activation of the non-paretic limb during a unilateral task performed on the paretic side. MMAI may offer a more sensitive alternative to direct visual observations of MM.
**OP-094**

Oral presentation

Parallel session 4: OS 4.2 Physical activity and fitness

**Risk factors for identifying feeding difficulties and undernutrition in children with cerebral palsy**

K.A. Benfer1, K.A. Weir2, P.S.W. Davies3, R.N. Boyd1, J.C. Arvedson3, K.L. Bell1

1The University of Queensland, SOUTH BRISBANE, Australia
2Griffith University, GOLD COAST, Australia
3Children's Hospital of Wisconsin-Milwaukee, WISCONSIN-MILWAUKEE, United States of America

**Introduction:** Feeding difficulties are prevalent in 60% of children with cerebral palsy (CP), and impact negatively on nutritional status. Aim: To determine the relationship between ‘red flag’ risk factors and (i) feeding difficulties; (ii) undernutrition in preschool children with CP.

**Patients and methods:** Longitudinal, population-based study. 179 children with CP diagnosis, aged 18-60 months (mean=34.1 months ±11.9 at entry, 111 males), with 1-3 appointments/child (n=423 assessments). The sample was representative of the Australian CP population (GMFCS I=46.6%, II=12.9%, III=15.7%, IV=10.1%, V=14.6%). Feeding difficulties were rated on the Dysphagia Disorders Survey. Undernutrition was indicated by Body Mass Index (BMI) or weight z scores <−2. Parent-reported ‘red flags’ were derived from Arvedson’s work (2013) and included mealtime duration regularly >30min (3-day food record), self-reported stress during feeding (binary), parent concern regarding growth (binary), and respiratory problems (hospitalisations or doctor visit for pneumonia/ chest infection or other respiratory conditions). Data were analysed using logistic regression (binary outcomes).

**Results:** Red flags associated with feeding difficulties included ‘parent stress’ (OR=1.5, p=0.043), ‘concern regarding growth’ (OR=1.9, p=0.002) and ‘respiratory difficulties’ (OR=1.6, p=0.036). Feeding difficulties were not associated with ‘mealtime duration’ (OR=1.0, p=0.594). Undernutrition was associated with ‘concern regarding growth’ (BMI OR=2.8, 0.015; weight OR=3.5, p=0.001) and ‘parent stress’ (BMI OR=3.1, p=0.014, weight OR=1.3, p=0.372), but not ‘mealtime duration’ (BMI OR=1.6, p=0.322; weight OR=1.4, p=0.447) or ‘respiratory difficulties’ (BMI OR=0.7, p=0.469, weight OR=0.7, p=0.289).

**Conclusion:** The ‘red flags’ present as feasible screening questions for parents of children with CP, but need validation as a screening tool.

**OP-095**

Oral presentation

Parallel session 4: OS 4.2 Physical activity and fitness

**The impact of functional anaerobic and strength training on muscle volume, strength and functional capacity in young adults with cerebral palsy.**

J. Gillett, G.A. Lichtwark, R.N. Boyd, L.A. Barber

The University of Queensland, SOUTH BRISBANE, Australia

**Introduction** Progressive resistance training leads to increases in muscle size and strength. In individuals with cerebral palsy (CP), the benefits of resistance training alone may not transfer to improve functional capacity. This study investigated the impact a 12-week combined functional anaerobic and strength training programme on muscle volume, isometric strength, and functional capacity in young adults with CP.

**Patients and methods** Six young adults (aged 24 ± 3 years, 3 male, GMFCS I=4, II=2) trained plantar flexion (PF), dorsiflexion (DF), leg press and functional anaerobic exercises 3 days/week for 12 weeks, with 3-4 sets per exercise, progressing during the programme from 12 to 6 RM. Outcome measures were evaluated for differences between pre- and post-training using repeated measures ANOVA (p<0.01).

**Results** Muscle volume increased significantly following the training programme (9.3% PF, 12.3% DF, p<0.01). Maximum PF and DF isometric strength increased after training by 51.4% (p<0.01) and 22.4% (p<0.01) respectively. Functional capacity measures all improved following training (muscle power sprint test 46.6%, p<0.01; agility 14.6%, p<0.01; and timed stairs test 23.6%, p<0.01).

**Conclusion** Combined functional anaerobic and strength training increased muscle size, improved isometric strength and functional capacity in young adults with CP. The addition of anaerobic training to progressive resistance training may have assisted in the transfer of neuromuscular improvements to functional capacity.

**OP-096**

Oral presentation

Parallel session 4: OS 4.2 Physical activity and fitness

**Sustaining participation in physical activity by adolescents with cerebral palsy: A qualitative study**

B. Adair1, A. Morris1, C. Kerr1, C. Imms1

1Australian Catholic University, FITZROY, Australia
2Queen’s University Belfast, BELFAST, Northern Ireland
Introduction
Many adolescents with cerebral palsy do not participate in regular physical activity in spite of its known benefits for long-term physical and mental wellbeing. Barriers and facilitators to physical activity for children with disability have been described, however little is known about what contributes to successfully sustaining involvement in physical activity. This study investigated facilitators for sustained participation in physical activity by adolescents with cerebral palsy.

Patients and methods
This qualitative study recruited participants in triads: an adolescent with cerebral palsy aged 12-18 years who participated in regular physical activity, plus one parent and one community-based individual who facilitated physical activity for the adolescent. Data were gathered using semi-structured interviews. Thematic analysis of verbatim transcripts identified patterns in the data. A matrix analysis occurred within individuals (n=15), triads (n=5), and across participant groups (adolescents, parents and facilitators) to build a thematic framework of strategies for sustaining participation in physical activity.

Results
Five triads took part (parent, facilitator and adolescent). Adolescents were male, Gross Motor Function Classification System levels I-III, and aged 13-16 years. All interviews have been completed and preliminary analyses conducted. All participants highlighted the importance of the facilitator. Adolescents focused on health and fitness more than friendship. Parents talked about the early challenges and need for extra effort to get their adolescent started in the physical activity.

Conclusion
Each participant group reported different factors for sustaining physical activity. This study identifies potential strategies to help adolescents with cerebral palsy sustain their participation in regular physical activity.

OP-097
Oral presentation
Parallel session 4: OS 4.2 Physical activity and fitness

Diagnostic evaluation of youth with walking problems should include testing of walking economy and aerobic capacity
VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands

Introduction: A proper diagnostic evaluation of youth with walking problems is needed in order to select the optimal treatment for an individual patient. The aims of this study were to determine the prevalence of increased energy cost (EC) or decreased aerobic capacity in youth with walking problems who have been referred for clinical exercise testing, and to predict which individuals have an increased EC or a decreased aerobic capacity.

Patients and methods: One hundred participants were included in this study (mean age 12y11mo, range 5y10mo–22y1mo). The percentage of participants with an increased EC (>2SD) and decreased AC (<25th percentile) were calculated. The gross EC (J/kg/m) was assessed during a 6-minute walk test. The aerobic capacity was measured during a maximal aerobic exercise test. Two models to predict an increased EC or decreased aerobic capacity were built using binary logistic regression analysis (p=0.157). The discriminative ability was assessed with the Area Under the receiver operating characteristic Curves (AUC).

Results: An increased EC occurred in 63.8% and a decreased aerobic capacity in 71.6%. Age and walking speed were significant predictors of an increased EC. BMI and walking speed were significant predictors of a decreased aerobic capacity. The discriminative ability of both models was moderate (AUCs 0.76 and 0.74).

Conclusion: The majority of youth with walking problems have an increased EC and/or a decreased aerobic capacity. Because the discriminative ability of both prediction models is insufficient, we argue that EC and aerobic capacity tests should be included in the diagnostic evaluation of these youth.

OP-098
Oral presentation
Parallel session 4: OS 4.2 Physical activity and fitness

Long-term effect of a very preterm birth on sport activities, laterality and cognitive functioning in early school age children
L. Rönnqvist
Umeå University, UMEÅ, Sweden

INTRODUCTION: Neuro-motor impairments are commonly described in children born very preterm. Our purpose was to examine whether children born preterm differ concerning choice and amount of sport activities, laterality, and cognitive functioning in comparison to term born.

METHOD: A sample of 130 children, investigated at early school-age (mean = 7.8y); categorized into three groups based on gestational age (GA); 66 children term born (FT; GA 39 – 42w), 33 moderately preterm (M-PT; GA 34 – 36w), and 31 very preterm (V-PT; GA 23 – 33w). Sport activities were perceived from parents' ratings; Activities
Environmental and personal factors interacted differently between participants. Personal factors included:

- Environmental barriers to PA were more frequently reported in children regularly participating in PA (n=4). Children not actively engaged/interested in PA showed poorer adherence and enjoyment patterns of VR. Only two children desired more PA, while others reported representing sports teams. No differences between groups on environmental factors. Contextual factors were coded using the ICF.

OP-099

Oral presentation
Parallel session 4: OS 4.2 Physical activity and fitness

The effects of an individualized objective health-risk report intervention on changes in perceived cardiovascular disease risk and physical activity behaviour in adults with cerebral palsy

P M. Mcphee1, J.W. Gorter1, M.J. Macdonald1, K. Martin Ginis2
1McMaster University, HAMILTON, Canada
2University of British Columbia, Okanagan Campus, KELOWNA, Canada

Introduction: The objectives of this study were to (1) examine the effect of an individualized objective health-risk report intervention on changes in perceived cardiovascular disease (CVD) risk; and (2) examine changes in perceived CVD risk as a predictor for changes in physical activity (PA) in adults with cerebral palsy (CP).

Patients and methods: Thirty-one adults with CP participated in the study. Information on objective CVD risk factors, such as blood pressure and lipids, was collected at baseline. Perceived CVD risk and PA were measured at baseline, and 1 and 2 weeks following receipt of individualized reports, respectively. Perceived CVD risk included information on heart disease, diabetes, and obesity; which were measured using a 7-point Likert-type scale (-3 = very unlikely to +3 = very likely to develop the disease). PA was measured using a Leisure Time PA Questionnaire. Body mass index (BMI) was assessed via anthropometrics. 2-way repeated measures ANOVA and regression analyses were performed to address objectives 1 and 2, respectively.

Results: A main effect for objective risk of heart disease based on blood pressure was evident (p=0.02), indicating that people who were hypertensive had higher overall perceived risk than those not at risk. Significant main effects for objective risk were present for obesity based on waist circumference (p<0.01) and BMI (p<0.01). Changes in perceived risk of CVD did not predict changes in PA (p>0.05).

Conclusion: Although perceived risk of CVD did not predict changes in PA, individualized objective risk information raises awareness about PA behaviour in this population.

OP-100

Oral presentation
Parallel session 4: OS 4.2 Physical activity and fitness

Barriers and facilitators to physical activity participation and engagement in wii-fit home-therapy programmes for children with cerebral palsy

M. Jaber1, W. Farr2, C. Morris3, S. Bremner4, I. Male5, D. Green5
1Hogar Nino Dios, BETHLEHEM, Palestina
2Sussex Community NHS trust, BRIGHTON, United Kingdom
3University of Exeter Medical School, EXETER, United Kingdom
4Brighton, Sussex Medical School, BRIGHTON, United Kingdom
5Sussex Community NHS Trust, BRIGHTON, United Kingdom
6Oxford Brookes University, OXFORD, United Kingdom

Introduction: Children with Cerebral Palsy (CP) have limited participation in physical activity (PA) and sports. Home-based virtual-reality (VR) technologies offer alternatives for PA and therapy adjuncts. This study explored patterns of PA participation and relationship to adherence and enjoyment in home-based VR programmes.

Patients and Methods: Mixed-methods data obtained from a feasibility study. Children with CP were randomised to receive physiotherapy supported or unsupported use of the Wii-Fit over 12 weeks. Questionnaires explored profiles of PA participation. Data from consoles and diaries identified adherence, enjoyment ratings and personal and environmental factors. Contextual factors were coded using the ICF.

Results: Data were available for 15 ambulatory children with CP: supported group (n=9; 7males; median age 100months); unsupported group (n=6; 4males; median age 116months). Two-thirds of children were regularly active, half desired more PA, only two children reported representing sports teams. No differences between groups on patterns of VR-therapy adherence: consistently completing all (n=6); sporadic (n=5); decline and incomplete adherence (n=4). Children not actively engaged/interested in PA showed poorer adherence and enjoyment. Environmental barriers to PA were more frequently reported in children regularly participating in PA and sports. Environmental and personal factors interacted differently between participants. Personal factors included:
perceptions of ability, motivation/desire. Environmental factors included: nature/level of support, social use, system feedback and commitment.

**Conclusion:** A complex interaction between different elements of the ICF with considerable individual variation was found. A deeper understanding of barriers to PA for children with CP is needed to inform therapy interventions aiming to enhance participation.

**OP-101**
Oral presentation
Parallel session 4: OS 4.2 Physical activity and fitness

**What is sedentary behavior in adults with cerebral palsy?**

A.C.J. Balemans1, G.R. Koelwijl1, M. Piek1, F. Tubbing1, H. Hjoudijk2, J.M.A. Visser-Meily1, O. Verschuren1
1Brain Center Rudolf Magnus and Center of Excellence for Rehabilitation Medicine, UTRECHT, The Netherlands
2Department of Human Movement Sciences, Vrije Universiteit, MOVE Research Institute, AMSTERDAM, The Netherlands

**Introduction**

Prolonged periods of sedentary behavior affect long-term health. Levels of energy-expenditure and muscle activity that represent sedentary activities in the general population may be different for adults with cerebral palsy (CP). The purpose of this study was to compare oxygen consumption and muscle activation 1) between individuals with CP and controls during lying and 2) between lying and other activities within individuals with CP and controls.

**Patients and methods**

Twenty-two adults with spastic CP [GMFCS I-IV] (age=33.8±6.7) and 18 controls (age= 33.5±12.3) participated. Oxygen consumption (VO$_2$) was measured using indirect calorimetry and expressed in Metabolic Equivalent of Task (METs). Muscle activation was measured using surface EMG for six muscle groups during sedentary activities (lying supine, sitting with back support, sitting without back support) and non-sedentary activities (standing and walking). VO$_2$ and EMG-values were compared between groups during lying and were compared between activities for all groups (p<0.05).

**Results**

During lying, VO$_2$- and EMG-values were not different for all GMFCS-levels compared to controls. Walking was the only activity during which MET- and EMG-values were significantly higher than during sedentary activities for controls and all GMFCS levels. During standing, METs were <1.5 METs in all groups, except for GMFCS level III+IV (1.65±0.45 METs) in which EMG was also higher (p<0.05).

**Conclusion**

Adults with spastic CP have similar energy expenditure and muscle activity during sedentary activities compared to controls. Breaking up sedentary behavior requires an activity like walking both in the general population and in mild CP, while for more severe CP standing might be sufficient.

**OP-102**
Oral presentation
Parallel session 4: OS 4.2 Physical activity and fitness

**Physical behavior in wheelchair-using youth with spina bifida**

1HU University of Applied Sciences Utrecht, UTRECHT, The Netherlands
2Erasmus University Medical Center, ROTTERDAM, The Netherlands
3Wilhelmina Children’s Hospital, UTRECHT, The Netherlands
4University Medical Center Utrecht, UTRECHT, The Netherlands

**Introduction**

Literature shows associations between physical behavior (expressed as activities and intensity) and health-related outcomes. Wheelchair-using children with a disability like spina bifida (SB) are of high risk for developing unfavorable physical behavior so the goal is to assess physical behavior of wheelchair-using children with SB.

**Patients and methods**

Accelerometry-based VitaMove data of 34 (13.7 ± 3.2 years) and Actiheart data of 36 (13.5 ± 3.6 years) wheelchair-using (for daily life, sports or long distances) children with SB were used to assess physical behavior. The VitaMove measures type of activities and the Actiheart measures intensity. The VitaMove-data were compared to available reference data from typically developing peers. Sedentary activities were defined as sitting and lying. Dynamic activities were walking, running, wheeling, (hand)biking and non-cyclic moving.

**Results**

Wheelchair-using children with SB showed significantly more sedentary activities (94.3% versus 78.0%, p<0.05) and significantly less dynamic activities (5.0% versus 12.2%, p<0.05) compared to typically developing peers. Wheelchair-using children with SB spent 90% of the wear time (IQR 8%) sitting or lying during a school day compared to 96% (IQR 10%) during a weekend day (p<0.01). Moreover, the intensity of the activities was
significantly higher during a school day compared to a weekend day.

Conclusion
Wheelchair-using children with SB are significantly more sedentary and less dynamic-active compared to typically developing peers. Physical behavior during a school day is significantly more favorable compared to a weekend day. Our results show the necessity to improve physical behavior in wheelchair-using children with SB.

OP-103
Oral presentation
Parallel session 4: OS 4.3 Long-term treatment effects

Does surgery influence the long-term evolution of walking in cerebral palsy?
A. Bonnefoy-Mazure1, G. de Coulon2, P. Lascombes2, S. Armand2
1Willy Taillard Laboratory of Kinesiology, GENEVA, Switzerland
2Pediatric Orthopaedic Service, Geneva University Hospitals, GENEVA, Switzerland

Introduction:
Assessment of the effect of treatments on gait in CP patient is often performed in short-term studies but rarely in long-term longitudinal studies. The aims of this study were: 1) to analyse long term evolution of gait using the Gait Deviation Index (GDI) and gait speed; 2) to observe the influence of treatments and possible confounding factors.

Patients and Methods:
Forty-one CP patients (GMFCS 1 and 3) with two Clinical Gait Analysis (CGA) were included (mean age: 10.2 ± 3.8 years at the first CGA, 20.0 ± 3.5 years at the last CGA). The GDI, gait speed and their evolutions (difference between the two CGA) were calculated. Patients were divided in three categories: no surgery, single level surgery and single event multilevel surgery (SEMLS). Statistical analysis was done to observe differences between the two CGA and considering the three categories. Pearson’s correlations were conducted to evaluate the associations between GDI and gait speed evolution with confounding factors.

Results:
GDI is higher at the last CGA (78.0 ± 11.3 vs. 84.0 ± 11.1, p < 0.001) regardless treatment categories. Significant improvement of GDI was found for the two categories of surgery. Gait speed was statistically lower for all categories. Significant correlations were found: 1) between GDI and gait speed evolution with GDI and gait speed at baseline and 2) between gait speed evolution and BMI evolution.

Conclusion:
This study confirms the benefice of orthopaedic surgery on ambulatory CP patients and more particularly for those with poor gait quality.

OP-104
Oral presentation
Parallel session 4: OS 4.3 Long-term treatment effects

G.V. Størvold1, R.B. Jahnsen2, K.A. Evensen2, U.K. Romild1, G.H. Bratberg3
1Nord Trondelag Health Trust, LEVANGER, Norway
2Oslo University Hospital, OSLO, Norway
3Norwegian University of Science and Technology, TRONDHEIM, Norway

Introduction
Intensive functional physical therapy has shown effect on gross motor function in children with cerebral palsy (CP), but it is still unclear if the same yields for interventions targeting impairments. It is also unclear how impairments and associated problems are associated with gross motor progress during childhood. The purpose of this study is therefore to investigate to what extent treatments during childhood, in particular intensive training, are associated with gross motor progress in children with CP when other available factors have been taken into account.

Patients and methods
Prospective cohort study based on register data at 5 years from the Cerebral Palsy Register of Norway (CPRN) and repeated measurements between 2 and 12 years from the CP follow-up program (CPOP). In all 442 children with a total of 2048 assessments participated. Outcome measure was GMFM-66 reference percentiles, while treatment and child characteristics were independent variables in a Mixed Linear Model.

Results
Intensive training was positively associated with gross motor progress (3.3 percentiles 95% CI: 1.0, 5.5) when controlled for intellectual disability, eating problems and ankle contractures. Intellectual disability was negatively associated with gross motor progress (-24.2 percentiles 95% CI: -33.2, -15.2). There were no interactions between intensive training or intellectual disability and other factors.

Conclusion
Our findings that intensive training was associated with gross motor progress independent of other factors underscores the importance of offering intensive training to all children with CP. Not having an intellectual disability seems to be the most important success factor for gross motor progress.

OP-105
Oral presentation
Parallel session 4: OS 4.3 Long-term treatment effects

Longitudinal follow-up of children with cerebral palsy after Single-Event Multilevel Surgery
A.V. van Campenhout, L. Bar-On, K. Desloovere
KU Leuven, PELLENBERG, Belgium

Introduction: Single event multilevel surgery (SEMLS) is an orthopedic procedure to treat musculoskeletal deformities in children with cerebral palsy (CP). However, there is limited evidence of the long-term outcome following SEMLS and there are contradictory results regarding the predictors of good outcome. Patients and Methods: 31 ambulant children with spastic CP (GMFCS I:14, II:12, III:5) who had undergone a SEMLS at an average age of 12±3 years (range 7–18 years) were included. Preoperative kinematics, gait profile score (GPS), GPS in the sagittal (GPSsag) and in the transversal plane (GPStrans) were compared with values obtained at 2, 5 and 8 years follow-up (FU) visits. Pre-operative parameters were explored for their predictive ability of good short- and long-term outcome at different FU periods using univariate correlations and of long-term outcome using a generalized estimating equation. Results: All gait measures and several kinematics improved significantly at 2 years FU and improvements were maintained until 8 years FU. No change was seen in pelvic tilt and hip extension only improved on the short-term. Age at time of surgery and GMFCS were predictive of positive short-term outcome for GPStrans (r=-0.53, r=0.51, respectively). Positive long-term outcome on GPS was associated with a low pre-operative GPS and a more extended knee angle at initial contact. Conclusion: Improvements of overall gait after SEMLS are maintained long-term. Less severe pre-operative gait deviations are indicators of good long-term outcome, age at the time of surgery was not associated with long-term positive outcome.

OP-106
Oral presentation
Parallel session 4: OS 4.3 Long-term treatment effects

Effectiveness of Upper Extremity Surgery on manual performance in children and adolescents with unilateral Cerebral Palsy.
A.M. Louwers, J. Warnink-Kavelaars, M.C. Obdeijn, M. Keulen, J.A. Beelen
AMC, AMSTERDAM, The Netherlands

Introduction In children/adolescents with unilateral Cerebral Palsy (CP) imbalance of upper arm muscles results in typical disabling deformities of the upper limb and abnormal hand posture, which influences the ability to handle objects. One of the treatment options, upper extremity surgery (UES), includes release of spastic muscles and tendon transfers and aims to achieve muscle balance and a better hand position for functional use. The aim of this study was to determine the effect of UES on manual performance in children/adolescents with unilateral CP. Patients and methods In this prospective study, manual performance of 29 consecutive children/adolescents with unilateral CP (14 males, mean age 14y7m (SD 2y8m), MACS level I-III) who underwent UES was evaluated before and 9-12 months after surgery. The indication for surgery was made by a multidisciplinary team based on patient-specific goals and expectations, physical examination and the following measurements; Canadian Occupational Performance Measure (COPM), Box and Blocks Test (BBT), Assisting Hand Assessment (AHA) and Abilhand-kids. Differences between outcomes pre- and 9-12 months post-surgery were evaluated using paired t-test. Results After surgery, significant improvements on all outcome measures were found: COPM-Performance +3.3 (SD 1.7), COPM-Satisfaction +3.5 (SD 1.8), (p < 0.001); BBT +2.7 blocks/minute (SD 5.3), (p=0.020); AHA +7.3 (SD 4.5) units (p <0.001) and ABILHAND + 1.5 (SD 1.1) logits (p <0.001). Conclusion This study shows that UES results in a clinically relevant improvement of children/adolescents’ subjective rating of their performance and satisfaction in their prioritized activities and improvement of objective (bi)manual ability.

OP-107
Oral presentation
Parallel session 4: OS 4.3 Long-term treatment effects

Differences in gait pattern two decades after Selective Dorsal Rhizotomy or Orthopaedic surgery: implications for the future
R.P. Lamberts1, J. Du Toit1, A.G. Fieggen2, N.G. Langerak2
1Stellenbosch University, TYGERBERG, CAPE TOWN, South Africa
Introduction With increasing concerns about ageing with Cerebral Palsy (CP), post-operative long-term outcome studies are imperative. The aim of this study was to determine the differences in gait pattern of adults with bilateral spastic CP more than 15 years after Selective Dorsal Rhizotomy (SDR) or only orthopedic interventions (ORTH). Patients and methods Inclusion criteria: diagnosis of bilateral spastic CP, classified pre-operatively as Gross Motor Function Classification System (GMFCS) levels I-III, and SDR or ORTH >15 years ago. Kinematic 3-dimensional gait data was collected with a Vicon system and six gait cycles (three left, three right) were analyzed. Differences in gait parameters and Gait Deviation Index (GDI) between the two groups were determined with an independent t-test. Results The SDR-group (n=31) and the ORTH-group (n=30) underwent initial surgery at the mean age of 7±5 vs. 5±2 years, respectively. Mean follow-up time after first surgical intervention was 27±7 and 21±2 years, and GMFCS levels were I: n=15 vs. 14; II: n=11 vs. 12; III: n=5 vs. 4, respectively. Mean GDI was similar for SDR vs. ORTH-group with 68.9±12.1 vs. 68.2±4.0, while some gait parameters were different, e.g. mean hip range of motion: 50.3° vs. 41.2°, maximal knee flexion: 67.4° vs. 46.7°, maximum plantar flexion: -8.7° vs. 1.0°, respectively. Conclusions Despite differences in some gait parameters (SDR-group closer to norm values), the overall gait pattern (GDI) was similar two decades after initial procedures. However, current orthopedic interventions differ to what was performed in the past, which needs to be addressed in future research.

OP-108 Oral presentation Parallel session 4: OS 4.3 Long-term treatement effects

In vitro fertilization procedures do not affect neurological condition at 9 years
M. Drethol Olivares¹, A.N. Bennema², D.B. Kuiper², K.R. Heineman³, M.J. Heineman³, M. Hadders-Algra¹
¹University Medical Center Groningen, GRONINGEN, The Netherlands
²University of Groningen, GRONINGEN, The Netherlands
³University of Amsterdam, AMSTERDAM, The Netherlands

Introduction Little is known on the long-term effects of in vitro fertilization (IVF) on the offspring’s neurological condition. Previous research showed that IVF procedures are not associated with early neurological outcome. The present study aims to determine the effect of IVF on neurological outcome at 9 years.

Patients and methods Participants were singletons of the Groningen Assisted Reproductive Technologies cohort study, consisting at birth of three groups: 1) controlled ovarian hyperstimulation-IVF (COH-IVF n=68), 2) modified natural cycle-IVF (MNC-IVF n=57) and 3) children naturally conceived to subfertile couples (Sub-NC n=90). Children were neurologically assessed at 9 years, focusing on minor neurological dysfunction (MND). Outcome was expressed in terms of the clinically relevant form of MND (complex MND (cMND)) and the neurological optimality score (NOS)). Multivariable statistics were performed to adjust for confounders.

Results At 9 years, 78.6% of children were assessed. cMND occurred in 17 (30%), 19 (41%) and 23 (35%) of the COH-IVF, MNC-IVF and Sub-NC groups. These prevalences are substantially higher than reported in the general population (5-6%). The median NOS scores were similar, i.e., 53 points. Univariable and multivariable statistics indicated that neurological outcome in the three groups was similar. The adjusted ORs for cMND of the IVF procedures vs. Sub-NC was 1.281 (95%CI 1.281 vs Sub-NC 1.281 (95%CI 0.548-2.993).

Conclusion IVF procedures do not affect neurological outcome at school age. However, the prevalence of cMND in the offspring of subfertile couples is substantially higher than that in the general population.

OP-109 Oral presentation Parallel session 4: OS 4.3 Long-term treatement effects

Alterations to the morphology and structure of the medial gastrocnemius muscles following repeated botulinum toxin A injections in children with spastic cerebral palsy
S.H. Schless¹, F.L. Cenni¹, L. Bar-On¹, G. Molenaers¹, B.M. Kalkman², T. O’Brien², G. Holmes³, K. Desloovere¹
¹KU Leuven, PELLENBERG, Belgium
²Liverpool John Moores University, LIVERPOOL, United Kingdom
³Alder Hey Children’s NHS Foundation Trust, LIVERPOOL, United Kingdom

Introduction Botulinum toxin-A (BTX-A) is an effective treatment in children with spastic cerebral palsy (SCPC), but repeat chemo-denervation is a concern. Rabbit muscle interventions highlighted a loss of contractile tissue, whilst in SCPC, a significant correlation was found between type-2 muscle fiber predominance and quantity of BTX-A interventions. This investigation aims to determine if the medial gastrocnemius (MG) of SCPC following repeated
BTX-A interventions differs to the MG of SCPC not receiving BTX-A-interventions. **Patients and methods** 65 typically developing children (TDC) (9.10±3.2 years; 33.3±12.8kg) and 35 SCPC were recruited. 20 SCPC had no previous BTX-A-interventions (noBTX-group) (9.7±2.3 years; 26.7±9.2kg) and 15 SCPC had at least two previous BTX-A-interventions (BTX-group) (11.4±3.2 years; 37.1±15.7kg; n=injectons 4.6±2.6; frequency 15.3±10.1 months). US scans were reconstructed in 3D. MG volume normalised to body-mass (MV), MG length normalised to muscle/tendon-unit length (ML) and echo-intensity (EI) were extracted and compared between groups. **Results** With respect to TDC, both noBTX- and BTX-groups had significant alterations (t-test p<0.00) to MV, ML and EI (noBTX= -33%, -5%, +25%; BTX= -38%, -6%, +28%, respectively). No significant differences were found between the groups of SCPC, but the BTX-group had slightly larger alterations. A significant positive-correlation was found between MV and the frequency of BTX-A intervention sessions (R² 0.54, p=0.01). **Conclusion** Recurring BTX-A-interventions do not seem to alter the growth of the MG, whilst echo-intensity is not reflective of alterations induced by BTX-A. SCPC with recurring BTX-A-interventions less than 10 months apart had larger MV deficits, suggesting that the MG may need close to a year to fully recover.

**OP-110**
Oral presentation
Parallel session 4: OS 4.3 Long-term treatment effects

**Thirty years after selective dorsal rhizotomy: level of physical pain and influence on daily activities in adults with bilateral spastic cerebral palsy**
B.E. Veerbeek1, R.P. Lambers2, A.G. Fieggen1, N.G. Langerak1
1University of Cape Town, CAPE TOWN, South Africa
2Stellenbosch University, CAPE TOWN, South Africa

**Introduction**
Selective Dorsal Rhizotomy (SDR) was reintroduced in Cape Town, South Africa, in the 1980s, which gives us the privilege to conduct long-term follow-up studies. Incidence of pain is one of the major concerns for parents/care-givers in the ageing process of their child. The aim of this study is to determine (i) level of physical pain, (ii) influence of pain on daily activities, and (iii) the relation with pre- and post-operative Gross Motor Function Classification System (GMFCS) levels, in adults with Cerebral Palsy (CP) 30 years after SDR.

**Patients and Methods**
Ten children with bilateral spastic CP (mean age: 7.0±3.4 years; GMFCS level II: n=5, III: n=5) were assessed 30 years after SDR (mean follow-up time: 30.3±0.2 years; GMFCS level I: n=4, II: n=4, III: n=1, IV: n=1) and completed a standardized pain questionnaire (location and frequency) (i) and an Oswestry Disability Index (ODI) questionnaire (ii). The relationship between ODI and GMFCS (iii) was tested with Spearman’s r correlation.

**Results**
Highest incidence of pain was found in lumbo-sacral area (daily: 30% and occasionally: 30%) and lower extremities (daily: 10% and occasionally: 40%). Ninety percent reported minimal disability due to pain (ODI score 0-20), while one participant (GMFCS level IV) indicated moderately disability (score 21). ODI was only related to Post-SDR GMFCS levels (r=0.67, p=0.04).

**Conclusion**
Thirty years after SDR 60% of the adults presented some pain (mainly back and lower extremities). In general, the pain had a minimal influence on daily life and was not related to pre-operative GMFCS levels.

**OP-111**
Oral presentation
Parallel session 4: OS 4.4 Measurement and Classification

**The Eating and Drinking Ability Classification System (EDACS) for cerebral palsy: a study of reliability and stability over time.**
J. Sellers1, L. Bryant2, A. Hunter1, C. Morris3
1Chailey Clinical Services, LEWES, United Kingdom
2Chailey Clinical Services, University of Brighton, EAST SUSSEX, United Kingdom
3University of Exeter Medical School, EXETER, United Kingdom

**Introduction:**
Eating and Drinking Ability Classification System (EDACS) describes the full range of eating and drinking abilities of people with cerebral palsy (CP) in 5 distinct levels, using key features of safety and efficiency. This study investigated the stability of EDACS using retrospective case-record data.

**Patients and Methods:**
Case-records for 100 children with CP were examined to collect retrospective data about eating and drinking abilities, at four time-points, minimum 2 years between each time-point. Gender, GMFCS level, presence of feeding tube and orthopaedic issues were also recorded. One speech and language therapist (SaLT) classified eating and drinking ability using EDACS for all cases at all time-points; a second SaLT assigned EDACS levels for 25 cases at all time-points. Stability over time and inter-observer reliability were assessed using Intraclass Correlation Coefficient (ICC). Association between children’s GMFCS and EDACS levels was calculated using Kendall’s tau.

**Results:**
Reliability of questionnaires after an intensive motor intervention for children with cerebral palsy (CP): a randomized trial

**Introduction:** Parents-reported questionnaires have for long been demonstrated as a valid estimation of activities of daily living in children with CP, particularly with good congruence with expert’s estimations in routine assessments. However, it is unknown whether during therapeutic interventions (intensive rehabilitation, surgery) a bias may be induced by the (in) satisfaction of the parents after the process. This is the aim of this study.

**Methods:** 40 children with CP were randomized in a control group (CG) following their conventional treatment or a treatment group (TG) receiving a 2 weeks intensive intervention (HABIT-ILE). Children were assessed at baseline, 2 weeks later and 3 months after. Primary outcomes were the ABILHAND-Kids and the ACTIVLIM-CP rated by parents and 2 blind experts (home-based videotapes). Level of agreement between raters was investigated using intraclass correlation coefficient (ICC).

**Results:** Agreement between the 2 experts was excellent for all assessments in both groups. Before treatment, agreement between parents and experts remained good to excellent in the CG while it decreased to a moderate level in the TG (parents overestimating child’s performance). Three months after, the same phenomenon was observed.

**Conclusion:** Parents and experts have a similar perception of activities of daily living status at baseline, without intensive treatment. Their perception is less congruent after an intensive rehabilitation process. Therefore it might be recommended in future studies with intensive interventions to use blind rated home-videotaped items of the questionnaires instead of the usual parents-reported version.

The Hand-Use-at-Home Questionnaire to assess spontaneous hand-use in children with unilateral paresis: evidence for validity and reliability

**Introduction** We developed the parent-rated Hand-Use-at-Home questionnaire (HUH) to assess the amount of spontaneous use of the affected arm/hand in daily-life activities in children with unilateral paresis, aged 3-10 years. This study describes its development and examination of the internal structure, unidimensionality, validity and test-retest reliability.

**Patients and methods** Children with Unilateral Cerebral Palsy (UCP) or Neonatal Brachial Plexus Palsy (NBPP) and Typically Developing children (TD) participated. Rasch-analysis was used to examine the rating scale and internal structure of the questionnaire. Test-retest reliability and construct validity was established. Intra-Class-Correlation (ICC), Standard-Error-of-Measurement (SEM) and Smallest-Detectable-Change (SDC) were calculated. Construct validity was determined by comparing HUH-scores between groups (UCP/NBPP/TD), within levels of lesion-extent in NBPP and Manual-Ability-Classification-System (MACS) levels in UCP.
Results
The development-cohort consisted of 322 children (mean age 6.7 years, UCP:n=131/NBPP:n=191) and the validation-cohort of 315 children (mean age 6.8 years, UCP:n=79/NBPP:n=136). Eighteen hierarchically ordered bimanual items fitted a unidimensional model. HUH-scores ranged from -4.69 to +5.17 logits. Test-retest reliability was excellent (ICC=0.89). Agreement was high with a SEM=0.60 and SDC=1.66 logits. The HUH discriminated between groups (TD/NBPP/UCP): H(2)=118.985,p<0.001, supporting construct validity. HUH-scores decreased with greater lesion-extent (r=-0.5) and higher MACS-levels (r=-0.4).
Conclusion
The Hand-Use-at-Home questionnaire has good psychometric properties and validly quantifies the amount of spontaneous use of the affected arm/hand in children with unilateral paresis, aged 3-10 years. The HUH questionnaire is a valuable addition to the current assessment of children with unilateral upper-limb paresis and provides clinicians with more insight in daily-life upper limb performance.

OP-114
Oral presentation
Parallel session 4: OS 4.4 Measurement and Classification

Longitudinal validity of the CHCHILD-DV following non-ambulatory children with severe disabilities
1 St. Omega, AMSTERDAM, The Netherlands
2 University Medical Center Groningen, GRONINGEN, The Netherlands
3 Rehabilitation Centre 'Revalidatie Friesland', BEETSTERZWAAG, The Netherlands
4 Revalidatie Friesland, BEETSTERZWAAG, The Netherlands
5 University of Groningen, GRONINGEN, The Netherlands

Introduction: Non-ambulatory children with severe disabilities are often subject to interventions to preserve or improve their quality of life. The Caregiver Priorities and Child Health Index of Life with Disabilities is a validated health related quality of life (HRQL) proxy measure specifically developed for non-ambulatory children with severe disabilities. The Dutch version (CPCHILD-DV) has been shown to be reliable and valid. The purpose of this study was to establish whether the CPCHILD-DV has sufficient longitudinal validity.

Patients and methods: Patients (n=38) of non-ambulatory children (26 boys, 12 girls (mean age: 9y, 5mo) with severe disabilities undergoing botulinum toxin injections in the hip region or a percutaneous endoscopic gastrostomy completed the CPCHILD-DV questionnaire at baseline prior to the intervention, at 3 months and 6 month follow-up. Longitudinal validity was analyzed by paired t-test of the pre-post scores, correlation analysis between the CPCHILD-DV scores and two external criteria: the patients' perceived change since the intervention on a five-point ordinal rating scale and the scores of a generic HRQL measure. Results: Preliminary results show that the mean pre-intervention total CPCHILD-DV score was 51.6 (SD:13.6). The mean difference at 3 month was 6.4 (95% CI 2.8-10.0) points (p=0.001) which exceeds the minimal clinically important difference of 5.8. There was a moderate positive correlation between the CPCHILD-DV total change score and the external criterion of 0,57 (R²=0,30) and no significant correlation with the total change score of the generic measure.

Conclusion: The CPCHILD-DV seems to have sufficient longitudinal validity statistically and clinically.

OP-115
Oral presentation
Parallel session 4: OS 4.4 Measurement and Classification

Functional profile and classification system analysis in individuals with dyskinetic cerebral palsy
E. Monbaliu1, M.D. de la Peña2, E. Ortibus3, G. Molenare4, J. Deklerck5, H. Feys6
1 KU Leuven, University of Leuven, LEUVEN, Belgium
2 University of the Philippines Manila, MANILA, Philippines
3 KU Leuven, LEUVEN, Belgium

Introduction Dyskinetic cerebral palsy (CP) is the second largest CP group and is characterized by dominant presence of dystonia and choreoathetosis. The last decade functional classification scales have become increasingly important in clinical practice. This cross-sectional study aimed (1) to map the functional profile of individuals with dyskinetic cerebral palsy (DCP), (2) to determine interrelationship between the functional classification systems, and (3) to investigate the relationship of functional abilities with dystonia and choreoathetosis severity.

Patients and Methods: Fifty-five children (<15 years) and youth (15–22 years) (mean age 14y 6mo, SD 4y1mo) with DCP were assessed using the Gross Motor Function Classification System (GMFCS), Manual Ability Classification System (MACS), Communication Function Classification System (CFCS), Eating and Drinking Ability Classification System (EDACS) and Viking Speech Scale (VSS) as well as the Dyskinesia Impairment Scale.

Results: Over 50% of the participants exhibited the highest limitation levels in GMFCS, MACS and VSS. Better
functional abilities were seen in EDACS and CFCS. Moderate to excellent interrelationship was found among the classification scales. All scales had significant correlation with dystonia severity except for CFCS in the youth group. Finally, only MACS and EDACS in the youth group demonstrated significant correlation with choreoathetosis severity.

**Conclusion:** The need for inclusion of speech, eating and drinking in the functional assessment of DCP is highlighted. The study further supports the strategy of managing dystonia in particular at a younger age followed by choreoathetosis in a later stage.

OP-116
Oral presentation
Parallel session 4: OS 4.4 Measurement and Classification

**Influence of trunk control and lower extremity impairments on gait capacity in children with cerebral palsy**

J. Balzer, P. Marsio, E. Mitteregger, M. van der Linden, T.H. Mercer, H.J.A. van Hedel

1Rehabilitation Center, University Children's Hospital Zurich, AFFOLTERN AM ALBIS, Switzerland
2Regional Group Zurich Foundation Cerebral Palsy (RGZ), ZURICH, Switzerland
3Queen Margaret University, EDINBURGH, Scotland

**Introduction**

We aimed to increase our in-depth knowledge on how trunk control, leg muscle strength and selectivity, and spasticity relate to each other and to gait capacity in children with cerebral palsy.

**Patients and Methods**

We analyzed data of 52 children with CP [29 boys, mean age 11 years 9 months (SD 4 years 6 months), Gross Motor Function Classification System (GMFCS) level I, n=22; level II, n=12; level III, n=16; level IV, n=5]. Gait capacity was measured by the “modified Time Up and Go test” (mTUG). Experienced therapists performed the “Modified Ashworth Scale (MAS),” “Manual Muscle Test” (MMT) and the “Selective Control Assessment of the Lower Extremity” (SCALE), and the “Trunk Control Measurement Scale” (TCMS). Spearman correlations coefficients (ρ) quantified the relationships. Consecutively, the variables were included in a backward regression model to explain the variance in mTUG.

**Results**

The TCMS, MMT and SCALE correlated moderately to strongly with the mTUG (ρ = -0.59 ≤ ρ ≤ -0.78; p<0.001). Correlations with MAS were generally low, however, only the TCMS (β = -0.624, p<0.001) and the MAS (β = -0.376, p<0.001) remained in the final regression model explaining 67% of the variance in mTUG.

**Conclusion**

In this group of children, we found moderate to strong correlations between leg muscle strength, selectivity, trunk control and gait capacity. This indicates that these factors are related to walking and all might need to be considered when training walking capacity in children with CP.

OP-117
Oral presentation
Parallel session 4: OS 4.4 Measurement and Classification

**The suitability of the Peabody Developmental Motor Scales, Second edition as early developmental assessment tool in young boys with Duchenne Muscular Dystrophy**

K. Klingels, J. Hoskens, F. Smeets, M. Schaeyen, M. van den Hauwe, N. Goemans

1Hasselt University, DIEPENBEEK, Belgium
2KU Leuven, LEUVEN, Belgium
3University Hospitals Leuven, LEUVEN, Belgium

**Introduction**

Boys with Duchenne Muscular Dystrophy (DMD) show difficulties in acquiring early motor milestones. The development of new therapies, currently tested in clinical trials, has highlighted the need for suitable outcome measures to assess disease evolution in young boys with DMD. This study aimed to review the clinical utility of the Peabody Developmental Motor Scales, Second edition (PDMS-II) in DMD.

**Patients and methods**

Fourteen boys with DMD aged between 1 and 7 years (median age: 4 years 6 months, IQR: 3 years 2 months – 6 years 3 months) were assessed with the PDMS-II. The North Star Ambulatory Assessment (NSAA) was performed in boys older than 4 years (N=8) and five boys also performed the 6 minute walk test (6MWT).

**Results**

All boys scored under the 20th percentile for the gross motor domain of the PDMS-II (median: 79.0; IQR: 69.0-87.0), with the lowest score for locomotion (median: 4.0; IQR: 3.8-5.0). Also for object manipulation the boys with DMD performed below average (median: 7.0; IQR: 5.8-8.0). On the fine motor domain, the boys showed an average performance (median: 97.0; IQR: 91.8-109.8). The Gross Motor Quotient of the PDMS-II showed moderate to good correlations with the NSAA (r=0.65; p=0.12) and 6MWD (r= 0.56; p=0.32).
Boys with DMD scored below average on locomotion, static balance and object manipulation compared to typically developing peers. The PDMS-II appeared suitable to evaluate gross and fine motor development in DMD, though a revision of the item hierarchy might be recommended.

*OP-118*

Oral presentation

Parallel session 4: OS 4.4 Measurement and Classification

**Turkish adaptation of the executive functions and occupational routines scale (EFORTS) and its validity and reliability**

G. Akyurek, G. Bumin

Hacettepe University, ANKARA, Turkey

**Introduction:** Dyslexia is a condition of impaired quality of occupational routines and performances. Successful occupational performance or the person’s ability to choose, organize and perform meaningful occupations depends on the evaluation and intervention by occupational therapist a crucial component in the care of these children, whose focus is on enabling occupation. The aim of this study was to translate the Executive Functions and Occupational Routines Scale (EFORTS) into Turkish language and to evaluate the validity and reliability of the Turkish version of EFORTS that measures children’s executive control in their routines.

**Patients and methods:** The EFORTS was culturally adapted using the internationally suggested method. Subjects were children with dyslexia (n=152, 84 girls) between the ages 6-10 (8.2±1.5) who referred by a physiatrist were recruited from the clinic of psychiatry at Ankara University Medical School Cebeci Hospital. They completed the Executive Functions and Occupational Routines Scale (EFORTS) and Behavior Rating Inventory of Executive Function (BRIEF) that contained items under consideration for inclusion in desired scales.

**Results:** The findings indicate that the EFORTS is a reliable and valid tool for examining children’s executive control in three occupational daily routines, focusing specifically on metacognitive manifestations of EF. Fit indices of the model supported the factor structure.

**Conclusion:** These findings suggest that the EFORTS can be a useful tool to assess children with EF deficits, and may serve targeting intervention programs toward the accomplishment of daily occupational goals.

*PP-001*

Poster presentation

Poster session 1 - timeslot 1

**Routine use of the General Movements Assessment (GMA) in a US Neonatal Intensive Care Unit (NICU) to improve targeted neuroimaging and follow-up of infants at high-risk for movement disorders**

N.L. Maitre1, M.A. Nelin1, G.N. Noritz1, O. Chorna1, J. Williams1, H. Carey1, A. Guzzetta2

1Nationwide Children’s Hospital, COLUMBUS, United States of America

2University of Pisa, Stella Maris Scientific Institute, PISA, Italy

**Introduction:** While very preterm infants are routinely screened for neural insults using cranial ultrasounds (CUS), MRIs and neurodevelopmental follow-up are reserved for those with severe CUS abnormalities or catastrophic perinatal events. However, extreme prematurity, encephalopathy or stroke do not account for all cases of motor disorders. We studied whether routine use of GMA in the NICU could identify missed infants needing MRIs and specialized follow-up. Methods: We conducted a one-year prospective study of 300 infants. Infant videos were scored by GMA experts in the SMILE lab (Pisa, Italy). Cramped-synchronized (CS) readings triggered a message to the follow-up physician who recommended that the neonatologist perform family counseling, a brain MRI and arrange follow-up at 3 months (with GMA, neurological and motor evaluation.)

**Results:** Infants had a median gestational age at birth of 32 weeks, range [23-40] and median PMA of 37 weeks [34-42]. 22.3% already had severely abnormal imaging on MRI or CUS and were referred for developmental follow-up per NICU protocols. Of those with normal neuroimaging, 42% had PR movements and 4.8% had CS movements. Half of MRIs obtained for CS after notification were abnormal (periventricular leukomalacia or neonatal encephalopathy), but only 62.5% of recommended MRIs were obtained. Additionally, at follow-up, 40% of infants with normal MRI but CS had atypical neurodevelopment.

**Conclusions:** GMA screening in the NICU can identify infants who would otherwise not be referred for early neurodevelopmental follow-up. Opportunities for improvement include better adherence to recommendations for neuroimaging and guidelines for PR findings.

*PP-002*

Poster presentation

Poster session 1 - timeslot 2
Computerized executive function training in very preterm born children aged 8-12 years
C.S.H. Aarnoudse-Moens¹, E.S. Twilhaar², J. Oosterlaan³, A.H.L.C. van Kaam¹, P.J. Prins⁴, A.G. van Wassenaer-Leemhuis¹
¹Academic Medical Center, AMSTERDAM, The Netherlands
²VU University Amsterdam, AMSTERDAM, The Netherlands
³University of Amsterdam, AMSTERDAM, The Netherlands

Introduction Very preterm born children are at high risk for poor executive function (EF) which hinders their academic achievement and behavioral functioning. We conducted a pilot study to examine whether a computerized EF training with game-elements (Braingame Brian, BGB) is feasible and produces reliable improvement in EF in very preterm born children at ages 9 to 11 years.

Methods and patients Eligible for inclusion were children born at a gestation <30 weeks with parent-rated EF problems. Braingame Brian (BGB) is an adaptive, computerized EF training consisting of 25 training sessions on working memory, inhibitory control, and flexibility, to be completed in six weeks. Outcome measures were parent interviews on BGB experiences and assessments of EF.

Results Twelve of the 15 (80%) invited children participated of whom 11 children successfully completed the training. Parents considered the effort as high, however were positive about training characteristics and lack of interference with school. Reliable changes (RCI ≥ 1.65) showed enhanced visual working memory in trained children.

Conclusion The results warranted a placebo-controlled trial, which is currently in progress, to assess the effects of computerized training with BGB on poor EF in very preterm born children.

PP-003
Poster presentation
Poster session 1 - timeslot 3

Can heart rate variability improve predictive value of general movements in preterm infants?
L. Dimitrijević¹, A. Mikov², H. Colovic¹, V. Zivkovic¹, S. Lukic¹
¹Clinical centre Niš, Niš, Serbia
²Institute for children and youth health Vojvodina, NOVI SAD, Serbia

Introduction: Adverse neurologic outcome in preterm infants could be associated with abnormal heart rate (HR) characteristics as well as with abnormal general movements (GMs) in the 1st month of life.

The purpose of the study was to demonstrate to what extent GMs assessment can predict neurological outcome in preterm infants in our clinical setting; and to assess the clinical usefulness of time-domain indices of heart rate variability (HRV) in improving predictive value of poor repertoire (PR) GMs in writhing period.

Patients and methods: Eighty two premature infants at risk of neurodevelopmental impairments were included prospectively. The protocol consisted of the following assessments: Video-recordings and evaluation of GMs at 1 and 3 months corrected, 24-h ECG Holter monitoring and HRV analyses at 1 month corrected and neurological examination at 2.5 years.

Results: We found that GMs in writhing period (1 month corrected age) predicted CP at 2.5 years with sensitivity of 100%, and specificity of 76.3%. Our results demonstrated the excellent predictive value of cramped synchronized (CS) GMs, but not of PR pattern. Analyzing separately a group of infants with PR GMs we found significantly lower values of HRV parameters in infants who later developed cerebral palsy (CP) or minor neurologic dysfunction (MND) vs. infants with PR GMs who had normal outcome.

Conclusions: The quality of GMs was predictive for neurodevelopmental outcome at 2.5 years. Prediction of PR GMs was significantly enhanced with analyzing HRV parameters.

PP-004
Poster presentation
Poster session 1 - timeslot 4

Verification of reliability and validity of feeding and swallowing scale for premature infants (FSSPI)
Samsung Medical Center, SEOUL, South-Korea

Introduction
To propose a new scale based upon videofluoroscopic swallowing study (VFSS) findings, the Feeding and Swallowing Scale for Premature Infants (FSSPI), and to verify the reliability and validity of the FSSPI.

Patients and methods
130 preterm infants who had undergone a VFSS were enrolled in this retrospective study. The FSSPI was developed by reference to the Baby Regulated Organization of Subsystems and Sucking (BROSS) approach. FSSPI score of each VFSS video was evaluated by a physiatrist as well as by experienced speech-language pathologists. To verify the reliability of FSSPI, the inter-evaluator and intra-evaluator associations for FSSPI scores were analyzed. Additionally, to verify the construct validity of FSSPI, the association between FSSPI scores and

...
clinical characteristics were analyzed.

Results
The mean gestational age was 27.3±2.8 weeks. FSSPI showed a high degree of both intra-rater reliability and inter-rater reliability. There were also significant negative correlations between the FSSPI scale score and Corrected age (CA) at the time VFSS was performed. Further, a significant positive correlation was observed between the FSSPI scale score and CA at the time full oral feeding was achieved. A significant negative correlation was observed between the scale score and weight gain: between the 1st and 2nd months after birth, and between the 2nd and 3rd months after birth, respectively.

Conclusion
In this study, we proposed a new clinical scale using VFSS to reflect the development of feeding and swallowing skills in preterm infants. Further, we verified the reliability and validity of the scale

PP-005
Poster presentation
Poster session 1 - timeslot 1

Brain structure at 29-35 weeks postmenstrual age is related to cognitive outcomes at 12 months corrected age in infants born very preterm
J.M. George¹, S. Fiori², J. Fripp³, K. Pannek⁴, A. Guzzetta⁵, A. Coulthard⁶, R.S. Ware⁷, S.E. Rose³, P.B. Colditz¹, R.N. Boyd¹
¹The University of Queensland, BRISBANE, Australia
²Stella Maris Scientific Institute, PISA, Italy
³Australian e-Health Research Centre, CSIRO, BRISBANE, Australia
⁴CSIRO, Australian e-Health Research Centre, BRISBANE, Australia
⁵University of Pisa, Stella Maris Scientific Institute, PISA, Italy
⁶Royal Brisbane and Women's Hospital, BRISBANE, Australia
⁷Menzies Health Institute Queensland, BRISBANE, Australia

Introduction
This study examined the relationship between a structural MRI scoring system of brain injury and growth impairment at 29-35 week's postmenstrual age (PMA, 'early MRI') and cognitive outcomes at 12 months corrected age, in infants born <31weeks gestational age.

Patients and methods
Eighty-three infants in a prospective cohort study underwent early 3T MRI between 29-35weeks PMA (mean 32±1 weeks; SD ±1±weeks); 49 males, born at mean gestation 26±1 day (±1±weeks) and birthweight 1076g (±317g). Seventy-eight infants had a second MRI at term equivalent age (TEA; 40±6 days; ±1±weeks). Structural MRI were scored with a validated scoring system generating white matter, cortical deep grey matter, deep grey matter, cerebellar and global brain abnormality scores. Outcome was assessed at 12 months corrected age (12 months 4 days; ±1±weeks) using the Bayley Scales of Infant and Toddler Development III (Bayley III). Linear regression was performed, with sex and social risk included as covariates.

Results
Early MRI global (regression coefficient β=1.50; 95% confidence interval CI=2.38, .81; p<0.01), white matter (β=2.00; 95%CI=3.47, -.53; p<0.01) and deep grey matter scores (β=4.46; 95%CI=7.63, 1.28; p<0.01) were negatively associated with the Bayley III cognitive composite score. Results were reconfirmed at TEA MRI, and in addition, TEA cerebellar scores also demonstrated negative associations with the Bayley III cognitive composite score (β=5.20; 95%CI=8.80, .60; p<0.01).

Conclusion
This modified early MRI scoring system demonstrates associations with cognitive outcomes suggesting that the brain changes associated with later cognitive outcomes are already present as early as 29-35 weeks PMA in infants born very preterm.

PP-006
Poster presentation
Poster session 1 - timeslot 2

Short-term intensive rehabilitation results in a child with Metachromatic leukodystrophy: A case report
Ö. Çankaya, K. Seyhan, M. Kerem Günel
Hacettepe University, ANKARA, Turkey

Introduction: Metachromatic leukodystrophy (MLD) is a lysosomal storage disease characterized by intralysosomal accumulation of sulfatides in several different types of cells. MLD mainly causes demyelination of the peripheral and central nerves, and thus patients present with neurologic symptoms that progress in nature, such as seizures, hypotonia, ataxia, loss of vision and hearing, quadriplegia, gait disturbances, and dementia. Our aim is to present the short-term intensive rehabilitation results in a child with metachromatic leukodystrophy.

Patients and Methods: 16 year-old girl was administrated to our department due to gait imbalance, falling and
coordination problems. Her MRI results were examined and some physiotherapy and rehabilitation evaluations were done. She was evaluated by static and dynamic balance tests, Pediatrik Berg Scale, Gross motor function measurement (GMFM-88/D and E parts), pediatric functional independency measurement (WeeFIM), timed up and go test (TUG) and coordination tests. And physiotherapy and rehabilitation programme were applied four times a week during 12 weeks.

Results: Her dynamic balance were improved, her gastrokinemius spastisity was decreased and botulinum toxin injection necessity was deferred. She began to walk few steps independently.

Conclusion: According to our clinic observation intensive rehabilitation may improve balance and functional independency in children with MLD.

PP-007
Poster presentation
Poster session 1 - timeslot 3

A case report of a patient with de novo duplication of 7q36.1-q36.3 and deletion of 9p24.3
J.Y. Oh
The Catholic University of Korea, INCHEON, South-Korea

Introduction) Only few patients with duplication from 7q36 to the end of the chromosome, and 9p24 deletion have been described so far. Here, we report the first case of a patient with de novo duplication of 7q36.1-q36.3 and deletion of 9p24.3 together.

Care report) A 6-year-old male patient visited our institution for evaluation about developmental delay, particularly speech and language. He could communicate by using about 10 words. In terms of growth, he has shown some delay. When the patient visited our clinic, his weight was 17.8kg (<3th centile), height was 115.8cm (10-15th centile) and head circumference was 48.5cm (<3th centile). The patient was born at 35 weeks of gestation with uneventful pregnancy, and weight at birth was 2400g (<3th centile). There was no remarkable finding in his pedigree. He had hospitalized several times, because of recurrent episodes of pneumonia.

Results) Chromosome analysis and array CGH analysis showed 46, XY, duplication of 7q36.1-q36.3 and deletion of 9p24.3. The duplication was estimated to be 9.9 Mb in size and 68 known genes were included. The duplicated genome base pairs of chromosome 7 spanned 149,128,443-159,088,636. The deletion of chromosome 9 was calculated to be 1.9 Mb in size including 6 known genes. The deleted genome base pairs were estimated to be 211,257-2,183,334. Array CGH analysis of both parents showed no specific findings.

Conclusion) Further cumulative data based on the molecular approach are needed to understand the role and influence of the genes in the duplication of 7q36.1-q36.3 and deletion of 9p24.3.

PP-008
Poster presentation
Poster session 1 - timeslot 4

Phenotype of 1p36.11-p35.3 interstitial deletion and review of the literature
H. Park, D.H. Jang
The Catholic University of Incheon St.Mary's Hospital, INCHEON, South-Korea

Introduction
1p36 deletion syndrome is the most common terminal chromosomal deletion in humans. In most of 1p36 deletion syndrome, the end of the chromosome (distal critical region) or proximal critical region (1p36.23-1p36.11) is missing. We describe here the case with 1p36.11-p35.3 interstitial deletion, the region more proximal than reported cases.

Patients and methods
12 months-old male patient presented with developmental delay and decreased tone. Brain magnetic resonance imaging showed thinning of corpus callosum, and electromyography showed no abnormality. He was referred to genetic clinic for evaluation. Chromosome analysis revealed 46, XY at the 550 band level. Array comparative genomic hybridization (CGH) revealed de novo 1p36.11-p35.3 interstitial deletion. Array CGH of the parents showed no abnormality. The deletion was estimated to be 1Mb in size.

Results
By searching Developmental Disorders Genotype-Phenotype Database, we found that only one gene, AHDC1 gene, is confirmed as causing developmental disorder. AHDC1 encodes protein, which is located on the short arm of chromosome 1(1p36.1-p35.3).

Conclusion
In 2014, Fan Xia et al. reported four unrelated children with mental retardation, who exhibited clinical features of developmental delay, hypotonia, mild dysmorphic features, and etc. With whole-exome sequencing, they found mutations in AHDC1 gene. In our case, there was deletion in 1p36.11-p35.3, where AHDC1 gene is located, and the phenotypes of the patient were similar to those with de novo truncated mutations in AHDC1 gene. Further cumulative data based on the molecular approach are needed to understand the role and influence of the AHDC1 gene with 1p36.11-p35.3 interstitial deletion.
**PP-009**  
*Poster presentation*  
*Poster session 1 - timeslot 1*

**A case report of a patient with interstitial duplication of 10p12.1 and 15q11.2q13.1**

H. Park, D.H. Jang  
The Catholic University of Incheon St.Mary's Hospital, INCHEON, South-Korea

**Introduction**  
15q duplication syndrome is caused by one extra copy of Prader-Willi/Angelman critical region within chromosome 15q11.2q13.1. Compared to 15q duplication syndrome, there are no reported cases of 10p12.1 interstitial duplication. Here, we present a case with interstitial duplication of 10p12.1 and 15q11.2q13.1, together.

**Patients and methods**  
3 months-old male patient presented with decreased tone with poor head control. He started physical therapy, but he could not walk by the age of 17 months. Brain magnetic resonance imaging showed unremarkable finding. Sleep electroencephalogram showed activity consistent with partial seizures. He was referred to the genetic clinic, and chromosome analysis revealed 46, XY at the 550 band level. Array comparative genomic hybridization (CGH) revealed interstitial duplication of 10p12.1 and 15q11.2q13.1, together. The duplication of chromosome 10 was estimated to be 0.8Mb and contained about 5 known genes. The duplication of chromosome 15 was calculated to be 5.7Mb, including 18 known genes.

**Results**  
This is the first case report of interstitial duplication at both 10p12.1 and 15q11.2q13.1, together. By searching Developmental Disorders Genotype-Phenotype Database (DDG2P), we found that 2 genes (ARMC4, RAB18) were related with chromosome 10, and 3 genes (GABRB3, MAGEL2, UBE3A) were related with chromosome 15. The phenotype of hypotonia, delayed development, cognitive impairment are all related with previously known 15q duplication syndrome features. However, RAB18 gene at 10p12.1 is also related with mental retardation and hypotonia.

**Conclusion**  
Further cumulative data are needed to understand the role and influence of the genes in interstitial duplication of 10p12.1 and 15q11.2q13.1, together.

---

**PP-010**  
*Poster presentation*  
*Poster session 1 - timeslot 2*

**A Systematic Review of the Definitions of Childhood Cerebral Visual Impairment**

H.E.A. Sakki1, R. Bowman2, J.C. Sargent2, N.J. Dale2  
1University College London, LONDON, United Kingdom  
2Great Ormond Street Hospital for Children NHS Foundation Trust, LONDON, United Kingdom

**Introduction**  
Childhood cortical or cerebral visual impairment (CVI) is a poorly understood condition and has no internationally accepted diagnostic criteria. This systematic review aimed to identify the terminologies, definitions and measurement tools used to characterize childhood CVI in the scientific literature.

**Patients and methods**  
MEDLINE, EMBASE, PsychINFO, CINAHL and AMED databases were searched in February 2016 for terms relevant to CVI and childhood. Publications were included if they were original research published in peer-reviewed journals, concerned childhood CVI, contained a definition of childhood CVI and described their measurement tools for identifying CVI. Qualitative thematic analysis was used to identify common concepts within definitions and descriptive analyses quantified their prevalence and the measurement tools for CVI.

**Results**  
Forty-eight articles met inclusion criteria. The most common term for CVI was "cerebral visual impairment" (n=21). Three themes of CVI were found, concerning visual deficits (n=38), brain integrity (n=31) and eye health (n=20), and each containing more specific subthemes. The most common subthemes were 'visual impairment' (n=19), 'retrochiasmatic pathway damage' (n=13) and 'normal/near normal eye health' (n=15). A range of assessments were used with no patterns found.

**Conclusion**  
This systematic review found diverse terminologies, definitions and assessment methods for childhood CVI. The most commonly appearing concepts lead to the definition of a visual impairment caused by damage to the retrochiasmatic pathways with normal/near normal eye health. However, this may not be the most useful definition for reaching an operational diagnostic consensus of childhood CVI. Further work is being undertaken to develop a systematic clinical assessment framework for identifying the condition.
Rehabilitation results in children with ataxia telangiectasia: three case reports
Ö. Çankaya, K. Seyhan, M. Kerem Günel
Hacettepe University, ANKARA, Turkey

Introduction: Ataxia telangiectasia (AT) is a genetic syndrome caused by mutations in the ATM gene (AT mutated) encoded on the long arm of chromosome 11. The clinical features are cerebellar ataxia, telangiectasia, immunodeficiency, and progressive loss of muscular coordination, including an inefficient cough and swallowing dysfunction, secondary to the progression of neurological disease. Our aim is to show effects of physical therapy and rehabilitation program on children with ataxic telangiectasia (AT).

Patients and Methods: We evaluated three children (2 female, 1 male) with AT for six months intervals in one year. Two of them were sisters (13 years old and 5 years old) and the third patient was 8 years old. Their demographic datas were collected by hospital records. Sisters’ have serious secretion problem. Gross motor function, balance and daily activities (DLA) were evaluated with gross motor function measure (GMFM-88), Pediatric Berg balance scale (PBS) and functional independence measure (WeeFIM) respectively. The physical therapy programme was applied two times a week for 60 minutes and individual home programme was given.

Results: While two of children showed improvement in motor function, balance and DLA, the other child showed decreased balance, sisters’ secretion problem had decreased.

Conclusion: AT is one of progressive and incurable rare disorders. We believe that physical therapy supports to reduce symptoms and improve physical development with medical treatment.

Relating shoulder muscle atrophy to strength loss in Obstetrical Brachial Plexus Palsy
C. Pons1, F. Sheehan2, H.S. Im3, K. Alter2, S. Brochard1
1CHRU Brest, BREST, France
2National Institute of Health, BETHESDA, United States of America
3University Hospital of Brest, BREST, France

Introduction: Treatment/prevention of shoulder muscle strength imbalances are major therapeutic goals for children with obstetrical brachial plexus palsy (OBPP). The study aims were to characterize muscle atrophy in children with unilateral OBPP, to quantify the agonist-antagonist muscle volume balance and the association between muscle volume and strength.

Patients and methods: Twelve children (age=12.1±3.3) participated in this case-control study. Three-dimensional magnetic resonance images of both shoulders were acquired. The unimpaired shoulder served as a reference. Volumes of deltoid, pectoralis major (PM), supraspinatus, infraspinatus, teres major (TM), subscapularis were calculated based on 3D muscle models, derived through image segmentation. Maximal isometric torques were collected in six directions.

Results: All the major muscles studied were significantly atrophied. The TM demonstrated the biggest difference in atrophy between groups, the PM was the less atrophied. The muscle volume distribution was significantly different between shoulders. Muscle volume could predict strength, but the regression coefficients were weaker on the impaired side.

Conclusion: This study clearly demonstrates muscle varied atrophy across all the main shoulder muscles of the glenohumeral joint, leading to significant three dimensional muscle volume imbalances. The PM, which is relatively preserved, is a key factor in generating 3D volumetric and strength imbalances. The weaker coefficients of determination on the impaired side suggest that other variables, in addition to atrophy, may contribute to the loss of strength, especially in external rotation. An individualized, comprehensive, 3D musculoskeletal evaluation, including a muscle volume specific evaluation should be a prerequisite for therapeutic interventions in children with OBPP.

Normal Ranges of Hip Abduction in Infants
D. Adler1, M.D. Romero Torres1, M.N. Ramirez Cifuentes2, V. Cruz Guisado1, P. Sillero Sanchez1, B. Romero Romero1, J.A. Conejero Casares1
1University Hospital Virgen Macarena, SEVILLE, Spain
2Hispalense Institut of Paediatrics, SEVILLE, Spain

Introduction
Abnormal hip abduction is an important predictor for developmental dysplasia of the hip (DDH) and other orthopaedic pathologies. There is only poor data about normal ranges of hip abduction in infants and often a detailed description of measurement methods is lacking.

The aim of this study is to determine the normal value of hip abduction in infants from 0 to 12 months.

Patients and methods

It was performed a prospective, descriptive study in 132 infants aged 0-12 month, measuring hip abduction in our Rehabilitation Unit of Paediatric Orthopaedics, independent of the reason for consultation. Inclusion criteria were age from birth to 1 year, excluding children with neurologic or orthopaedic abnormalities in lower extremities. Normal hip status was confirmed by ultrasonography of the hip. Measurement was performed in lateral position with the leg in full extension due a highly experienced physician, with the pelvic fixed by an assistant. For measurement we used the Dr.Rippstein Plurimeter which facilitate a reproductive and fast way to explore the hip abduction.

Results

We measured both hips of 132 infants (84 women; 48 boys) at age from 0 to 12 months (average age 3.3 months). Mean angle of abduction of left hip was 63.3° (± 6.25°) and for right hip 62.75°. Maximum abduction was 80° and minimum abduction was 50°.

Conclusion

In infants, with normal hip status, from 0 to 12 months the average abduction of left hip is 63.3° and for right hip 62.75°.

PP-015
Poster presentation
Poster session 1 - timeslot 3

The relationship between swallow frequency, dysphagia and saliva control in children with cerebral palsy

G. Gelin1, E. Ortibus2, N. Rommel2
1University Hospitals Leuven, LEUVEN, Belgium
2KU Leuven, LEUVEN, Belgium

Introduction

This study investigated the link between spontaneous swallow frequency (SSF), dysphagia and drooling in children with and without CP. The impact of activity and gross motor function on SSF was assessed.

Patients and Methods

SSF of 15 children with CP (mean age10.8±3.6yrs) was compared to 22 healthy children (mean age 1.5±1.4yrs). SSF was recorded for 15 minutes (rest and activity) by a microphone taped to the cricoid and connected to a digital recorder (Crary M et al, 2012). Drooling Quotient was scored during the middle 5 minutes. Dysphagia was evaluated using the Dysphagia Management Staging Scale. Audiofiles were analyses (N sw/min) with Audacity. Data are presented as Median[IQR], non-parametric statistics were applied.

Results

SSF of children with CP is lower than in controls (CP median=0.53 [0,40]; controls median=1.065 [0,61] sw/min, p-value=0.001). In children with CP, SSF correlated significantly with dysphagia (r=0.357; p=0.046). Dysphagia correlated with saliva control in rest (r=0.494; p=0.01) and during activity (r=0.415; p=0.026). A statistical trend was seen between SSF and saliva control in rest (r=0.423; p=0.058). GMFCS correlated with severity of dysphagia (r=0.445; p=0.028) and with saliva control in rest (r=0.417; p=0.029) but not with SSF. Saliva control of children with CP did not differ in rest versus activity.

Conclusions

This study shows that children with CP swallow less frequently than healthy children. SSF of children with CP correlates with dysphagia but only limited with saliva control.

SSF may have potential as a clinical screening tool in paediatric dysphagia.

PP-016
Poster presentation
Poster session 1 - timeslot 4

Validity and intra-rater reliability of freehand 3D ultrasound for the determination of lower leg muscle volume in children with cerebral palsy

L.A. Barber1, C. Alexander2, R.N. Boyd3, S. Reid4, J. Valentine3, K. Stannage3, C. Elliott4
1The University of Queensland, BRISBANE, Australia
2University of Western Australia, PERTH, Australia
3Princess Margaret Hospital for Children, PERTH, Australia
4Curtin University, PERTH, Australia

Introduction

The use of freehand 3D ultrasound (3DUS) for in vivo measurement of muscle volume in children with cerebral palsy (CP) has increased however validity and reliability has not been determined in this population. This study assessed
the validity and intra-rater reliability of in vivo medial gastrocnemius (MG), lateral gastrocnemius (LG) and soleus (SOL) muscle volume measurement using freehand 3DUS and MRI in children with CP.

**Patients and methods**

The MG, LG and SOL of both limbs of 15 children with CP (mean(SD) age 8y1m(2y1m), hemiplegia=7, diplegia=8, GMFCS I=9, II=6) were scanned three times using the freehand 3DUS and once using magnetic resonance imaging (MRI). All freehand 3DUS and MRI images were segmented and volumes rendered by one rater. Validity was assessed using Bland-Altman plots, reliability assessed using intraclass correlation (ICC), and minimal detectable change (MDC) calculated.

**Results**

The 3DUS overestimated MG and LG muscle volume by mean difference (95% CI) 0.20(2.8)ml and 0.30(2.4)ml, and underestimated SOL muscle volume by 1.1(2.9)ml compared to MRI. The ICC for repeated segmentation of 3DUS and MRI measurement of MG, LG and SOL were greater than 0.98. MDC for MG, LG and SOL muscle volume measurement using MRI was 2.5-3.2ml and 3DUS was 3.1-4.1ml.

**Conclusion**

Freehand 3DUS is a valid and reliable method for the measurement of the calf muscle volume of children with CP in vivo. It could be used as an alternative to MRI for measuring in vivo calf muscle volume to monitor change pre-post interventions and muscle growth over time.

---

**PP-018**

Poster presentation
Poster session 1 - timeslot 2

**The influence of functional bandaging for the children with idiopathic toe walking**

D. Tuncer1, N.E. Akalan2, M.M. Caliskan2, Y. Temelli2

1Bezmialem Vakif University, Faculty of Health Sciences, ISTANBUL, Turkey
2Istanbul University, ISTANBUL, Turkey

**Introduction**

Idiopathic toe-walking (ITW) is a term used to describe persistent toe-walking pattern in children older than 3 years old who has no neuro-orthopaedic problem. The aim of this study is to compare the acute effects of ankle functional bandaging on dominant and nondominant body sides of the children with ITW.

**Patients and Methods**

19 ITW participants (2 participants were left sided, 17 were right sided) were included. A pressure sensor was
placed beneath the heel for each participant bilaterally. The duration of heel contact was determined when the LED's light which was connected to the pressure sensor was on. Five steps were taken for dominant and nondominant sides of each case. They were evaluated by video based observational gait analysis (VBOGA).

Results
Without bandage application, there was no light-on status for dominant and non dominant sides in any phases of walking. After the bandage application, 19 participants achieved light-on status by contacting 53.7% of steps their heels on sensor for dominant side, and 60% steps for the non-dominant sides. According to the VBOGA, after bandage application, there was no statistically significant difference on the light-on status between the dominant and non-dominant sides for all phases in 190 steps (p=0.232).

Conclusions
This is the first study conducted to compare the acute effects of functional bandaging on dominant and nondominant sides of the children with diagnosed ITW. The results showed that, there the affect of bandaging has no statistical differences between dominant and nondominant sides of the children with ITW.

PP-019
Poster presentation
Poster session 1 - timeslot 3

Upper limb muscle strength in children with unilateral cerebral palsy; a bimanual problem?
K.J.F.M. Dekkers¹, Y.J.M. Janssen-Potten², A.M. Gordon², L.A. Speth³, R.J.E.M. Smeets², E.A.A. Rameckers⁵
¹Maastricht University, MAASTRICHT, The Netherlands
²Adelante Centre of Expertise in Rehabilitation and Audiology, HOENSBROEK, The Netherlands
³Columbia University, Teachers College, NEW YORK, United States of America
⁴Libra Rehabilitation and Audiology, EINDHOVEN, The Netherlands
⁵Adelante, Maastricht University, HOENSBROEK, The Netherlands

Introduction
Muscle strength of the upper limb (UL) has been proven to be a predictive factor for the use of the UL in daily activities in children with unilateral Cerebral Palsy (CP). Muscle weakness of the UL may lead to problems in daily activities. Several studies with fMRI showed bilateral brain damage in children with unilateral CP. It’s unclear what the influence of this bilateral brain deviation is on the UL muscle strength of the non-affected side.

Patients and methods
A total of 139 children (7-10y) participated in this study. Fifty-nine were diagnosed with unilateral CP and eighty healthy pears. In each child, isometric muscle strength was tested with the Handheld Dynamometer and with the Biometrics E-link system, in seven UL muscle groups. Independent samples t-tests were performed to compare the muscle strength between the non-affected side in children with CP and dominant side in the comparison group.

Results
In the four most distal muscle groups significant differences up to 20% were found, in favor of the group children without CP. In the other muscle groups, no significant differences in muscle strength were found between children with CP and the healthy pears.

Conclusion
Children with unilateral CP have less muscle strength in the non-affected distal UL muscle groups, compared to the dominant side in healthy children. More attention at the non-affected side is needed, although it is not clear to what extent this reduced muscle strength of the non-dominant side leads to a further loss of activity opportunities.

PP-020
Poster presentation
Poster session 1 - timeslot 4

Association between quality of general movements and gross motor development in high risk infants.
Dogan, T.D¹, Altunalan T¹, Yilmaz A¹ Spastic Children Foundation of Turkey, Istanbul, Turkey
T. Dogan, T. Altunalan, A. Yilmaz, B. Aksoy
Spastic Children Foundation of Turkey, ISTANBUL, Turkey

Introduction:
Babies at high risk for developmental disorders, such as infants with low gestational age at birth or low birthweight usually are referred to Early Intervention (EI). Developmental outcome of at risk babies is heterogeneous. Our aim is to show risky babies’ motor developmental trajectories which are taken early intervention program according to subtype of spontaneous movements abilities and to investigate relationship between subgroups.

Patients and method:
This study includes 64 infants. All were referred in 2014 to 2015 to the Early Intervention Unit of Spastic Children Foundation of Turkey, at the age of 0 to 12 months corrected age. Infants with syndromes, blindness and deafness were excluded. All babies received Neurodevelopmental Treatment (NDT). Their motor condition was evaluated with the General Movements Analysis (GMs) and the Alberta Infant Motor Scale (AIMS). Motor assessment was carried out at 2 to 4 months intervals. The association between GM-quality and AIMS scores were analysed.
**Results:** At the age of 0 to 5 months corrected age, 26 infants showed normal GMs, 20 infants poor repertoire (PR) GMs, 18 infants showed absent fidgety (AF) movements and one infant presented with cramped synchronized movements. Infants with normal GMs had significantly better AIMS scores throughout infancy than infants with PR (p=0.001) and AF movements (p=0.001). AIMS scores of infants with PR and AF movements did not differ (p=0.77).

**Conclusion:** the quality of GMs is a helpful tool in predicting gross motor development in infants at high risk for developmental disorders.

---

**PP-021**

**Poster presentation**  
**Poster session 1 - timeslot 1**

**Early intervention and high risk infants**  
F. Duma, V. Dukovska, V. Sabolik, N. Angelkova  
PHI University Children’s Hospital, SKOPJE, Macedonia, Former Yugoslav Rep

**Introduction:** For over 15 years, our team of specialists has worked with children who may be at risk for developmental problems. Our team of experts works together to assess a child’s health and development, and connects families with resources if problems are found. Our team was established to provide developmental follow-up of children from birth to age three who are designated as high risk.

**Material and methods:** 575 high-risk infants and children with developmental disorders were followed from January 2013 until December 2014, as outpatients in our developmental clinic. The evaluation consists of a neurological examination, ultrasound of the brain, and diagnostics using developmental tests and screening. (Griffiths Developmental Test).

**Results:** Child referral was on the basis of the following: prematurity (242), asphyxia (120), convulsions (24), HIE (4), IVH (52), congenital malformations (33), cardiopathia (7), epilepsy (22), West syndrome (17), meningitis (11), alalia (4) and damaged hearing (8).

Of those children, 100 had developmental achievements that are more than 2 SD below the average, which is significant evidence for the existence of severe disabilities. There were 33 children with motor impairments, 45 with disabilities in both motor and mental development and 2 children with autism.

**Conclusion:** The goal of the clinic is to provide early identification and referral for early intervention for the neurodevelopmental and neurobehavioral problems, to prevent or minimize the consequences of the perinatal brain injury.

---

**PP-022**

**Poster presentation**  
**Poster session 1 - timeslot 2**

**Height-weight status, feeding ability and motor function among children and adolescents with cerebral palsy**  
D. da Silva¹, M.A. Campos², R. Poinhos¹  
¹FCNAUP, BRAGA, Portugal  
²APPC, PORTO, Portugal

**Introduction:** Cerebral Palsy, the most common cause of motor disability during childhood. The changes of movement and posture lead to feeding or eating difficulties. The prevalence of this difficulties can be related to the severity of motor function and its consequences include long and stressful meals, dehydration, low weight and cases of overweight.

**Objectives:** To assess the relationship between height-weight status, feeding skills and motor function among children and adolescents with cerebral palsy.

**Patients and methods:** This study evaluated 20 children and adolescents aged between 4 and 18 years old. Motor function was assessed using the Gross Motor Function Classification System, feeding ability using the Eating and Drinking Ability Classification System. Percentiles of body mass index for age were determined using the specific growth charts for this population.

**Results:** In terms of motor function, level V of Gross Motor Function Classification System was the most prevalent (45%), regard to feeding competencies, was verified for level I of Eating and Drinking Ability Classification System (40%). Most children and adolescents have shown to be totally dependent to perform their feeding. The prevalence of risk was higher for overweight than for low weight. It was found that, greater severity of motor function and feeding difficulties, lower the percentil of BMI. It was also found that higher feeding difficulties are associated with higher risk of underweight.

**Conclusion:** Confirmed a relationship between motor function, feeding abilities, and their BMI. Higher feeding difficulties appear to be a determinant of the height-weight status in this population.

---

**PP-023**
Safeguarding Children with Disability
E. Abbas
Wrightington, Wigan, Leigh NHS FT, WIGAN, United Kingdom

Children with disability are at increased risk of all types of abuse, according to large American database, 3.8 times more likely to be physically abused and neglected. The risk of abuse are accentuated by the additional needs, lack of ability to communicate and other factors

Aim
To ascertain the scale of the problem in Wigan & improve the service
To raise the awareness of risk of abuse

Method
List of children with concern of NAI, seen in our department over a year period (January- December 2014)

Result
212 cases identified, with 37% Female, 63% male, 81(38%) referred because of bruises, 20(9%) with burn, 12(6%) red mark, 10(5%) fractures, 4(2%) with head injury, 34(16%) children identified with disabilities, of those, 36% of disabled group presented behavioral problems & 26% had ADHD. 23% with speech & communication difficulties, 20% with learning difficulties and 20% with physical disability.

27% of disabled children confirmed to have NAI vs 14% of nondisabled, with relative risk of 1.88 & p value 0.07 while 29% of disabled found their injuries to be accidental vs 49% of nondisabled with relative risk 0.51 & P value 0.06. 32% of disabled assessment was inconclusive vs 10%, with RR of 3.1 & P value 0.001.

Conclusion
Although the small sample size was small, it is evident that children with disabilities are more likely to be having NAI. The relative risk (3.3) of NAI in disabled is higher with higher inconclusive indicates that clinicians are likely to miss the NAI. Our safeguarding team training sessions to raise the awareness of risk.

PP-024
Poster presentation
Poster session 1 - timeslot 4

Music reduces pain perception in healthy newborns: a comparison between different music tracks and heartbeat
A. Rossi1, G. Chirico2, A. Molinaro3, S. Micheletti1, E. Savi2, E. Fazzi4
1ASST Spedali Civili of Brescia, BRESCIA, Italy
2ASST Spedali Civili, BRESCIA, Italy
3University of Brescia, BRESCIA, Italy
4ASST Spedali Civili, University of Brescia, BRESCIA, Italy

Introduction: this study aims to evaluate the effect of 3 music interventions (compared with no music) on physiological parameters and pain perception in healthy newborns undergoing painful medical procedures. A comparison between the effect of each music intervention was conducted in order to investigate the optimal characteristics of the sound stimulus to be used in healthy newborn.

Patients and Methods: prospective, randomized trial on 80 full-term newborns, aged from 1 to 3 days, undergoing antibiotic injections and/or Guthrie test. 60 subjects listened to Mozart piano Sonata K.448 (first movement), Beethoven Moonlight Sonata or recorded heartbeat sounds (70 bpm) during the injection. 20 newborns didn’t received any music intervention. Heart rate, oxygen saturation and pain perception were collected 10 minutes before, during, 10 and 20 minutes after the interventions.

Results: Heart rate values showed a more rapid and significant decrease after medical procedures in the experimental group. The same effects were obtained for oxygen saturation and pain perception. For each parameter, data showing a statistically significant difference between the control group and experimental groups (p<.001). No differences were found among the three experimental groups.

Conclusions: music interventions showed changes in heart rate, oxygen saturation and pain perception in healthy newborns.

PP-025
Poster presentation
Poster session 1 - timeslot 1

Detection vision development in a national cohort of young children with severe to profound visual impairment: OPTIMUM cohort
A.T. Salt1, M. O’Reilly1, E. Sakkalou1, C. Springall2, N.J. Dale1
1UCL Great Ormond Street Institute of Child Health, LONDON, United Kingdom
2Great Ormond Street Hospital for Children NHS Foundation Trust, LONDON, United Kingdom
Introduction
Understanding of a young child’s vision level is essential to guiding developmental advice, however there is currently no widely accepted standardised way to assess/monitor vision if children with the lowest levels of vision are unable to complete a formal measure of resolution acuity. This study aimed to investigate the development of near detection acuity using the Near Detection Scale (NDS), developed by Sonksen, in children with severe to profound visual impairment (SVI/PVI).

Patients and Methods
A longitudinal observational investigation of a nationally recruited cohort of infants (N=80) with congenital disorders of the peripheral visual system; entry age 8-16 months (T1) followed up 12 months later (T2); mean age 13 months (T1) and 26 months (T2). Detection acuity using NDS and resolution acuity where possible, were assessed.

Results
At T1 22 (27.5%) children were PVI (light perception at best) and 58 (72.5%) SVI (‘form’ vision). From T1 to T2 all children were testable with the NDS, however only 35% and 56% (respectively) achieved a resolution acuity. One child improved from PVI to SVI, 85% of SVI (40/47 not at the ceiling of the test) showed an increase in vision level and the median change in NDS was 1.0 (range -1 to 7, SD 1.68). The pattern of vision development varied with vision disorder.

Conclusion
A standard measure of detection acuity is feasible in young children with SVI/PVI, when resolution acuity measurement is not possible. In children with SVI an improvement in vision remains possible after 12 months of age.

Investigation of field conditions of early childhood intervention (ECI) with infants with congenital visual impairment: OPTIMUM cohort (England)
J. Dale, E. Sakkalou, M. O'Reilly, S. Glew, A.T. Salt
UCL Great Ormond Street Institute of Child Health, LONDON, United Kingdom

Introduction
Little systematic information is available on the delivery of ECI for infants with congenital VI, though factors like ‘availability’ and ‘proximity’ may influence effectiveness (Guralnick 1991, ICEVI 2002). This study set out to investigate current delivery in a prospective longitudinal study of a national cohort of infants with congenital disorders of the peripheral visual system (CDPVS).

Patients and methods
81 of 90 infants (mean age 13 months) had an identified practitioner. 59 completed diary records of their intervention over 12 months. Results were analysed according to the total sample and vision level groups (PVI – profound VI, light perception at best; SVI – severe VI, ‘form’ vision).

Results
83% were qualified teachers of the visually impaired. Diaries showed most delivery was at home with median 6.5 visits (range 0-25) and median 1 nursery visit. Frequency was mainly once per 1 to 6 weeks. Children with PVI received a significantly higher number of home visits than those with SVI (median 11, 5 respectively, p<0.001).

Frequency of home visits decreased significantly from the first to second six months (p<.001) with support transferring to nursery by 26 months. The main ECI method (85%) was the Developmental Journal VI.

Conclusions
In line with global recommendations, ECI was community and home based in the second year of life, with specialist educational provider. The Developmental Journal VI is currently the main method of delivery. High variability in frequency of home visiting and cessation by 2 years potentially affecting the efficacy of ECI requires further investigation.

Premature infants and hand - eye coordination
V. Dukovska, F. Duma, V. Sabolik, N. Angelkova
PHI University Children’s Hospital, SKOPJE, Macedonia, Former Yugoslav Rep

Introduction: Hand - eye coordination are related to cognitive and social skills. Assessment of hand - eye coordination skills in very low birth weight (VLBW ) premature infants compare with term children in the earliest developmental period.

Patients and methods: 137 VLBW premature infants with average gestational age of 28 gestational weeks and average birth weight of 1260 gr. and 100 term children as control group. We followed them from the first month of life until the end of the thirty-sixth month corrected gestational age ( CGA ), using Griffiths Developmental Tests.
Results: VLBW premature infants show significantly lower developmental outcome in the field of hand-eye coordination at the end of the fourth, the twelfth, the twenty-fourth and the thirty-sixth month CGA compared to term children according to Mann-Whitney U test. 42% have below average hand-eye coordination skills, 21% have severe impairment. 

Conclusion: Hand-eye coordination is related to learning abilities, social communication, early language learning. Many studies have found a link between eye contact and ASD. A better understanding and follow-up of hand-eye coordination aimed at better early intervention.

PP-029
Poster presentation
Poster session 1 - timeslot 1

The Efficacy of a Systematic Process for Developing Function-based Treatment for Young Children with Disabilities
M. Aldosari
Prince Sattam Bin Abdulaziz University, ALKHARJ, Saudi Arabia

This study conducted an in-depth analysis of the efficacy of the Decision Model in the development of function-based treatments for disruptive behaviors in four toddlers with disabilities aged from 26 to 34 months in inclusive toddler classrooms. The research was conducted in three parts. In Part 1, a functional behavioral assessment was conducted to identify the function(s) of the disruptive behavior. In Part 2, behavioral treatments, developed and designed using the Decision Model, were systematically constructed for each toddler. In Part 3, the treatment was implemented in the inclusive toddler program during the most problematic naturally occurring activities for each child. The function-based treatments resulted in a significant increase in the child’s replacement behaviors. Additionally, special education teachers’ social validity ratings indicated that the individualized function-based treatments were preferable to the previous behavior management strategies.

PP-030
Poster presentation
Poster session 1 - timeslot 2

Participatory design in the development of an early therapy intervention for perinatal stroke
A.P. Basu, J.E. Pearse, J. Baggaley, R.M. Watson, T. Rapley
Newcastle University, NEWCASTLE UPON TYNE, United Kingdom

Introduction: Perinatal stroke is the leading cause of unilateral (hemiplegic) cerebral palsy, with life-long personal, social and financial consequences. Early therapy intervention could significantly improve long-term motor outcome. By involving families and health professionals in the development and design stage, we aimed to produce an intervention with which they would engage.

Patients and methods: Nine parents of children with hemiplegia and fourteen health professionals involved in the care of infants with perinatal stroke took part in focus groups to discuss evolving therapy materials, with revisions made iteratively. The materials were also discussed with the London Child Stroke Research Reference Group. Focus group data were coded using Normalisation Process Theory constructs to explore potential barriers and facilitators to routine uptake of the intervention.

Results: We developed the Early Therapy in Perinatal Stroke (eTIPS) program - a parent-delivered, home-based complex intervention for infants in the first 6 months of life after unilateral perinatal stroke. Parents and health professionals saw the intervention as both valuable and different from usual practice (high coherence). They were keen to engage (high cognitive participation), trusted the approach and considered the tasks for parents to be achievable (high collective action). They saw the approach as flexible and adaptable (high reflexive monitoring).

Conclusion: Focus groups with parents and health professionals provided meaningful feedback to iteratively improve the intervention materials prior to a pilot study. The intervention has a high potential to normalize, becoming a routine part of parents' interactions with their child following unilateral perinatal stroke.

PP-031
Poster presentation
Poster session 1 - timeslot 3

Physiotherapy effects on bronchopulmonary dysplasia and reduction of hospital stay in preterm infants
F.J. Fernández Rego¹, C. Gómez Antonia², A. Arenas Juan², T. Ferrero Galaad²
¹University of Murcia, MURCIA, Spain
²MURCIA, Spain

Introduction
Preterm infants are at risk of suffering respiratory problems and concomitant diseases due to their immature systems increasing hospital stay and the risk of developmental disorders.

**Patients and methods**

Sixty preterm infants with gestational age (GA) ≤ 32 weeks and a diagnosis of RDS were randomly allocated into two groups: experimental group (EG, N=32), and a control group (CG, N=28). Both groups received standard care in the neonatal intensive care unit (NICU), additionally the EG received two daily sessions of 5 minutes of Vojta therapy during 30 days. There were no significant differences between the groups in GA [EG: 28.2 weeks, CG: 28.9 weeks, p-value=0.218], birth weight [EG: 1122.56 g, CG: 1160.35 g, p-value=0.630] and gender distribution [p-value=0.554].

Two t-Student tests, of mean differences for independent samples between the days of hospitalization and ventilation support of both groups were carried out and a statistic d was calculated to determine the effect size.

**Results**

Our results show significant differences indicating that infants in the EG were less days with ventilation support \[t_{58}=-3.013 \ p=0.004\] with a moderate effect size \(d=0.78\) and less days in hospital \[t_{58}=-3.602 \ p=0.001\] with a large effect size \(d=1.86\).

**Conclusions**

Vojta therapy was effective in the reduction of the days of hospitalization and ventilation support of preterm infants with RDS, reducing the risk of BPD.

---

**PP-032**

**Poster presentation**

**Poster session 1 - timeslot 4**

**Testing the usability of functional outcome measures with young children with dystonia.**

T.D. Adlam\(^1\), H. Mcfadden\(^2\)

\(^1\)Designability, BATH, United Kingdom

\(^2\)Vrank House, EXETER, United Kingdom

**Introduction**

Measuring intervention outcomes for young children with dystonia is challenging due to their typically high level of physical disability and lack of effective communication. A range of outcome measures were tested for usability in preparation for a forthcoming trial of dynamic seating.

**Patients and methods**

Following assessment sessions with families in realistic settings, and consultation with experienced therapists, we evaluated the following observational, questionnaire based, and instrumented measures with children aged 2-5 with dystonic cerebral palsy:

- **Classification:** GMFCS, CFCS, MACS, EADS
- **Phenotyping:** HAT, BFM, BADS
- **Developmental:** Bayleys3, Vineland2, Hawaii
- **Quality of life/Goal setting:** CP Child, CHU9D, PEDSQL, COPM
- **Sensor/physiological:** pressure pads and accelerometers measured movement, sleep and seat occupancy
- **Qualitative measures:** videos, photos and diary/record forms documented sessions and significant events

**Results**

Classification measures were quick and family friendly

Phenotyping required a high level of therapist skill

Parents felt that the motor components of developmental measures masked cognitive ability and evoked unwanted emotions by comparing their children to non-disabled children

Only small sections of the quality of life measures were relevant due to the high level of physical disability

Goal setting was challenging but useful for families

Sensor data capture had to be discreet and comfortable but generated useful data

Quick and spontaneous qualitative measures were favoured by families

**Conclusions**

Families were unfamiliar with goal setting but enjoyed this exercise. Therapist’s observations from videoed sessions and sensor based data were favoured due to low family time burden. Parents reported that measures comparing their children to non-disabled, age equivalent children were least meaningful to them and provoked unhappy, often suppressed emotions.

---

**PP-033**

**Poster presentation**

**Poster session 1 - timeslot 1**

**Two measures of gait performance in children with neuromuscular disorders: Construct validity and interrater reliability in an inpatient setting**

C. Ammann\(^1\), C.H.G. Bastiaenen\(^2\), H.J.A. van Hedel\(^1\)

---
**Introduction:** Although the evaluation of walking performance offers valuable information, gait therapy outcome is predominantly evaluated with capacity measures. Our aim was to explore the construct validity and interrater reliability of two walking performance measures in youth with neuromuscular disorders in pediatric inpatient rehabilitation.

**Patients and methods:** Seventy-one children with a neuromuscular disorder (27 females; median age 12y 11mo (interquartile range 4y 10mo)) were consecutively recruited when starting an inpatient gait rehabilitation program. Physiotherapists and nurses independently scored the children’s level of walking performance with the Functional Mobility Scale (FMS) and Gillette Functional Assessment Questionnaire (FAQ), while parents’ scores regarding walking performance at home were obtained by interview at the same measurement time point. Comparator instruments to assess construct validity based on a-priori formulated hypotheses included the Functional Independence Measure for children, 10-meter and 6-minute walking tests, and Gross Motor Function Measure-88 dimension E.

**Results:** Spearman correlation coefficients between the FMS and the comparator instruments ranged between 0.58-0.79, and for the FAQ between 0.69-0.73, being in line with our a-priori hypotheses. Linear weighted kappa coefficients were substantial to almost perfect for all comparisons and ranged between 0.62-0.92 and 0.69-0.77 for the FMS and FAQ, respectively. Friedman tests did not reveal differences between the ratings of nurses, physiotherapists and parents.

**Conclusion:** The FMS and FAQ are valid tools to evaluate walking performance in pediatric inpatient rehabilitation and health professionals can reliably assess walking performance in this setting. Inpatient scores correspond well to the children’s performance in their usual environment.

---

**PP-034**
Poster presentation
Poster session 1 - timeslot 2

**Inverse kinematic modelling in clinical movement analysis: is it time for a change?**
P. Carty1, H. Kainz2, L. Modenese2, H.P.J. Walsh3, D.G. Lloyd1
1Griffith University, GOLD COAST, Australia
2The University of Sheffield, SHEFFIELD, United Kingdom
3Children’s Health Queensland Hospital and Health Service, BRISBANE, Australia

**Introduction**
Most clinical gait laboratories use the PlugInGait model, which employs Direct Kinematics (DK) to calculate joint kinematics. In recent years user friendly musculoskeletal modelling software has emerged which employs a computational method called Inverse Kinematics (IK) along with potential to provide direct information on surgically adjustable parameters (muscle-tendon lengths). The aim was to assess (i) factors contributing to differences between DK and IK models, (ii) the sensitivity of DK and IK models to hip joint centre errors, and (iii) the reliability DK and IK models in clinical motion analysis.

**Patients and methods**
MRI and 3D gait data were collected from eleven children with Cerebral Palsy who returned for a second gait session one week later. Personalised skeletal models were created by segmenting MRI’s in Mimics and defining reference systems in NMS builder. Sensitivity of kinematic data to hip joint misallocation was assessed by perturbing the location of the hip joint in 6mm steps within a 60mm cubic grid.

**Results**
Kinematic differences of up to 13° were found between the PlugInGait and the OpenSim ‘gait2392’ gait model, with 94% of these differences attributed to differences in the anatomical models rather than differences in the computational method or marker set. Sensitivity analysis showed the hip joint centre location errors affected all analysed joint angles using IK, whereas DK only affected hip and knee joint kinematics. Finally, IK models were slightly more reliable than DK models.

**Conclusion**
Contemporary IK musculoskeletal models can be trusted and are suitable to for clinical gait analysis.

---

**PP-035**
Poster presentation
Poster session 1 - timeslot 3

**Validity of the squat test to assess functional lower limb muscle strength in children with cerebral palsy**
M.M. Eken1, A.J. Dallmeijer2, J. Harlaar2, E. de Waard2, C.A.M. van Bennekom3, H. Houdijk2
1MOVE Research Institute Amsterdam, VU Uni, AMSTERDAM, The Netherlands
2VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands
3VU University Amsterdam, MOVE Research Institute, AMSTERDAM, The Netherlands
4Heliomare Rehabilitation, WIJK AAN ZEE, The Netherlands

**Introduction:**
Physiotherapists and nurses independently scored the children’s level of walking performance with the Functional Mobility Scale (FMS) and Gillette Functional Assessment Questionnaire (FAQ), while parents’ scores regarding walking performance at home were obtained by interview at the same measurement time point. Comparator instruments to assess construct validity based on a-priori formulated hypotheses included the Functional Independence Measure for children, 10-meter and 6-minute walking tests, and Gross Motor Function Measure-88 dimension E.

**Results:**
Spearman correlation coefficients between the FMS and the comparator instruments ranged between 0.58-0.79, and for the FAQ between 0.69-0.73, being in line with our a-priori hypotheses. Linear weighted kappa coefficients were substantial to almost perfect for all comparisons and ranged between 0.62-0.92 and 0.69-0.77 for the FMS and FAQ, respectively. Friedman tests did not reveal differences between the ratings of nurses, physiotherapists and parents.

**Conclusion:**
The FMS and FAQ are valid tools to evaluate walking performance in pediatric inpatient rehabilitation and health professionals can reliably assess walking performance in this setting. Inpatient scores correspond well to the children’s performance in their usual environment.
Introduction
Clinical decision making for children with cerebral palsy (CP) with mobility problems requires valid assessments of their lower limb muscle strength. We investigated the validity of the squat test to functionally assess lower limb muscle strength by determining test performance, muscle fatigue and movement execution in children with CP and typically developing (TD) peers.

Patients and methods
Twenty children with bilateral CP (6-19 years; GMFCS/II/III: N=5/13/2) and sixteen TD peers (7-16 years) participated. Test performance was measured by the number of two-legged squats until fatigue (max20). Muscle fatigue was assessed from changes in electromyography (EMG) using mixed model analyses. Joint range-of-motion (ROM) and net torque were calculated from 2D-video and force plate recordings to determine movement execution per squat.

Results
Seventeen children with CP performed less than 20 squats (median=13;IQR=7-19), while all TD children performed the maximum of 20 (p<0.05). Significant decreases in EMG median frequency and increases in EMG amplitude indicated quadriceps muscle fatigue in both groups (p<0.05). Joint ROM and net torque remained constant over the repetitive squats, except for knee ROM which increased in TD and decreased in CP (p<0.05).

Conclusions
Results showed that the squat test discriminated in test performance between CP and TD children which supported validity. In addition, quadriceps muscle fatigue in both groups supported that validly a repetition maximum was assessed. Minor differences in execution between CP and TD children supported that the squat test was valid to functionally assess lower limb muscle strength in children with CP, when test execution is monitored closely.

PP-036
Poster presentation
Poster session 1 - timeslot 4

Responsiveness and minimal clinical important difference of the Trunk Control Measurement Scale in children with neuro-motor disorders
P. Marnico1, U. Kirsten1, A. Anja1, H.J.A. van Hedel2
1Rehabilitation Center for Children and Adolescents, University Children’s Hospit, AFFOLTERN AM ALBIS, Switzerland
2University Children’s Hospital Zurich, AFFOLTERN AM ALBIS, Switzerland

Introduction: With the Trunk Control Measurement Scale (TCMS), a tool exists to quantify trunk control in sitting in children with various neuro-motor disorders. We investigated the responsiveness and the minimal clinical importance difference (MCID) of the TCMS.

Patients and Methods: Children and youth (5 to 20 years) with neuro-motor disorders were included. They underwent a multimodal therapy program including once a week Hippotherapy. We investigated the external responsiveness by correlating changes in the TCMS with changes in various measures including the Goal Attainment Scale (GAS). The MCID was determined by asking children, parents, and therapists about changes in trunk stability in daily life and the importance of them. Using Receiver Operating Characteristics, we determined the threshold of the TCMS considered to be important.

Results: To date, 12 children and youths (mean age 6.5 years) were included in the study. The time between the assessments was on average 64 days. The children received between 3 to 19 therapy sessions per week. The Spearman correlation between the change scores of the TCMS total and the GAS is 0.63. The MCID of the TCMS is currently 7 points (sensitivity/specificity: 1.00/0.66)

Conclusion: Preliminary results show that the TCMS appears responsive. The MCID can be needed to plan randomized control studies investigating trunk control therapy methods and allows in clinical practice to interpret changes measured with the TCMS. Our study will complements previous findings and provides researchers and therapists with the necessary information to decide whether the TCMS might be appropriate for their application.

PP-037
Poster presentation
Poster session 1 - timeslot 1

Analyzing masticatory movements in children with cerebral palsy by using clinical observation, ultrasound and kinematics
C.S.M. Remijn1, B.E. Groen2, R. Speyer3, J. van Limbeek4, L. van den Engel-Hoek5, M.W.G. Nijhuis-van der Sanden6
1HAN University of Applied Sciences, NUJMEGEN, The Netherlands
2Sint Maartenskliniek, NUJMEGEN, The Netherlands
3James Cook University, TOWNSVILLE, QUEENSLAND, Australia
4Zilveren Kruis Health Insurance Company, LEUSDEN, The Netherlands
5Radboud University Medical Center, NUJMEGEN, The Netherlands

18
Introduction
Children with cerebral palsy (CP) need more time to eat solid foods and choke more frequently on solids compared to typically developing children. The aim of this study was to explore the feasibility of three measurement methods to gain insight in masticatory movements: the clinical Mastication Observation and Evaluation (MOE) instrument, ultrasound and kinematic measurements.

Patients and methods
Five bites of a biscuit of 8 children with CP spastic type (mean age 9;08 years, GMFCS I-V) were compared to those of 14 typically developing control children (mean age 9;01 years). Data were collected with the MOE instrument, ultrasound and 3D kinematics; differences were tested with a t-test at group level.

Results
Total MOE score per bite ranged from 17 to 31 (median 24) in the CP group and from 28 to 32 (median 31) in the control group. Higher MOE scores indicate better performances. The bites in the CP group showed a longer total time (15.9 versus 7.1 sec), higher number of chewing cycles (14.0 versus 8.9), a larger chewing cycle duration (0.84 versus 0.64 sec) and a larger anterior excursion of the mandible (10.3 versus 6.6 mm) compared to the control group. Tongue movements showed a smaller horizontal (0.67 versus 0.92 mm) and smaller vertical displacement (0.48 versus 0.59 mm).

Conclusion
Assessments of bites with ultrasound, kinematics and observation are feasible in children with CP. The MOE captures differences in mastication between individual children with CP. Objective measurements were complementary to the observational data.

PP-038
Poster presentation
Poster session 1 - timeslot 2

EFFECTS OF DIFFERENT TREATMENT APPROACHES ON SITTING CONTROL OF CHILDREN WITH CEREBRAL PALSY
S. Kutlutürk¹, C. Arslan², D. Tarakçı¹, Z.C. Algun²
¹Institute of Health Science, ISTANBUL, Turkey
²Istanbul Medipol University, ISTANBUL, Turkey

Introduction: The purpose of our study was to investigate the difference between Neurodevelopmental Treatment (NDT) and Sensory Integration Therapy (SIT) interventions on sitting control of children with Cerebral Palsy (CP).

Patients and methods: The experimental study was carried out at Mavi Pusula Special Education and Rehabilitation Centre and Dilbade Special Education and Rehabilitation Centre. According to inclusion criteria, 28 children with CP were selected in the ages between 2 and 6 years old. There were two different treatment groups that were NDT (group-1:n:14), SIT and home program (group-2:n:14) in 2x1 day/week which lasted for 6 weeks. Gross Motor Function Measure-88 (GMFM-88), PEDALO Balance Test and Pediatric Evaluation Disability Index (PEDI) were used to assess patients' development as after and before the treatment.

Results: There was no significant difference between PEDALO Balance test scores that were indicated two groups' post-treatment sitting postural sways (p<0.05). There was no significant difference between changes after the treatment between the groups according to PEDI (p<0.05). While there were a significant difference between the results of the GMFM-88 before and after the treatment (p=0.000<0.05), there was no difference between two groups (p<0.05).

Conclusion: There is no differences between effects of NDT and SIT on cerebral palsy children’s sitting control. But each of treatment approaches improves gross motor functions of children with cerebral palsy.

PP-039
Poster presentation
Poster session 1 - timeslot 3

Pelvic, acetabular and lower limb skeletal deformities in spastic diplegia
A. Massaad¹, A. Assi², N. Khalil³, F. Yared², Z. Bakouny², W. Skalli³, I. Ghanem⁴
¹Sesobel, KESERWAN, Lebanon
²Faculty of medicine, BEIRUT, Lebanon
³Institut de biomécanique Georges Charpak, Arts et Métiers, ParisTech, PARIS, France
⁴Hotel Dieu de France, BEIRUT, Lebanon

Introduction: Lower limb (LL) skeletal deformities are known to affect gait in children with cerebral palsy (CP). Changes at the pelvic and acetabular levels and their influence on gait are still unknown.

Research question: Do children with spastic diplegia, walking with different gait patterns, present different skeletal deformities at the LL.

Methods: 26 spastic diplegia (age:11±6 years), age-matched to 22 TD children, underwent 3D gait analysis. All children performed EOS in order to calculate: femoral anteversion (FA), tibial torsion (TT), pelvic incidence (PI),
acetalabular coverage (Acet-Cov), anteversion (Acet-Ant), abduction (Acet-Abd) and tilt (Acet-tilt), bilaterally and in 3D. Comparison between groups was performed using ANOVA.

**Results:** Gait patterns in CP were: apparent equines (N=9), true equines (N=9), crouch (N=8). FA was increased in crouch (32.3±13.3°; p=0.001), true equines (23±10°; p=0.015), apparent equines (26±16°; p=0.031), compared to the TD (14±9°). Acet-Abd was significantly increased in crouch compared to TD group (78±6 vs. 71±6; p=0.001). Crouch group presented a decreased Acet-Cov compared to TD (39±4% vs. 42±3%; p=0.033). FA was not correlated to pelvis, hip and knee motion in TD and all CP groups (p>0.05); however FA was correlated to the internal foot progression in apparent and true equines (r=0.47; p=0.001& r=0.62; p=0.007 respectively). In crouch, Acet-Abd was correlated to the hip int/external rotation (r=-0.55, p=0.041).

**Discussion:** The increased FA in all the CP groups seems to contribute to the internal foot progression only in true and apparent equines groups. Morphological deformities at the acetabulum in crouch could be important factors influencing this gait pattern.

**References:** [1] Gage, 2001

---

**PP-040**

Poster presentation
Poster session 1 - timeslot 4

**Upper limb three-dimensional motion analysis: A comparison between children with unilateral cerebral palsy and typically developing children using Statistical Parametric Mapping**

C. Simon-Martinez1, L. Maillieux1, A. Nieuwenhuys2, E. Jaspers3, K. Desloovere1, E. Ortibus1, H. Feys1, K. Klingels1

1KU Leuven, LEUVEN, Belgium
2University Hospitals Leuven, LEUVEN, Belgium
3ETH Zürich, ZÜRICH, Switzerland

**Introduction**

Three-dimensional motion analysis (3DMA) has mainly focused on feature analysis of waveforms by extracting scalars or performing point-by-point comparison. However, these analyses do not take into account the dependency between the waveforms time-points. Statistical Parametric Mapping (SPM) has been shown to offset these limitations by using random field theory to identify field regions taking into account the co-variance among the waveform time-points. Here, we compared Upper Limb (UL) waveforms between typically developing children (TDC) and children with unilateral cerebral palsy (uCP) during a reach-to-grasp task.

**Patients and Methods**

Twenty TDC (mean age 10y11m (SD 2y11m), 2 left-handed) and 21 children with uCP (mean age 11y1m (SD 2y1m), 10 right-hemiplegia) participated. Non-dominant and affected UL were tested. Children sat in a custom-made chair and were instructed to grasp a vertical cylinder, positioned at arm-length. SPM was used to compare the waveforms in 13 angles.

**Results**

SPM(t) tests depicted differences between groups for wrist flexion (uCP>TDC during 89% of movement cycle, p<0.001), elbow flexion (uCP>TDC during 56%, p<0.001), shoulder elevation (TDC>uCP during 37%, p<0.001), elbow supination (TDC>uCP during 43%, p<0.001), scapula protraction (uCP>TDC during 100%, p<0.001) and scapula medial rotation (uCP>TDC during 9%, p=0.04).

**Conclusion**

Children with uCP have abnormal UL movement patterns over large percentage of the 3DMA waveforms for the wrist, elbow, shoulder and scapula compared to TDC during a reach-to-grasp task. These results show the additional value of SPM-analysis to better understand UL movement pathology in uCP.

---

**PP-041**

Poster presentation
Poster session 1 - timeslot 1

**Introduction of the Windmill-task: A new quantitative and objective method to assess mirror movements in children with unilateral cerebral palsy**

I.M. Zielinski1, B. Steenbergen2, A. Schmidt1, K. Klingels3, C. Simon-Martinez3, P. de Water4, B. Hoare4

1Radboud University Nijmegen, NIJMEGEN, The Netherlands
2Radboud University Medical Center, NIJMEGEN, The Netherlands
3KU Leuven, LEUVEN, Belgium
4Victorian Paediatric Rehabilitation Service, MELBOURNE, Australia

**Introduction**

In children with unilateral cerebral palsy (uCP) mirror movements are frequently observed. They are typically assessed with the observation-based Woods and Teuber scale (W&T). However, due to its subjective nature and variable administration, interpretation of W&T data across studies of uCP is problematic. We introduce the Windmill-task, a new objective assessment to quantify the presence of mirror movements. The concurrent validity of the Windmill-task is assessed and sensitivity and specificity for mirror movement detection between both assessments
domains of variation and performance were associated with a lower IQ at 4 (variation typically developing children (95% confidence interval (CI)

Infants with low total IMP scores throughout development had a 8.9 points lower IQ at 4 years than the comparison with the CS group (p=0.005) and the femoral anteversion was significantly greater in the DIP group in comparison with the CS group (p=0.00003). Other 3D parameters were not significantly different among the 3 groups. Low correlations were found between bone parameters and GDI in all groups. Conclusion: The most determinant factor of the bone morphology of children with CP remains bone size in relation to growth. These data suggest that, at the level of a sample of ambulant children with CP, most of the 3D bone parameters are not strongly related neither to the topography of the neurological lesions nor to the gait kinematics.

PP-042
Poster presentation
Poster session 1 - timeslot 2

Three-dimensional lower limb bone morphology in ambulant children with cerebral palsy and its relation to gait
R. Bailly1, M. Lempereur2, M. Thepaut2, R.N.O. Remy Neris1, C. Pons2, L. Houx2, S. Brochard1
1Laboratoire LaTIM, BREST, France
2CHRU Brest, BREST, France

Introduction: This study aimed at describing the three dimensional lower limb bone morphology of children with CP according to the topography of the neurological lesions and evaluate its relation to gait kinematics. Patient and method: 105 ambulant children with CP (3–17 years old) underwent a biplanar X-Rays (EOS system) from which was extracted a full 3D bone model of their lower limbs. Moreover each child underwent a quantitative gait analysis from which was extracted the Gait Deviation Index (GDI). The children were divided into 3 groups: diplegic (DIP, n=48), hemiplegic Unaffected side (CS, n=56) and Affected Side (CA, n=56). Results: Using a principal component analysis, we found that the growth parameters (length, width, …) were the factors the most prominent of bone morphology compared to other morphological characteristics. The Neck-shaft angle was greater in the CA group in comparison with the CS group (p=0.005) and the femoral anteversion was significantly greater in the DIP group in comparison with the CS group (p=0.00003). Other 3D parameters were not significantly different among the 3 groups. Low correlations were found between bone parameters and GDI in all groups. Conclusion: The most determinant factor of the bone morphology of children with CP remains bone size in relation to growth. These data suggest that, at the level of a sample of ambulant children with CP, most of the 3D bone parameters are not strongly related neither to the topography of the neurological lesions nor to the gait kinematics.

PP-044
Poster presentation
Poster session 1 - timeslot 4

Motor development in infancy is related to cognitive function at age 4 years
K.R. Heineman1, P. Schendelaar2, E. van den Heuvel3, M. Hadders-Algra2
1Treant Hospital, UMCG, GRONINGEN, The Netherlands
2University Medical Center Groningen, GRONINGEN, The Netherlands
3Eindhoven University of Technology, EINDHOVEN, The Netherlands

Introduction: Evidence is accumulating that motor and cognitive development are closely intertwined. This study aims to investigate associations between motor development in infancy and IQ at the age of 4 years. Patient and methods: The study group consisted of two hundred twenty-three children (119 boys and 104 girls) born with or without assisted reproduction techniques to subfertile couples (gestational age at birth: median 39.6 weeks, range (30-43 weeks)). Motor behaviour was assessed with the Infant Motor Profile (IMP) at 4, 10 and 18 months. IQ was evaluated at 4 years with the Kaufman Assessment Battery for Children (K-ABC-II). Latent class growth modelling and linear regression were used to analyse relations between total IMP and IMP domain scores (variation, symmetry, fluency, performance) and later IQ. Results: Infants with low total IMP scores throughout development (n=23) had a 8.9 points lower IQ at 4 years than the typically developing children (95% confidence interval (CI) -14.1 - -3.6). Also consistently low infant scores in the domains of variation and performance were associated with a lower IQ at 4 (variation 6.1 IQ points lower (CI -10.23 -
Conclusion
Motor development in relatively low risk infants is associated with cognition at 4 years. In particular less varied motor behaviour and a lower performance during infancy are associated with a substantially lower IQ at 4 years.

PP-045
Poster presentation
Poster session 1 - timeslot 1

A clinical assessment and three-dimensional movement analysis: an integrated approach for upper limb evaluation in children with unilateral cerebral palsy.

L. Mailleux¹, E. Jaspers², C. Simon Martinez¹, K. Desloovere¹, G. Molenaers¹, E. Ortibus¹, K. Klingels¹, H. Feys¹
¹KU Leuven, LEUVEN, Belgium
²ETH Zürich, ZURICH, Switzerland

Introduction
The clinical application of upper limb (UL) three-dimensional movement analysis (3DMA) in children with unilateral cerebral palsy (uCP) remains challenging. Therefore, we aimed to investigate the relation between clinical and kinematic parameters in this group.

Patients and methods
Fifty children with uCP (MACS: I=14, II=27, III=9) underwent an UL evaluation of sensorimotor impairments (grip force, muscle strength, muscle tone, two-point discrimination, stereognosis), the Assisting Hand Assessment (AHA), the Melbourne Assessment 2 (MA2), and 3DMA during three tasks (hand-to-mouth, hand-to-head and reach-to-grasp a cylinder). Joint specific (discrete angles, Arm Variable Scores (AVS)) and global parameters (Arm Profile Score (APS), duration, (timing of) maximum velocity, and trajectory straightness) were extracted. The APS and AVS refer to total movement pathology and the amount of movement deviations of wrist, elbow, shoulder, scapula and trunk, respectively.

Results
Longer movement durations and higher APS-scores were found with increasing MACS-levels (p<0.001). Increased APS was also associated with more severe sensorimotor impairments (r=0.30-(0.73)) and with lower AHA and MA2 scores (r=0.50(-0.86)). For the joint specific parameters, stronger movement deviations distally were significantly associated with increased muscle weakness (r=0.32(-0.74)) and muscle tone (r=0.33(-0.61)), while proximal movement deviations correlated only with muscle weakness (r=0.35-0.59). Lastly, regression analysis exposed grip force as the most important predictor for the variability in APS (p<0.002).

Conclusion
Lower correlations at joint level suggest that 3DMA provides additional information regarding UL motor function, particularly for the proximal joints. This highlights the clinical relevance of integrating both methods to obtain a comprehensive representation of UL function.

PP-046
Poster presentation
Poster session 1 - timeslot 2

Does the development of kinematic quality of reaching in infants with cystic periventricular leukomalacia differ from that of infants with other brain lesions?

University Medical Center Groningen, GRONINGEN, The Netherlands

Introduction
Typical infant reaching movements are characterized by variation. They become more smooth and straight with increasing age, i.e. the number of corrections in the reaching trajectory (movement units; MU) decreases. Preterm infants show a mix of developmental acceleration and impaired efficiency of reaching. Clinically, the most severely affected preterms are infants with cystic periventricular leukomalacia (cPVL). We aimed to assess reaching development in infants with cPVL compared to infants with other neonatal brain lesions (non-cPVL).

Patients and methods
Eighteen infants with non-cPVL and seven infants with cPVL were studied longitudinally. A reflective wrist-marker was used to assess the kinematics of reaching movements at the corrected median ages of 14 (range: 11-17) and 21 months (range: 20-23) while sitting in an infant chair. Data were obtained using SIMI Motion system.

Results
At 14 months (14m) and 21m infants with cPVL had a longer duration of the reaching movement compared to infants without cPVL (14m: non-cPVL 0.9s, cPVL 1.26s; Mann-Whitney p=0.032; 21m: non-cPVL 0.9s, cPVL 1.2; Mann-Whitney p=0.025). Similar differences were found for the number of MU's (14m: non-cPVL 1.8, cPVL 3.0; Mann-Whitney p=0.006. 21m: non-cPVL 1.0, cPVL 2.0; Mann-Whitney p=0.042). The index of curvature and transport MU only differed between the groups at 14m (data not shown).
Conclusion
The results suggest that kinematic quality of reaching in infants with cPVL is worse than that in infants with other neonatal brain lesions. Nevertheless, the infants with cPVL do show catch-up in some kinematic reaching parameters.

PP-047
Poster presentation
Poster session 1 - timeslot 3

Effect of Botulinum toxin injections on gait of children with hereditary spastic paraplegia
A.V. van Campenhout, E. Papageorgiou, P. Neut, K. Desloovere
KU Leuven, PELLENBERG, Belgium

Introduction: Children with Hereditary Spastic Paraplegia (HSP) present with spasticity and muscle weakness of the lower limbs leading to progressive gait problems. Botulinum neurotoxin type A (BoNT-A) injections decreases spasticity of the muscles of HSP patients, but the evolution of their gait after the treatment has not been reported. Patients and Methods: Children with HSP that had a first BoNT-A were included if they had a 3D gait analysis before and after the procedure with exclusion for patients who had orthopaedic surgery or ITB pump. Primary outcome measure was Gait Profile Score (GPS); Movement Analysis Profile (MAP), selected gait parameters and spasticity were recorded as secondary outcome measures. Results: 34 of 106 HSP patients received BoNT-A; 12 fulfilled all inclusion criteria. On average GPS and MAPs remained stable after BoNT-A. A significant decrease in cadence, increase in knee extension at initial contact and during stance and a reduction in the pelvic sagittal range of motion were observed. Spasticity of the injected muscles reduced significantly for hip flexors, hamstrings and gastrocnemius, but not for adductors. Both SPG4 children showed an increased GPS demonstrating a deteriorated gait; both SPG3 children had a reduction of GPS after BoNT-A. Conclusions: Children with HSP demonstrated a slower but more extended gait after BoNT-A injections. However, the overall gait expressed by GPS did not improve. The results from this pilot study suggest that genetic diagnosis might alter the outcome after BoNT-A injections with worsening of gait in children with SPG4 HSP.

PP-048
Poster presentation
Poster session 1 - timeslot 4

Influence of cognitive-motor interference on sitting posture of children and adolescent with cerebral palsy
L. Carcreff¹, V.N. Valenza¹, G. Allali¹, A.K. Aminian², J. Fluss¹, S. Armand¹
¹Geneva University Hospitals, GENEVA, Switzerland
²EPFL, LAUSANNE, Switzerland

Introduction
Cerebral palsy (CP) is characterized by motor impairments frequently accompanied by disorders of the cognitive functions. The interaction between these impaired functions when performing cognitive and motor tasks simultaneously leads to decreased performances. Sitting upright in a classroom while learning is a usual situation for CP children where cognitive-motor interference (CMI) occurs. That is why this study aimed to evaluate the influence of CMI on their postural control.

Patients and methods
15 children and adolescents with CP and 10 age- and sex-matched controls were recruited. The participants, seated on a stool on a force platform, performed a simple motor task: maintaining a straight posture for 30 seconds. Then they performed five different dual tasks (DT): walking while counting forward/backward, enumerating animals/fruits, alternating between animal and fruit names. The center of pressure and the trunk displacements were measured and the number of items given during the cognitive tasks was reported. Finally, we calculated the relative change between the simple and the DT (DTcost).

Results
Every postural parameter was significantly different between the tasks within the CP group (p<0.02) but that was not observed within the control group. The DTcost increased with regards to the cognitive load of the tasks and showed a tendency to be higher in the CP group.

Conclusion
When CMI occurs, CP children have more difficulties to control their posture than their healthy classmates. These preliminary results suggest that assessing the capabilities of CP patients under DT is relevant in order to better understand their daily difficulties.

PP-049
Poster presentation
Poster session 1 - timeslot 1
The difference between different treatment applications on standing balance of the patients with Cerebral Palsy

P. Kay, C. Arslan, D. Tarakci, Z.C. Algun
Istanbul Medipol University, ISTANBUL, Turkey

Introduction: The purpose of this study was to compare the effect of Sensory Integration (SI) Therapy and Neurodevelopmental Therapy (NDT) intervention on standing balance, proprioception, functionality and motor levels in patients with cerebral palsy (CP).

Patients and methods: Fourteen patients at the age of 2-6 years old were included in this study (SI, n=7, NDT, n=7). 12 sessions (6*2/week) of SI therapy which included vestibular, proprioceptive and tactile activities and NDT therapy were performed for both groups. Evaluations were performed before and after the treatment. The Pedalo Sensoras move Balance device was used to evaluate the balance and proprioception of the patients. The data was calculated with sway range of the Center of Pressure (COP) on this device. The functionality was evaluated by Pediatric Evaluation of Disability Inventory (PEDI) and motor level was evaluated by Gross Motor Function Measure (GMFM-88).

Results: There was no statistically significant difference in balance, proprioception, all parameters of PEDI and total GMFM-88 score before and after the intervention between the groups (p>0.05).

Conclusion: While there was no significant difference between NDT and SI therapy treatment between two groups, it is recommended that sensory integration therapy should be integrated into individualized neurodevelopmental therapy programs.

PP-050
Poster presentation
Poster session 1 - timeslot 2

Elbow flexion contractures in neonatal brachial plexus palsy: a one-year comparison of serial casting and dynamic orthosis

S. Bleeker¹, J.H. de Groot², R. Nelissen², D. Steenbeek²
¹Sophia Rehabilitation Centre, DEN HAAG, The Netherlands
²Leiden University Medical Center, LEIDEN, The Netherlands

Introduction About 50% of patients with neonatal brachial plexus palsy develop elbow flexion contractures. Contracture reduction treatment comprises either static or dynamic stretching through serial casting or a dynamic night orthosis. We compared elbow contracture reduction by a dynamic night orthosis with serial casting followed by night-splinting over a one year period in a single blind randomized controlled trial.

Patients and methods Fourty-four patients with elbow flexion contractures ≥ 30° were enrolled in the two study arms: dynamic orthosis group (24) and serial casting group (20). Passive elbow range of motion angles were measured at enrolment and at eight (t1), twenty (t2) and fifty-four weeks (t3). Functional goals at the ICF activity level were evaluated using Goal Attainment Scaling (GAS), comfort was scored with a 10-point Visual Analogue Scale (VAS). Treatments were compared using Multi Variate Analysis with repeated observations.

Results For orthosis compared to casting we found a change over time at t1 mean 8° (SD6°) versus 16° (SD10°), at t2 9° (SD7°) versus 14° (SD6°), at t3 10° (SD8°) versus 12° (SD12°). At 54 weeks no significant contracture differences between treatments were found. At t1 and t2 a p-value of 0.003 and 0.017 was found respectively. GAS-scores improved equally in both groups up to at least two points or more in 35 patients indicating full goal attainment.

Conclusion and clinical relevance Elbow flexion contracture reduction after one-year follow-up was comparable for both serial casting and the dynamic orthosis. Serial casting seems to have a quicker effect.

PP-051
Poster presentation
Poster session 1 - timeslot 3

Feasibility of an RCT to evaluate home-based virtual reality therapy in children with cerebral palsy

W. Farr¹, C. Morris², I. Maile¹, H. Gage², S.E.R. Bailey², S. Speller¹, V. Colville¹, M. Jackson¹, S. Bremner¹, A. Memon¹, D. Green³
¹Sussex Community NHS Foundation Trust, HAYWARDS HEATH, United Kingdom
²University of Exeter Medical School, EXETER, United Kingdom
³University of Surrey, GUILDFORD, United Kingdom
⁴Brighton, Sussex Medical School, BRIGHTON, United Kingdom
⁵Oxford Brookes University, OXFORD, United Kingdom

INTRODUCTION Children with cerebral palsy often struggle with home-based therapy. This study investigated feasibility of a randomised controlled trial design evaluating Virtual Reality Therapy at home. PATIENTS AND METHODS We aimed to recruit 30 children with cerebral palsy (GMFCS I/II) to a 12 week trial of home-based intervention using Nintendo Wii Fit. Children were allocated by minimisation into a supported (SG) group, where
therapist indicated programme of work from a selection of Wii Fit plus games, or an unsupported group (USG) with freedom over game choice. It was recommended games were played for 30 minutes, three times per week. Data gathered were number approached, recruitment, adherence to programme using diaries, therapist input, and SanDisk usage from consoles. Feedback was sought, through telephone interview and survey, from a sample of families in both groups. Feasibility of collecting outcome measures (Gross Motor Function Measure, Bruininks-Oseretsky Motor Proficiency, Strengths and Difficulties Questionnaire, Timed up-and-go, Goal Attainment Scale, Edinburgh Handedness Inventory) was assessed through a physiotherapist focus group. RESULTS 44 children assessed for eligibility, 31 consented, 30 available for randomisation: 15 to each group. Ten in SG (5 withdrawals) and 11 in USG (4 withdrawals) had data available for analysis. Games were acceptable. Reasons for discontinuation were tiredness, after-school activities, homework, surgery, technical difficulties and negative system feedback. Children varied in their ability to follow assessment instructions. CONCLUSION Aspects of the trial design were successful but the feasibility study highlighted key modifications to inclusion criteria and outcome assessments necessary for definitive trial.

PP-052
Poster presentation
Poster session 1 - timeslot 4

Efficiency of robot assisted gait training on Lokomat® for children with cerebral palsy
K. Groleger Sršen¹, I. Jemec Štukl², I. Pišek¹, Z. Novak¹, N. Majdic¹
¹University Rehabilitation Institute, LJUBLJANA, Slovenia
²University Rehabilitation institute, LJUBLJANA, Slovenia

Introduction
Robot assisted gait training (RAGT) is a relatively novel approach for improving gait-related gross motor function of children with cerebral palsy (CP). We wanted to evaluate the impact of RAGT on the range of movements (ROM) in lower limbs, gross motor performance, gait speed and endurance.

Patients and methods
97 children with different neurological impairments were engaged in RAGT from 2010 to 2016. We run a retrospective analysis of charts: of 85 children with CP. 66 (GMFCS levels I to IV: 6; 24; 20; 16) had more than 10 RAGT sessions. We analyzed data on ROM, Timed up & go test (TUG), 10-meter walk test (10MWT) and 6-minute walk test (6MWT) before and after RAGT.

Results
66 children (mean age 10.9 years) with CP were included in the final analysis. They had a mean of 15.9 RAGT sessions, with duration up to 45 min, based on fatigue of a child (mean from 29.7 to 38.8 min). Their body weight was partially supported and the RAGT was enhanced by the use of virtual reality. ROM was improved in most of children with contractures at the level of hips, knees and ankles. Mean values of test results improved: TUG 8.2 s to 7.7 s; 10MWT 7.6 m to 7.1 m; 6MWT 425.3 m to 439.4 m.

Conclusion
RAGT is effective intervention in improving ROM in case of contractures in lower limbs joints, as it is in improving gross motor performance, gait speed and endurance ambulatory children with CP.

PP-053
Poster presentation
Poster session 1 - timeslot 1

Functional Intensive Treatment (FITCare4U) to improve self-care skills in children with severe motor disabilities. New pathways for treatment in the pediatric rehabilitation.
E.A.A. Rameckers, M. Coenen, P. Heuts, I. Meeuwsen, C. Knols, L. Theeuwen, M. Munnecom, R. Rooijen
Adelante, Maastricht University, VALKENBURG, The Netherlands

Introduction
Self-care needs are frequently requested in rehabilitation, however no specific treatment method exists to train self-care skills in adolescents with severe motor disabilities. To be able to train the self-care skills we translated to principles of intensive motor learning methods and physical training methods into an multidisciplinary intensive treatment method, based on the needs of the adolescents with severe motor disabilities. Both individual needs as the physical components of self-care are main elements of our treatment modality, called FITCare4U. The objective of the clinical FITCare4U treatment is to increase the self-care skills in children with severe motor abilities.

Research question: Does FITCare4U increase the self-care skill and realize the individual goals and remain after three months. Patients and method 20 adolescents with severe motor disabilities participated (wheelchair dependent or little walking possibilities, transfer problems) and individual needs on the level of self-care skills. The treatment program exists of 90 hours in 3 weeks. Testing of Self-care (Activlimb), goals (COPM,GAS) has been performed as double baseline, direct after the camp and three month after the treatment. Non-parametric Friedman test and post hoc Wilcoxon test are performed to measure the effects. Results Significant positive effect on COPM (performance, p<0.02) and GAS (p<0.01) were shown, remaining after 3 months COPM (p<0.03) and GAS (p<0.01). Activlimb logit scores (p<0.03) and post hoc (p<0.04). Conclusion The results are very promising and the
FITCare4U is successfully implemented as usual care. Comparison with control treatment will be performed in near future.

**PP-054**
Poster presentation
Poster session 1 - timeslot 2

**Task-specific and functional effects of speed-focused elliptical and motor-assisted cycle training in ambulatory children with bilateral cerebral palsy**

L. Damiano¹, J. Stanley¹, K. Alter²

¹National Institutes of Health, BETHESDA, United States of America
²National Institute of Health, BETHESDA, United States of America

**Introduction:** Locomotor training using treadmills or robotic devices is commonly utilized to improve gait in cerebral palsy (CP); however, effects, unlike those in upper limb training, are inconsistent and fail to exceed those of equally intense alternatives. Possible limitations of existing devices include fixed non-variable rhythms, and too much limb or body weight assistance. Objective here was to quantify and compare effectiveness of two novel alternatives, elliptical and motor-assisted cycle, in CP to improve interlimb reciprocal coordination through intensive speed-focused leg training.

**Methods and Patients:** 27 with bilateral CP, 5-17 years, participated in 12 weeks, 30 minutes, 5 days/week home-based training on randomly assigned device (elliptical =14; cycle =13) at ≥ 40 RPMs with resistance added when speed target achieved. Primary outcomes: voluntary cadence on devices and gait speed at self-selected and fastest speeds. Secondary outcomes: knee extensor strength, SCALE, PODCI and PEDI-CAT.

**Results:** Cadence on trained but not non-trained device increased, demonstrating task specificity of training and increased ability to exercise. Mean gait speed did not increase in either group nor did PODCI and PEDI-CAT. Knee extensor strength increased in both. Group X time interaction seen for SCALE with score increasing for elliptical group and decreasing for cycle group, possibly relating to limb coupling during each task.

**Conclusion:** Direct effects of training were similarly positive across groups, but no transfer to gait or function. Training dose still very low compared to upper limb training recommendations (20 vs. 60+ hours) and may be insufficient to produce appreciable clinical change.

**PP-055**
Poster presentation
Poster session 1 - timeslot 3

**Climbing as a setting for peer socialization giving rise to intensive and motivating training for children with cerebral palsy**

J. Lorentzen¹, M.S. Christensen¹, T. Jensen¹, C. Camilla², J.B. Nielsen¹

¹Elsass Institute, University of Copenhagen, CHARLOTTENLUND, Denmark
²Elsass Institute, CHARLOTTENLUND, Denmark

**Introduction:** Cerebral Palsy (CP) is often associated with cognitive and physiological challenges. Climbing requires a multifaceted repertoire of movements, participants at all levels of expertise may be challenged functionally and cognitively, making climbing of great potential interest in (re)habilitation settings. This study explored the feasibility and possible functional and cognitive benefits of three weeks of intensive climbing training in eleven children with cerebral palsy (CP) aged 11-13 years.

**Patients and methods:** The training took place in a social setting together with six typically developed (TD) children of similar age. Physiological, psychological and cognitive tests were made two times prior to and one time following the training. The children accomplished the training goal of a total of nine 2.5-hour sessions (total of 16h) within the 3-week training period. Results: Both groups of participants improved their climbing abilities, the CP group managed to climb a larger proportion of the tested climbing route at the end of training and the TD group climbed faster. For the CP group this was accompanied by significant improvements in the Sit-to-stand test (p<0.01), increased rate of force development in the hand during an explosive pinch test and increased muscular-muscular coherence during a pinch precision test (p<0.05). Conclusions: These findings show that it is possible to use climbing as a setting for peer socialization as a motivating and effective training alternative in children with CP. The improved motor abilities obtained through climbing likely reflect plastic changes in the nervous system that may be transferred to daily functional abilities.

**PP-056**
Poster presentation
Poster session 1 - timeslot 4

**Exploring the feasibility of a motor learning-based physiotherapy intervention and functional electrical**
stimulation on advanced motor skills in children with hemiplegic cerebral palsy.

K. Evans¹, A. Wright¹, L. Dodds¹, F.V. Wright²
¹Novita Children's Services, REGENCY PARK, Australia
²Holland Blooview Kids Rehabilitation Hospital, TORONTO, Canada

Introduction
Use of functional electrical stimulation (FES) to ankle dorsiflexors can promote improved gait mechanics in children with hemiplegic cerebral palsy (CP). It is not known whether this translates to improvements in advanced motor skills and/or physical activity participation. The role of motor learning-based physiotherapy (MLP) intervention to complement FES is also unclear.

Patients and methods
Six children with hemiplegic CP (6-13 years, GMFCS I/II) participated in this single-group, mixed-methods RCT feasibility study. They were assessed after: A) 8-weeks of current orthotic wear plus fortnightly MLP sessions; B) 4-weeks of WalkAide® (FES) acclimatisation and 8-weeks of wear, plus fortnightly MLP sessions; and C) 8-week follow-up (no intervention). Advanced motor skills were measured by the Challenge and Canadian Occupational Performance Measure (child/family activity and participation goals). Interviews with children, parents and clinicians explored their experiences.

Results
Four children tolerated WalkAide wear and completed all assessments, demonstrating substantial gains in advanced motor skills. Clinically important improvement in advanced motor skills was evident for five children after the four MLP sessions (Challenge scores increased by 3 to 13 percentage-points), with mixed outcomes post-FES addition (further Challenge gains of -8 to +13 percentage-points) and at follow-up (further Challenge gains of -1 to 6 percentage-points). Qualitative data and individual goals provided insight into response variability within each phase, and will be discussed in relation to results and WalkAide clinical utility.

Conclusion
Results reinforce the need for a larger RCT to determine integrated FES+MLP intervention effectiveness, including consideration of device functionality impact on performance.

PP-057
Poster presentation
Poster session 1 - timeslot 1

Rehabilitation Computer Stepping Games for Patients with Cerebral Palsy
O. Kachmar, I. Kozyavkin
International Clinic of Rehabilitation, TRUSKAVETS, Ukraine

Introduction
Rehabilitation games that combine physical therapy exercises with computer games provide prerequisites for effective motor learning – repeated practice of the task, adjusted difficulty, motivating feedback in safe environment. Stepping games that are using Dance Mat - flat electronic game controller with 3×3 matrix of square panels for the player to step on, to evoke actions within the game, were tested. Eight different games with individually adjusted difficulty were available for home training. The aim of the study was to evaluate influence of stepping games on walking abilities and balance of children with Cerebral Palsy.

Patients and methods
Preliminary assessment was done on ten patients with cerebral palsy, aged four to twelve years, GMFCS Level II - III. Patients followed two weeks home training program with daily 20 minutes gaming session. Every session includes 3 or 4 different games with individually adjusted difficulty parameters. Each patient was assessed before and after the training course by following tests: Timed Up and Go, Pediatric Balance Scale and Four Square Step Test.

Results
After two weeks of daily training, balance and walking improvements were noted. Pediatric Balance Scale improved on average by 1.5 points (p<0.05), Timed Up and Go Test by 2.1 seconds, and the time in the Four Square Step Test was reduced on average by 1.7 seconds (p<0.05). Results could have bias since the author participated in the creation of the games.

Conclusion
Rehabilitation computer stepping games may improve balance and walking skills in patients with cerebral palsy.

PP-058
Poster presentation
Poster session 1 - timeslot 2

Young children with severe to profound cognitive and motor developmental delay: Exploration of difference or delay in their motor development.
G.H. Schalen¹, A.A.J. van der Putten¹, B. Maes³, C. Vlaskamp¹
¹University of Groningen, GRONINGEN, The Netherlands

Conclusion
Rehabilitation computer stepping games may improve balance and walking skills in patients with cerebral palsy.
Introduction: Early motor stimulation is valuable for children with severe to profound motor impairments, especially those with a comorbid intellectual impairment. A prerequisite for the implementation of suitable and effective interventions and evaluation thereof, is the knowledge of the specific course of the motor development of this group of children. Therefore, this study aims at exploring the course and (atypical) patterns of motor development of these children.

Patients and methods: The gross and fine motor skills of 40 children (aged 6 to 59 months) with severe to profound motor and cognitive developmental delay were assessed by means of an adapted questionnaire of motor abilities. Patterns are analyzed by means of Item Response Theory analysis.

Results: Preliminary results will be presented: All children showed a delay in motor development, however, a substantial part seems to show alterations from the typical developmental course; specific child characteristics appear to be related to a different motor developmental course.

Conclusion: The majority of current evaluations is based on theories and models of typical motor development and evidence for the suitability of these theories for children with severe motor and intellectual impairments is still lacking. This research on young children with severe to profound cognitive and motor developmental disabilities can fill this gap.

PP-060
Poster presentation
Poster session 1 - timeslot 4

Somatosensory reorganization at ultra high field MRI in congenital hemiplegia
S. Fiori1, L. Biagi1, P. Cecchi2, E. Beani1, A. Guzzetta3, M. Tosetti4, M. Cosottini5, G. Cioni6
1IRCCS Fondazione Stella Maris, PISA, Italy
2University of Pisa, PISA, Italy
3University of Pisa, Stella Maris Scientific Institute, PISA, Italy
4IRCCS Fondazione Stella Maris, University of Pisa, PISA, Italy

Introduction. Reorganization of sensorimotor function influences the clinical recovery of subjects with congenital unilateral brain lesions. Clinical field functional MRI contributed fundamentally to the current knowledge on such plasticity mechanisms. The purpose of this study was to obtain preliminary information on the possible advantages of ultra high field functional MRI (7T) in the study of somatosensory reorganization.

Patients and methods. We enrolled 6 young adults (mean age 25 ± 6) with congenital unilateral brain lesions (4 in the left hemisphere, 4 with perilesional motor reorganization) and 7 healthy age-matched controls. Paretic hand sensory assessment included stereognosis and 2-point-discrimination. Task-dependent sensory fMRI was performed. A reliable vibrotactile stimulus to the distal phalanx of thumb and index fingers was elicited by using a 7T-compatible pneumatic system developed ad hoc (Linari Engineering, s.r.l., Pisa). Group analysis was performed in the control group to assess the centre of mass of S1-related activation. Single subjects analyses in the native space were performed in hemiplegic subject and each S1 centre of mass was determined. The distance between group and single subjects S1 centre of mass was calculated and related to sensory measures.

Results. A correlation emerged between group and single subjects S1 centre of mass distance and sensory deficit (p<0.05) in hemiplegic subjects, with a bigger distance being related to a more severe sensory deficit.

Conclusions. Increase in spatial resolution at 7T allows a better localization of reorganized function and allows quantitative determinants to be related to sensory clinical measures.

PP-061
Poster presentation
Poster session 1 - timeslot 1

Can GMFCS be directly used in its original form in underdeveloped countries? An observation in Nepal
R. Thapa
Self help group for cerebral palsy, LALITPUR, Nepal

Introduction
GMFCS is a very useful widely used tool to classify and quantify severity of a child with Cerebral Palsy(CP) with many applications. This was developed in Canada, a country with one of the best healthcare system in the world. But during practice in Nepal it was observed that a child didn’t always confirm to the criterion of GMGCS and soon changed GMFCS levels.

Patients and methods
From Jan 2014 to March 2016, 646 children were seen through mobile health camps in 22 districts of Nepal. Among them 336 were diagnosed with CP and GMFCS classification was done. Among them 48 children along with their mothers were called in groups of 4-6 to a well facilitated rehabilitation center in Kathmandu for intensive therapy for one month. GMFCS was classified again at the end of the month.

Results
At the end of intensive rehabilitation program, an increase in GMFCS level by 1 was seen in 27 children, a raise by 2
was seen in 2 children and 19 children didn’t show any change in their GMFCS. Deprived children from lower socioeconomic background showed more improvements.

**Conclusion**

In an underdeveloped country like Nepal due to lack of treatment, potential of children with CP remains unexplored. Directly diagnosing a GMFCS level might be misleading, which influences counseling and further course of treatment. Therefore it is best to wait for at least one month of treatment before pronouncing a GMFCS level. Meantime, we may use a range (e.g. GMFCS Level II to III).

---

**PP-062**  
Poster presentation  
Poster session 1 - timeslot 2

**Functional electrical stimulation to improve upper limb function in a child with an acquired brain injury: A single case experimental design study.**  
G. Kelly¹, J. Shanley²  
¹The Children's Trust, TADWORTH, United Kingdom  
²Coventry University, COVENTRY, United Kingdom

**Background**

Children with acquired brain injuries (ABI) can present with upper limb (UL) impairments affecting their ability to participate in daily activities. Evidence supports use of functional electrical stimulation (FES) to improve UL outcomes in adult stroke, and children with cerebral palsy. Limited evidence exists for its use with children with ABI. This study aimed to investigate the use of UL FES in a child with hemiplegia, MACS level V, following an ABI.

**Method**

Ethical approval and informed consent gained prior to study. Single case experimental design: ABAB design was employed. A (non-intervention) phases consisted of standard rehabilitation, and B (intervention) of standard rehabilitation plus 30 minutes of grasp and release FES with task training daily. Each phase lasted 4 weeks, and twice weekly measures of Melbourne Unilateral Upper Limb Assessment 2 (MA2), Goal Attainment Scale (GAS), and active wrist extension were collected. Visual analysis of level, slope and gradient of data and statistical analysis using two standard deviation band method was completed.

**Results**

FES improved gross range and accuracy of movement measured by MA2 and achievement of GAS goals in a child with hemiplegia following an ABI. It did not change range of wrist extension, or dexterity movement fluency scores on MA2.

**Conclusion**

This study supports using FES with task training to develop gross motor upper limb activity in children with hemiplegia, MACS V, following ABI. It is consistent with existing evidence in other neurological populations. Specific results can assist with setting of realistic UL goals for similar children.

---

**PP-063**  
Poster presentation  
Poster session 1 - timeslot 3

**Eye movements in autistics and their management with optometric vision therapies**  
A. Goyal  
Sankara college of optometry, BENGALURU, India

**Introduction:**

Autism spectrum disorder has a prevalence of 1.6% according to WHO. A number of etiologies have been suggested, but none of them satisfies all the autistics. Among almost all autistics, a few visual signs and symptoms are seen frequently. They are:  
- Poor eye contact  
- Excessive head movements  
- Lateral gaze  
- Flicking of fingers and looking at them

**Methods:**

As there are no existing procedures to quantify saccades, a procedure using a commercial eye tracker was designed. It was validated against DEM, which is used to quantify saccades in neurotypical children. After validation, this device was used to ascertain saccades in 24 autistics who had never undergone optometric vision therapy. Saccades were also measured for 24 autistics who had undergone optometric vision therapies.

**Results:**

The results showed that the saccades had improved considerably in all the 24 subjects who had undergone optometric vision therapy as compared to the group which had not undergone optometric vision therapies. Qualitatively too, the parents opined that the eye contact had improved after optometric vision therapies.

**Conclusions:**
Most of the autistic children demonstrate visual signs which require intervention of behavioral and developmental optometrists to provide optometric vision therapies. After undergoing these therapies, the saccadic movements and also the smooth tracking pursuits improve. These in turn result in improvement of the child’s attention and concentration. This can further be extrapolated to improve binocularity, visual perception and visual motor coordination, which will improve their academic pursuits and hence their quality of life.

**PP-064**
Poster presentation
Poster session 1 - timeslot 4

*Treatment with botulinum toxin in Children with cerebral palsy: a qualitative study of parents’ experiences*
K. Lorin, A. Forsberg
Region Örebro, ÖREBRO, Sweden

**Introduction**
In children with cerebral palsy everyday movements such as walking, standing and using one’s hands can be difficult to perform due to spasticity. Botulinum neurotoxin type A (BoNT-A) are often used to reduce spasticity. The aim of this study was to describe how parents of children with cerebral palsy experienced the child’s treatment with BoNT-A, how the child was affected by the treatment and how spasticity affected the child.

**Patients and methods**
A qualitative study in which 15 parents of children (6–13 years old) with cerebral palsy were interviewed about their experiences of the BoNT-A treatment. An interview guide was used with topics: the child’s functions before and after the treatment, the outcomes of the treatment and how they valued the BoNT-A treatment. Content analysis was used to analyse the interviews.

**Results**
The analyses resulted in two themes: ‘When softness comes and goes’ and ‘Both want and do not want’. The reduction of spasticity was described to promote motor functions, and facilitate the next step in motor development. The children were described as being more active out of their own initiative and having a happier mood. The BoNT-A injection procedure was perceived as troublesome and painful for the child, and sometimes traumatic for both children and parents.

**Conclusion**
Treatment with BoNT-A was described as facilitating motor development and activity. The children’s and the parents’ negative experiences of the injection procedure should be addressed. Further research is needed to elucidate the children’s experiences of receiving BoNT-A treatment.

**PP-065**
Poster presentation
Poster session 1 - timeslot 1

**Effect of a 4 day activity focused intervention program in children in the age of 7 - 10 years.**
B. Snijders¹, E.J. de Viet²
¹Revant Rehabilitation Centres, BREDÁ, The Netherlands
²Revant rehabilitation centres, BREDÁ, The Netherlands

**Background**
Activity focused training and child-set goals have shown promising results in improving functions in daily activities in children with physical disabilities.

**Aim**
The aim of this study is to determine the effect of a 4-day activity focused intervention program in achieving goals on long term in children with physical disabilities age 7 – 10 years.

**Methods**
In the intervention a motor learning approach was used. Children between 7 and 10 years with physical disabilities were included. The intervention lasted 4 days, 2 consecutive days, 1 day without therapy and again 2 consecutive days. All children received 3 hours of individual activity focused training and 1 hour of group training a day. After the intervention all children received homework instructions. Data were collected 1 or 2 weeks before (t0) and 2 months after the intervention (t1). Outcome measures were Goal Attainment Scaling (GAS) and Canadian Occupational Performance Measure (COPM).

**Results**
Twelve children (8 boys) participated in this study. Four with cerebral palsy, 6 with developmental coordination disorder, 1 with traumatic brain injury and 1 with neuromuscular disease aged from 7.3 to 10.11 years (mean age: 8.1 years).
All children improved in motor activities and made progress on the GAS. 14 of the 24 goals were scored higher in satisfaction on the COPM. (4 goals were not scored)

**Conclusion**
A four day activity focused intervention program increases motor activities and performance in daily activities.
Isometric grip strength measurements in children with unilateral cerebral palsy; to use or not to use, that’s the question
K.J.F.M. Dekkers¹, Y.J.M. Janssen-Potten², A.M. Gordon³, L.A. Speth³, R.J.E.M. Smeets⁴, E.A.A. Rameckers⁵
¹Maastricht University, MAASTRICHT, The Netherlands
²Adelante Centre of Expertise in Rehabilitation and Audiology, HOENSBOEK, The Netherlands
³Columbia University, Teachers College, NEW YORK, United States of America
¹Libra Rehabilitation and Audiology, EINDHOVEN, The Netherlands
⁵Adelante, Maastricht University, HOENSBOEK, The Netherlands

Introduction
About 60% of the children with cerebral palsy (CP) experience problems with regard to hand function. Insufficient grip strength can be a cause of the hand function problems, especially in tasks which require a lot of muscle strength. In general practice, grip strength is measured on the function level of the ICF-CY. However, it’s unclear if grip strength measured on function level represents grip strength executed on activity level.

Patients and methods
137 children with unilateral CP in the age of 7-15 years (mean 11 years 1 months; 64 girls, 73 boys) were tested in the Netherlands and in the USA. In each participant, isometric grip strength on function level was measured with the Biometrics E-link system and grip strength on the activity level was measured by determining the maximum amount of lift-and-hold capacity, using a measuring cup filled with weights. Because the data was not normally distributed, Spearman correlation coefficient was calculated between both measurements.

Results
A significant Spearman’s Rho of 0.567 was found between both measurements.

Conclusion
Grip strength measured on function level has a moderate correlation with the strength executed on activity level. Beside grip strength, other motor impairments have also influence on grip strength executed on activity level. If a child with CP experience problems with tasks that require a lot muscle strength, it is useful to measure grip strength on function level. However, because the lack of grip strength norm values, interpretation of the muscle strength value must be done with carefulness.

Physical activity and body composition in adolescents with cerebral palsy: Are they doing more than we think?
L. Mcfadden¹, N. Gibson², M. Blackmore³, S.A. Williams¹
¹Curtin University, PERTH, Australia
²Princess Margaret Hospital for Children, PERTH, Australia
³Ability Centre, PERTH, Australia

Introduction
Cerebral Palsy (CP) limits movement ability, increasing the risk of physical inactivity and associated chronic disease. This study aimed to describe the physical activity behaviour, body composition and nutritional intake of adolescents with CP. A secondary aim was to determine the validity of skinfold assessment in this population.

Patients and methods
This was a cross-sectional, descriptive study of 12 adolescents with CP, Gross Motor Function Classification System levels II-V. Daily physical activity was measured using Actiheart accelerometry over 7-days. Percentage body fat (BF) was determined using Dual Energy X-ray Absorptiometry (DXA) and skinfold assessment (tricep and subscapular). Nutritional intake was measured using the South Australian Nutrition Questionnaire for students 12 – 18.

Results
Adolescents with CP spent 413 minutes in sedentary activity, 202 minutes in light activity, and 87 minutes in moderate-vigorous activity per day. No significant relationship between physical and sedentary activity and BF by DXA for boys (Spearmans r physical activity=0.66, sedentary activity = 0.54) or girls (Spearmans r = physical activity= 0.40, sedentary activity = -0.20) were found. Percentage body fat from skinfold assessment demonstrated strong agreement with DXA (ICC3,1 = 0.97, 95% CI = 0.90 to 0.99). Participants did not reach recommended dietary guidelines for any food item, other than sweetened beverages.

Conclusion
In keeping with other research, adolescents with CP showed high levels of both sedentary activity and percentage body fat, but also displayed high levels of moderate-vigorous activity. Skinfold assessment for adolescents with CP...
was an excellent indicator of percentage body fat.

PP-069
Poster presentation
Poster session 1 - timeslot 1

How does physical activity change according to clinical types of cerebral palsy: a perspective with SCPE and ICF-CY from Turkey.
K. Seyhan, Ö. Cankaya, M. Kerem Günel
Hacettepe University, ANKARA, Turkey

- Introduction: Cerebral palsy is a group of permanent movement disorders that appear in early childhood and seen with activity limitations. Subtypes of CP are spastic, dyskinetic, ataxic according to Surveillance of Cerebral Palsy in Europe (SCPE). International Classification of Functioning, Disability and Health children and youth (ICF-CY) is a framework for describe the health situation of children. - Patients and methods: 73 children with the mean age 8.10 ±3.76 (4-18) years were evaluated in Cerebral Palsy Unit, Hacettepe University for this study. Motor function with Gross Motor Function Classification System (GMFCS) and gross motor function measurement (GMFM), hand function with Manual Ability Classification System (MACS), eating function with Eating and Drinking Ability Classification System (EDACS), communication with Communication Function Classification System (CFCS), cognition and daily living activity with Functional Independence Measure for Children (WeeFIM), walking activity independency with Gillette were evaluated. Children were divided three groups: spastic, dyskinetic and ataxic. - Results: 49 (67.1%) spastic, 17(23.3%) dyskinetic, 7(9.6%) ataxic children had similar mean ages (p=0.32, p=0.73, p=0.74). Even if there were significant differences between the spastic and dyskinetic in all test (p<0.001) and between dyskinetic and ataxic children with CP (p<0.05), there were no difference between spastic and ataxic children(p>0.20). - Conclusion: Clinical subtypes of CP may affect body functions (hand, speaking, cognition) and daily life activity and participation such as self care, feeding, and walking according to ICF-CY. Clinical subtypes should be consider with classification systems when describing the activity levels of children, not only classified functional levels.

PP-070
Poster presentation
Poster session 1 - timeslot 2

Do improvements in exercise parameters result in less walking problems and fatigue in youth with a non-progressive motor disorder?
A.C.J. Balemans1, E.A.M. Bolster1, J. Scholten1, J. Teeuwen1, A.I. Buizer1, H.J.G. van den Berg-Emons2, A.J. Dallmeijer1
1 VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands
2 Department of Rehabilitation Medicine, Erasmus MC, and Rijndam Rehabilitation, ROTTERDAM, The Netherlands

Introduction
Walking problems like fatigue, a reduced walking distance or speed are commonly reported in youth with a non-progressive motor disorder. Clinical exercise tests are applied to determine the potential physiological cause of these self-reported walking problems. However, it is not clear yet whether improvements in exercise parameters do actually result in less walking problems.

Patients and methods
Forty children (12y5mo, 22 boys/18girls) with a non-progressive motor disorder (cerebral palsy (N=32), spina bifida (N=3), other (N=5)) who were referred for exercise testing participated. Exercise parameters: gross energy cost of walking (EC[J/kg/m]), aerobic fitness (VO2peak[ml/kg/min]), physical strain (%VO2walk) and sprint capacity (P20[W/kg]) were measured pre and post treatment as part of clinical care. Walking problems were assessed through the Canadian Occupation Performance Measure [1-10] and the Mobility Questionnaire [0-100%]; and fatigue with the Checklist Individual Strength (CIS [8-56]). Linear regression analyses were applied in subgroups to determine associations between changes in exercise parameters and walking problems.

Results
Improvement of EC was associated with an improvement in COPM performance (B=0.996 (95%CI: -1.839 to 0.154,R²=0.282,p=0.02,n=18) and with an improvement in fatigue (CIS) (B=4.10(-1.84 to -0.15,R²=0.27,p=0.01,n=24). Improvement of physical strain was associated with an improvement in fatigue (B=0.17(0.03-0.31,R²=0.30,p=0.02,n=17). No other associations were found.

Conclusion
The current preliminary results indicate that improving physical strain and EC may lead to less experienced fatigue in daily life and a reduction of walking problems (EC only). Treatment focused at improving exercise parameters could improve walking problems and fatigue in this population but requires confirmation in a larger cohort.
Impact of lower limb impairments on RaceRunning performance

M. van der Linden, M. Verheul, S. Jahed, N. Tennant
1Queen Margaret University, MUSSLEBURGH, United Kingdom
2Edinburgh University, EDINBURGH, United Kingdom
3NHS Greater Glasgow and Clyde, GLASGOW, United Kingdom

Introduction
The aim of this study was to take a first step towards an evidence based IPC classification for RaceRunning (RR) by investigating the relationships between lower limb impairments known to affect gait in persons with Cerebral Palsy and hypothesized to also impact RR performance.

Participants and Methods
An experienced paediatric physiotherapist assessed the lower limb muscle strength (Manual Muscle Testing in Outer, Mid and Inner range), selective voluntary motor control (SCALE) and spasticity (Australian Spasticity Assessment Score) in RR athletes with at least one year of RR experience. Spearman’s correlation coefficients between RR competition race times and lower impairments summed over all three joints and both legs were calculated.

Results
Thirty participants (24 with CP, 3 with TBI/brain tumour, 3 unknown) were recruited. Average (±SD) age was 25 (9) years (range 14 to 54). Complete data for were recorded for 27. Observation of scatter plots of plots showed clear relationships between all impairments and RR race times but with several outliers to the trend reducing the value of Spearman’s rho: ASAS: ρ=0.40, SCALE: ρ=0.34; MMT: ρ=0.35.

Conclusion
The results of this study demonstrate the value of recording a range of impairment variables in order to obtain an athletes’ profile from which his or her performance capacity can be estimated. Future studies should include more participants allowing multiple regression analysis or principle component analysis. For classification purposes, other factors such as training status should also be considered.

The effects of tandemskiing on postural control, muscular and cardiac activities in children with profound intellectual and multiple disabilities

C.J. Newman, A. Bonjour, D. Michaud, L. Mondada, F. Degache
1University Hospital of Lausanne, LAUSANNE, Switzerland
2University of Applied Sciences and Arts of Western Switzerland, LAUSANNE, Switzerland
3Lausanne University, LAUSANNE, Switzerland

Introduction
Children with profound intellectual and multiple disabilities (PIMD) have low physical activity and deficient postural control. In tandemskiing (TS) the passenger rides in an adapted seat, piloted on articulated skates. We aimed to determine the effect of TS on postural control, muscular and cardiac activity in children with PIMD.

Participants and methods
Nineteen children with PIMD and 10 age-matched controls took part. Body segment movements were measured with 10D inertial sensors (Physilog®) on the head, C7 (including EMG), sternum (including ECG) and pelvis, with a seat reference. Each participant was measured during a 10-turn slalom. Primary outcomes were 3D body segment angular velocities, EMG root mean squares and heart rates.

Results
In PIMD angular velocities of the head and sternum differed significantly from the seat (respectively 92.4 ± 22.4 °/s and 85 ± 20.7 °/s vs 62.5 ± 16.4 °/s; p<0.001), analogous to controls.
There were no significant differences between the PIMD and control groups in sternocleidomastoid (0.04 mV vs 0.03 mV) or trapezius (0.09 vs 0.08 mV) muscle activities during TS.
Heart rate in both groups differed significantly between rest (PIMD 99bpm, controls 97bpm), exercise (PIMD 140bpm, controls 139bpm; rest vs exercise p<0.001) and recovery (PIMD 101bpm, TD 107bpm; exercise vs recovery p<0.001). There were no significant differences in heart rates between groups.

Conclusion
TS elicits active postural control associated with muscle and cardiac activities that are similar in children with PIMD and controls. Therefore TS can be considered a genuine sports activity for children with PIMD.
Relationship between balance and functional independence in children with cerebral palsy
A. Cakmak, Z. Gergi, Ö. Cankaya, K. Seyhan, M. Kerem Gunel
Hacettepe University, ANKARA, Turkey

Introduction: Cerebral palsy (CP) is a developmental disability that affects motor, sensory, and cognitive functions resulting in activity limitation. Our purpose was to investigate relationship balance and functional independence in children with CP.

Patients and methods: Fifteen children with CP (5 girls, 10 boys) were included in our study. Demographic characteristics of children were recorded. Children in our study had different types of CP (spastic (n=11, 73.3%), dyskinetic (n=1, 6.7%), ataxic (n=3, 20%)). Balance was assessed using the Pediatric Berg Balance Scale (PBS). The Functional Independence Measurement for Children (WeeFIM) was used to evaluate functional independence. Correlations were calculated with Spearman’s correlation coefficient. Findings were considered statistically significant at p<0.05.

Results: Mean age of children with CP was 8.10±4.20 years. There were positive moderate correlations between PBS score and WeeFIM scores (r_motor=0.733, r_total=0.698, p<0.05).

Conclusion: Our results showed that balance affects functional independence in children with CP. Balance assessment and training should be considered to improve functional independence and prevent activity limitation in children with CP.

Outcomes of Clinical Exercise tests are related to fatigue in youth with walking problems
E.A.M. Bolster, A.C.J. Balemans, V. de Groot, A.I. Buizer, A.J. Dallmeijer
VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands

Introduction: With clinical exercise tests the energy consumption during walking, aerobic capacity, anaerobic capacity and physical strain of walking can be measured to guide treatment of youth with physical disabilities. The aim of this study was to determine the relation between these outcomes and fatigue in youth with walking problems who have been referred for clinical exercise testing.

Patients and methods: Fifty-eight participants with physical disabilities were included in this study (mean age 12y11mo, range 5y10mo–22y1mo). Overall fatigue was assessed with the Checklist Individual Strength (CIS) and fatigue after 6 minutes walking at comfortable speed with the OMNI. Univariate and multiple regression analyses were performed with fatigue as dependent variable and clinical exercise outcomes as independent variables (p<0.05).

Results: A decreased aerobic capacity (R²=0.20) and maximal aerobic work rate (R²=0.20) were significantly related with fatigue, measured with the CIS. An increased gross and net energy cost, physical strain and a decreased aerobic and anaerobic capacity and maximal aerobic work rate were all significantly related with fatigue, measured with the OMNI (R² ranged from 0.15–0.25). In a multiple regression model both an increased net energy cost and a decreased aerobic capacity were related with a higher OMNI score (R²=0.28).

Conclusion: In youth with walking problems an increased net energy cost and a decreased aerobic capacity are associated with fatigue during walking. Therefore, clinical exercise tests should be included in the diagnostic evaluation when youth with walking problems report fatigue during walking, in order to select the optimal treatment for an individual patient.

Relevant Areas of Functioning in people with adolescent idiopathic scoliosis on the International Classification of Functioning, Disability and Health Coding System: from patients’ perspective
J. Yu¹, D.C.P. Du², W.P. Wang³, C.Q. He⁴
¹West China School of Medicine & Sichuan University, CHENGDU, China
²West China Hospital & Sichuan University, CHENGDU, China

Introduction: To investigate relevant aspects of functioning and disability, and environmental factors in people with adolescent idiopathic scoliosis (AIS) according to patients’ self-reports based on the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY). Patients and methods: Multicentre, empirical, cross-sectional study. Semi-structured interviews were conducted with 975 patients with AIS from 5 hospitals
The effect of child, family and environmental factors on the participation of young children with disabilities

D. Anaby1, L. Salvo2, E. di Marino1, M. Khetani2, S. Tremblay1
1McGill University, MONTREAL, Canada
2Jewish Rehabilitation Hospital, LAVAL, Canada
3University of Illinois, CHICAGO, United States of America

Introduction
Participation in everyday activities is essential to a child’s development, however, little is known about the participation of young children with disabilities. This study 1) described the participation patterns of children under age six and 2) examined the extent to which child’s factors (i.e., age, complexity of condition), family factors (i.e., family functioning, income) and environmental factors (i.e., environmental helpfulness) affect participation in three settings: home, daycare/preschool and community.

Patients and Methods
Parents (n=90) of children, ages 1.4 to 6 years (mean = 4.15, SD = 1.03), with various functional issues including communication (67%), attention (66%) and controlling behaviours (55%) completed the Young Children’s Participation and Environment Measure, the Family Assessment Device and a demographic questionnaire. Radar Plots and multiple linear regressions were performed to describe participation patterns and identify the significant explanatory factors in each setting.

Results
Participation restriction (range and frequency of activities) was primarily evident in the community setting. Environmental helpfulness (resources, supports) had a significant effect on participation frequency, involvement and desire for change across all settings, whereas the contribution of child’s factors was minor. Family functioning had a significant effect when examining participation involvement in the community and desire for change in the home setting and, in combination with environmental helpfulness, explained 18% and 21% of the variance respectively.

Conclusions
Findings emphasize the importance of the environment in supporting participation of young children and can re-direct practitioners’ attention towards modifying the environment as the primary target of intervention in early childhood.

5 year motor outcomes of children following arterial ischaemic stroke

A.N. Cooper
Murdoch Children's Research Institute, MELBOURNE, Australia

Introduction:
Childhood arterial ischaemic stroke is a common cause of disability and mortality. Neuromotor impairment is the most commonly reported clinical sign at diagnosis and long-term consequence, yet current research is limited and detailed motor outcomes are poorly understood. This study aimed to measure motor outcomes of children, five years post stroke onset. It also explored the relationship between motor outcomes and participation, adaptive behaviour and quality of life (QOL).

Patients and methods:
33 children (21 male, mean age 2.8y) were recruited from a prospective longitudinal study, five years post stroke onset. Children were stratified into age groups: neonates, pre-school (30d <6y) and childhood (≥6y/o) at time of stroke. Global outcomes were quantified using the Pediatric Stroke Outcome Measure (PSOM). Motor assessments (Bruininks-Oseretsky Test of Motor Proficiency: BOT-2; Melbourne Assessment 2: MA2; Assisting hand assessment: AHA), functional skills and participation questionnaires: Participation and Environment Measure for Children and Youth: PEM-CY; Pediatric Quality of Life Inventory: Fatigue Module: PEDS-QL; Vineland Adaptive Behavior scales, second edition: Vineland-11) were completed.

Results:
Where population norms were available for comparison, the stroke group performed more poorly than test norms on most assessment measures (ps<0.05). Fine motor function was more severely affected than gross motor function. A significant relationship was found between adaptive behavior and both gross and fine motor outcomes. Preschool and school-aged groups differed in participation, quality of life and fatigue measures.

Conclusion:
Stoke has a persisting impact on many different areas of a child’s life including motor function, participation and QOL.

PP-081
Poster presentation
Poster session 1 - timeslot 1

Instruments for mapping activity preferences for children and adolescents with disabilities: A review of the literature
L.K. Dalen¹, R.B. Jahnsen¹, A. Ullenhaag², L. Shields³
¹Beitostølen Healthsport Center, BEITOSTØLEN, Norway
²Målardalens högskola & Beitostølen Healthsports Center, BEITOSTØLEN, Norway
³Charles Sturt University, BATHURST, Australia

Introduction:
A main goal for health, social and pedagogical service providers is to optimize participation at different life arenas for children and adolescents with disabilities (CAD). Involvement in physical leisure activities gives children and youth in general a sense of belonging, opportunities to fulfill personal goals, and to develop and grow as individuals. Participation based on the individual’s preferences promotes both learning, knowledge of self and a sense of mastery.

BarnAs 1 is a Norwegian assessment tool under development, which aims to assess preferences of activities among CAD.

Methods:
A literature search has been done in order to find other valid instruments available for measuring CAD’s preferences for activities.

Results:
Five instruments were found that partly mapped self-reported activity preferences among CAD, while one met all criteria’s, namely the preferences for activities of children (PAC), which is used to assess children’s self-reported preferences for recreational, physical, social, skill-based and self-improvement activities. It shows satisfactory results for clinical use of the Norwegian version. However, because of restrictions put in place by the publisher, the Norwegian version could not be widely disseminated. The scaling of the original version has also proven to be too difficult for children to understand without substantial help and guidance. The instrument is about 15 years old, and not updated with many of current activities that CAD participate in.

Conclusion
Due to the lack of an applicable tool, there is a need for another updated and validated Norwegian instrument to evaluate preferences for participation in activities in CAD.

PP-082
Poster presentation
Poster session 1 - timeslot 2

Effects of occupational therapy on motor skills, sensory processing patterns and occupational participation of two children with rubinstein-taybi syndrom
M. Huri, S. Kars, H. Kayihan
Hacettepe University, ANKARA, Turkey

Introduction: Researches on Rubinstein-Taybi syndrome (RTS) support the possibly of related sensory and motor difficulties which may result with occupational participation restrictions. The aim of our study was evaluate the effects of client centered occupational therapy intervention (OT) motor skills, sensory processing patterns and occupational participationon children with RTS.

Patients and methods: A girl and a boy diagnosed by RTS were included. Motor skills were evaluated by Bruininks and Oseretks Test of Motor Proficiency, sensory processing patterns were evaluated by Sensory Profile and Sensory Integration and Praxis Test (SIPT), occupational participation was evaluated by Short Child Occupational Profile before and after OT which is planned 45 minute, twice a week for 12 months. Results were compared with SPSS 17.

Results: Both children showed motor, sensory processing and participation restriction. Fine motor precision and integration, upper-limb coordination scores, development of somatosensory perception, somatopraxia and bilateral integration and sequencing patterns were lower than the typically developing peers. Occupational participation was related to decreased motor skills, process skills, habitation, communicaton and interaction skills. Children showed statistically significant development on fine motor precision and integration, upper-limb coordination scores,
Conclusion: This study provides initial evidence that children with RTS may present clear differences in motor and sensory processing patterns which may effect child's occupational participation. Client centered occupational therapy intervention programmes may be added to individual education plan of children with RTS to increase participation. Further researches must be planned.

PP-083
Poster presentation
Poster session 1 - timeslot 3

'Dragons and Couch potatoes' Meanings of participation using metaphors from children and young people with cerebral palsy.
D.M. Pickering, P. Gill, C. Reagon, J.P. Davies
Cardiff University, CARDIFF, United Kingdom

Introduction
A recent critique of the WHO-ICF model has proposed health as the ability to ‘adapt and self-manage’, suggesting that coping strategies and participation are more important than a full restoration of health (Huber et al, 2011). Children with cerebral palsy (CP) mature into adulthood living with their long term condition and it is proposed that participation in recreational activities can have both physical and emotional well-being benefits. Whilst some do participate, it is not yet fully known why some choose not to participate.

Patient and Methods
Two pilot cases are presented as part of a doctoral study exploring the lived experiences of children and young people with CP. Creative methods were used for them to tell their stories in 2 interviews, 3 months apart. A diary of recreational activities was kept in the intervening period. This included creating a digital story, using hand puppets, figure characters in a sandbox and observations of a super triathlon. Data were transcribed verbatim and analysed using an interpretative phenomenological approach (Smith et al, 2013).

Results
Becky, aged 9 years, describes neurosurgery that changed her capabilities, enabling her to walk with her friends, improving her social opportunities. Katie, aged 21 years, described herself previously as inactive before she was given the opportunity, aged 19 years, to try RaceRunning. These findings support the health and well-being benefits of participation.

Conclusion
Further doctoral data will increase this knowledge using children and young people with CP's own ‘voices’ about what is meaningful to their quality of life.

PP-084
Poster presentation
Poster session 1 - timeslot 4

Occupational performance needs of children and young people with acquired brain injury
L.J. Wales, F. Benford, M. Burrough, C. Dunford
The Children's Trust, TADWORTH, United Kingdom

Introduction
Following a severe acquired brain injury (ABI) children and young people (CYP) present with a wide range of occupational performance needs. The Canadian Occupational Performance Measure (COPM) is an evidence-based outcome measure designed to capture a client’s self-perception of performance in everyday living, over time. This study aims to investigate the occupational performance needs of CYP in rehabilitation following an ABI.

Patients and Methods
 Routinely collected COPM data from 2014-2016 of 19 CYP aged 1-18 years with 13 girls and 6 boys during a period of intensive rehabilitation. Twelve had an ABI and 7 had a traumatic brain injury.

Results
Overall, 100 occupational performance targets were set in all areas: leisure (37%), self-care (35%), productivity (22%) and other (6%). Occupational performance needs identified were personal care (n=26); functional mobility (13); active recreation (13); school (11); socialisation (11); quiet recreation (10); community management (7); paid work (2); other (6). Handwriting was a commonly identified area of occupational performance (n=10).

Conclusion
Using COPM enabled CYP to identify their occupational performance problems and demonstrates the importance of self-care and leisure during rehabilitation. The most common problem in each area was personal care (self-care), handwriting (productivity) and active recreation (leisure). COPM is a useful tool to ensure occupational therapists consider the full span of occupational performance areas that are meaningful to CYP following an acquired brain injury.
Spatial navigation in children with motor disorders: cerebral palsy, spinal cord involvement and orthopedic deformities
Å. Bartonek¹, L. Piccardi², C. Guariglia³
¹Karolinska Institutet, STOCKHOLM, Sweden
²L'Aquila University, L'AQUILA, Italy
³Sapienza, University of Rome, ROME, Italy

Introduction
During locomotion, the control of spatial orientation through dynamic updating between the body and the environment, both with respect to extrapersonal and peripersonal spaces, is required. Difficulties during navigational tasks may lead to functional problems in everyday life.

Aim
The aim of the study was to explore spatial navigation in children with motor disorders.

Patients and methods
Two hundred-two children, 5-17 years of age, of which 84 with motor disorder (42 with cerebral palsy, CP, 42 with spinal cord involvement, SI/orthopedic deformities, OD, and 118 typical developing (TD) children, participated in examination of topographical working memory (Walking Corst test, WalCT) and visuo-spatial memory (Corsi block-tapping Test, CBT). Cognitive non-verbal test (Raven’s Coloured Progressive Matrices, CPM) was performed in children with motor disorder. Parametric statistics was performed using SPSS version 24.

Results
Age groups 5-9 years and 10-17 years were analyzed. In age group 10-17 years, the CP group (n=27) had lower WalCT (3.81 vs 5.12, p<0.001) and lower CBT scores (4.07 vs 5.36, p<0.001) than TD (n=58), and lower CBT score than SI/OD (4.07 vs 5.05, p=0.001). SC/OD (n=27) had lower WalCT score than TD (4.30 vs 5.12, p=0.014).

Conclusion
At similar cognitive development, no significant differences between the groups were found in age group 5-9 years, whereas in age group 10-17 years, both CP and SI/OD groups performed less than TD group in WalCT. The CP group also performed less CBT scores than TD indicating difficulties both with topographical as well as with visuo-spatial working memory.

HEALTH RELATED QUALITY OF LIFE IN SLOVENIAN CHILDREN AND ADOLESCENTS WITH CEREBRAL PALSY
A. Radsel¹, D.N. Osredkar¹, D. Neubauer², M. Jekovec Vrhovsek²
¹University Medical Centre Ljubljana, LJUBLJANA, Slovenia
²University Medical Centre Ljubljana, Children’s Hospital Ljubljana, LJUBLJANA, Slovenia

Introduction
In view of the integrated therapeutic approach for children with life-long disabilities such as cerebral palsy (CP) the aspect of Health related quality of life (HRQoL) is increasingly gaining importance and has been recognized as a useful tool for planning therapeutic interventions. The presented study examined HRQoL of children and adolescents with cerebral palsy and identified factors associated with it.

Patients and Methods
Families of 122 children and adolescents with CP were addressed to fill out the proxy-versions of HRQoL questionnaires (DISABKIDS generic and CP module). Children and adolescents without cognitive deficit were asked to fill out the self-report versions. The results were analyzed according to various clinical and socio-demographic data and factors negatively associated with HRQoL have been identified.

Results
Ninety-one families of 43 children and 48 adolescents completed proxy-reports. Fortyeight individuals were able to self-report. HRQoL was perceived as good. Self-reporting participants scored their HRQoL higher than their caregivers. Adolescents scored lower than children in all domains. Higher age, pain and disturbed sleep were strong predictors of worse HRQoL. Social Inclusion and Independence domains received the lowest scores. DISABKIDS questionnaires proved to be good tools for HRQoL assessment in children with CP.

Conclusion
HRQoL of Slovenian children and adolescents with CP is good, with Social Inclusion and Independence being the weakest domains. Children report higher scores than adolescents or their caretakers. Pain and disturbed sleep were the strongest predictors of poor HRQoL and need to be actively addressed and treated in individuals with CP.
Sensory processing issues associated with adaptive behaviour and participation of a child with Bardet-Biedl syndrome: a case study
S. Kars, S. Kars, M. Huri, H. Kayihan
Hacettepe University, ANKARA, Turkey

Introduction: Bardet-Biedl syndrome (BBS) is a rare autosomal recessive ciliopathy characterised by retinal dystrophy, learning difficulties, hypogonadism, obesity, post-axial polydactyly and renal dysfunction. The aim of the case report was to analyze the sensory processing patterns, adaptive behaviour, and participation to activities of daily living (ADL) in child with BBS. Patients and methods: A seven years old boy was included. Sensory Profile (SP) was used to analyze sensory processing patterns. AAMR Adaptive Behavior Scale (ABS) was applied to measure child’s adaptive behaviour and Pediatric Evaluation of Disability Inventory (PEDI) was used to evaluate child’s participation to ADL. Measurements were applied pre and post of 12-month (1 session/week) sensory integration based occupational therapy intervention programme. Results were compared with SPSS 17. Results: The child showed sensory processing patterns and adaptive behaviour problems with participation restriction to ADL (p ≤ 0.05). According to statistical analysis of pre and post test results, the child showed significant development in sensory processing patterns (p ≤ 0.05) and adaptive behaviour (p ≤ 0.05) which may effect the child’s participation to ADL, positively (p ≤ 0.05). Conclusion: This study provides initial evidence that children with BBS may present clear differences in sensory processing patterns which may affect child’s adaptive behaviour and participation to ADLs. Sensory integration based occupational therapy intervention programmes can be added to individual treatment plan of children with BBS to increase adaptive behaviour and participation to ADL.

PP-088
Poster presentation
Poster session 1 - timeslot 4

Screening and multidisciplinary treatment for children with a physical disability having continence problems during day and night
T. van Oosten, M.C. van Vliet, K. Nieuwenhuis, T. Westendorp, I. van der Ham
Rijndam Rehabilitation, ROTTERDAM, The Netherlands

Introduction
Toilet training for children with a physical disability is challenging. It is known that they have more problems in bladder control, and have a higher incidence of obstruction than peers without disabilities. Although, incidence is high, many of these problems are not noticed. The aim of this project is to develop a screening procedure and multidisciplinary treatment for children with a physical disability and continence problems.

Patients and methods
To deal with the continence problems of children with a physical disability a new multidisciplinary team is composed. This team consists of a rehabilitation physician, a pediatric physiotherapist specialized in continence problems, a continence nurse, a psychologist, and an occupational therapist. A screening procedure and a specific multidisciplinary treatment are developed. This outpatient treatment method is called HIPPER.

Results
Between September 2015 and August 2016 30 children attended the screening. The average age was 8.8 years and 55% were boys. Seven of these were referred to another medical specialist after screening, the other 23 started the treatment program. So far seven children completed the treatment program. These 7 children had 18 treatment goals. 67% of these goals were accomplished after treatment. Parents gave an 8.3 as average score for satisfaction with treatment.

Conclusions
The HIPPER provides support and guidance for children with physical disabilities and continence problems and their parents. Before the HIPPER-screening and treatment these problems were often not observed According to the results most treatment goals are achieved and the parents are very satisfied with the given treatment.

PP-089
Poster presentation
Poster session 1 - timeslot 1

Care givers priority and their perspective on health related quality of life in children with cerebral palsy undergoing conventional versus intensive rehabilitation
J.S. Rajkumar, D. Sharan, R. Balakrishnan, S. Tiwari
RECOUP Neuromusculoskeletal Rehabilitation Centre, BANGALORE, India

INTRODUCTION
The aim of this study is to compare the caregivers’ priority and their perspective on the health status, comfort, wellbeing, functional abilities and ease of care giving in children with cerebral palsy (CWCP) undergoing conventional rehabilitation (CR) and post single event multilevel surgery intensive rehabilitation (PSIR).
METHODS
A cross-sectional survey was conducted with the CPCHILD (Caregiver Priorities and Child Health Index of Life with Disabilities) questionnaire among the primary caregivers (n = 80) of CWCP aged between 2-19 years. Group A (44 caregivers) included CWCP who received PSIR for more than 2 hours per day. Group B (36 caregivers) received CR for 2 hours per day. Other data like demographics of the caregiver and child, hours of care giving and GMFCS levels were also collected.

RESULTS
The mean CPCHILD total scores for Group A were 22.0, 38.2, 23.0, 44.5, and 59.3 respectively and were statistically significant (p<0.01) compared to Group B. Moving about indoors (72%), standing for exercise or transfers (83%) and visiting public places (40%) were perceived as the top 3 priority by the caregivers in group A. Comfort during transfers or position changes (82%), toileting activities or hygiene (76%) and transferring into or out of wheel chair or car (58%) were perceived as the top 3 priority by the caregivers in group B.

CONCLUSION
The caregivers' priorities and perspectives on the health status, functional limitations, and well-being of children with CP undergoing PSIR were more positive and encouraging to achieve the goals.

PP-090
Poster presentation
Poster session 1 - timeslot 2

Professionals' views on good practices to enhance children's participation and human agency
N. Vänskä1, S. Sipari1, K. Pollari2
1University of Helsinki, VANTAA, Finland
2Metropolia University of Applied Sciences, HELSINKI, Finland

Introduction: The purpose of this study was to describe professional's views on existing and needed good practices that strengthen the participation and human agency of children with disabilities. Patients and methods: Data collection was carried out by two focus group interviews (a±2h). Each group included professionals multidisciplinary. Participants (total n=16) were physiotherapists (8), occupational therapists (6) and speech therapists (2) from children's rehabilitation firms and central hospital in Finland. The tape-recorded data was transcribed verbalism and analysed with inductive content analysis. Results: Professionals viewed that good practices to enhance child's participation and agency included four elements: 1) child's individual support, 2) supporting smooth daily life of the family, 3) influencing on the factors in child's daily environment and 4) building a collaboration and co-agency between child, family, professionals and other important persons in child's life. Professionals needed expertise to master these elements. To strengthen child's participation in rehabilitation planning together with adults professionals identified the need for child-centred attitudes, strength-based dialog and proactive tools and practices that help the child and family to prepare themselves before the joint meetings. Conclusion: The findings demonstrate that good rehabilitation practices that are considered to strengthen child's participation and agency, are based on the strong collaboration between child, family, professionals and the persons from child's daily environment. There is a lack of flexible, child-specific and shared practices that enable child's active participation in this collaboration. The key outcome of rehabilitation should be child's meaningful participation and active agency in his/her everyday life situations.

PP-091
Poster presentation
Poster session 1 - timeslot 3

Implementation of PEDI-CAT in the Netherlands: an inventory of support, barriers and facilitators
M.F. Engel1, M. Ketelaar2, P. Research Group1
1De Hoogstraat Rehabilitation, UMC Utrecht, UTRECHT, The Netherlands
2De Hoogstraat Rehabilitation, UTRECHT, The Netherlands

Introduction: In the Netherlands, the process of translation and validation of the PEDI-CAT is ongoing. Implementation in clinical practice is next step thereafter. Implementation strategies are ideally preceded by a proper analysis of barriers to and facilitators of implementation. The aim of the present study is to gain insight in view of pediatric rehabilitation specialists on the usefulness and implementation of the PEDI-CAT. Patients and methods: Using the contact list of the Dutch association of pediatric rehabilitation physicians, we sent a questionnaire through e-mail and two reminder e-mails. This is an ongoing process, the preliminary results are described here. Results: Of the 140 physicians addressed, 41 (29%) responded, of which 7 refused to participate due to various reasons. The remaining 34 respondents (working in 22 different institutions) were uniformly positive about the contents and applicability of the PEDI-CAT and would apply the instrument in daily practice. However, only 8 (24%) of them are convinced it might be an adequate indicator to use in the evaluation of the pediatric rehabilitation process. Specific diagnostic groups were mentioned for which it might not be an adequate measure (e.g. progressive disorders, DCD, chronic pain). Frequently reported barriers to implementation were: costs, lack of time and lack of added value.
Facilitating factors that were mentioned: implementation in the electronic patients file, user functional software and user friendliness of the contents. Conclusion: Dutch pediatric rehabilitation physicians are positive on the usefulness of the PEDI-CAT. However, different barriers to its implementation are foreseen.

PP-092
Poster presentation
Poster session 1 - timeslot 4

Neurovisual assessment in children with ataxia telangiectasia
J. Galli†, A. Iodice*, A. Molinaro*, A.F. Franzoni†, S. Micheli*, L. Pinelli*, A. Plebani†, A. Soresina†, E. Fazzi‡
†University of Brescia; ASST Civili Hospital of Brescia, BRESCIA, Italy
‡ASST Civili Hospital, BRESCIA, Italy

Introduction: to describe visual disorders, specifically oculomotor impairment, in a sample of children with Ataxia-Telangiectasia (AT).

Patients and methods: 15 AT patients (mean age 12 years and 4 months) underwent neurovisual evaluation, particularly focused on oculomotor functions (fixation, smooth pursuit, saccades and abnormal ocular movements). We compared the visual profile thus obtained with that described using the International Cooperative Ataxia Rating Scale (ICARS) subscale of oculomotor dysfunction.

Results: Refractive errors were seen in 8 patients and strabismus in 3. Major oculomotor findings were: fixation abnormalities (6/15), saccadic impairment (15/15), abnormal smooth pursuit (14/15). Abnormal ocular movements were seen in 13/15 (saccadic intrusion in 8 and nystagmus in 5). Using ICARS scale, 13/15 children presented gaze-evoked nystagmus, 4/15 a clearly saccadic pursuit and 11/15 dysmetria of saccades.

Conclusion: we propose a clinical neurovisual evaluation which seems to reflect the oculomotor involvement in pediatric AT patients better than ICARS score. We strongly recommend the empowerment of visual functions to slow–down progressive global disability of these patients.

PP-093
Poster presentation
Poster session 1 - timeslot 1

Can we propose a foot amputation to a child to improve its participation?
CHRU Brest, BREST, France

Introduction
When a child is victim of a severe limb trauma, the general rule is to preserve the limb as much as possible. However in some rare cases secondary amputation can be a solution to improve function and participation. There is no description of such an approach in the pediatric literature while it is a clinical challenge to manage with such a decision. We report the history of a 13yo boy for whom the question of a secondary transtibial amputation was raised.

Patients and method
A 13 yo boy was victim of a left foot crash and foot salvage was decided. Despite intensive physiotherapy and posture, an equinus and intense neuropathic foot pain appears. 17 months after trauma, the boy presents a painful, non-functional and ulcerative foot with important impact on gait and participation. After two multidisciplinary consultations, the boy and his parents decided a left transtibial amputation. A specific multidisciplinary preparation of 3 months was carried out: meeting with amputees, psychologist, prosthetist, pediatric surgeon and PMR. This process led to confirm the family decision and a left transtibial amputation followed by an intensive rehabilitation program was carried out 20 month after the trauma.

Results
1 year after amputation he has no pain, practices several sports and has a typical teenager life without restrictions of participation assessed by motion analysis and standardized scale.

Conclusion
Amputation can be a step towards a better participation even in childhood. From this case report, some clinical advices can be established.

PP-094
Poster presentation
Poster session 1 - timeslot 2

Assessing participation and fitness in the field: Lessons from a feasibility study in children with
Summer camps are an increasingly used strategy for skills development with children with disability. The purpose of
barriers and facilitators
Poster session 1
Poster presentation
2

Introduction

'Starkick' is an all Abilities Australian Rules football program for children with disability. Operating with the simple
mantra, “if you want to play we will find a way”, it aims to promote inclusion and equality in sports participation for children
with disabilities. This study aimed to assess the feasibility of field measures of participation, enjoyment and
physical skills and to quantify the benefits of involvement for children and their families.

Patients and methods

Consent and data were obtained for 13 children with disabilities (1 female) aged between 5 – 12 years from the 42
who registered for the program. Data were collected during training sessions over two weeks. Validated measures
included participation (participation and environment measure in children and youth - pemcy), enjoyment (physical
activity and enjoyment scale - paces), and self-perception (self-perception profile for children - sppc), anaerobic
and aerobic fitness and agility.

Results

Participation frequency and involvement decreased from the home, to school and community environments (pemcy
frequency medians: Home=76%, range 39-97; School=64%, range 29-80; Community=50%, range 30-54). Level of
enjoyment was high (paces median=4.28, range 3.0-5.0). SPPC score of athletic competence was low
(median=2.7, range 1.7-3.5), but global self-worth was high (median= 3.5, range 3.0-4.0). Measures of anaerobic
and aerobic fitness and agility were collected during training with no interruption to games.

Conclusion

Questionnaires and field measures were feasible methods of determining the benefits to participants of 'Starkick'.
This preliminary data obtained to guide future planning for intervention and research suggests targeting physical
competence and school and community participation.

The studying of children with autism for correlation between changes in their fine motor functioning and
speech

T. Voloshyn¹, I. Kozyavkin²
¹ICR, TRUSKAVETS, Ukraine
²International Clinic of Rehabilitation, TRUSKAVETS, Ukraine

In half of the patients with ASD gross motor function impairments are observed, indicators of fine motor functions are
below average rates. Amount of ASD children suffering motor discoordination and dyspraxia according to different
studies is up to 85 percent.

The aim of the study was inspection of correlation between formation of fine motor functioning and level of speech
function development. 87 patients diagnosed ‘child autism’ (F84.0) were randomized, aged from 4 to 16 years, 69%
of them- male. Divided into three age groups- 4 to 8, 8 to 12 and 12 to 16.

Reliable correlation was noticed between improvements in fine motor function according to tests "Box and Block"
and "9-hole peg" (p<0.01), between dynamometry measurements and indicators of forementioned tests mild
correlation observed (p>0.05).

Also positive correlation dependency observed between improvements by results of tests “Box and Block”, “9-hole
peg” and speech development (p<0.05). Most meaningful changes happened in children aged up to 8 years what
indicates different rehabilitation resource for different age groups and necessity of restorative treatment onset for
activation of mechanisms of neuroplasticity as early as possible. Results of the study give evidence on interrelation
of fine motor function and speech, importance of integrated approach for rehabilitation of children with autism,
necessity of influence on mental and speech development as well as on motor sphere, fine motorics in particular.
New perspectives unveiled for studying of autism that can be useful for search of optimal complex rehabilitation
approach for these patients.

Barriers and facilitators in a skills training program for children with Cerebral Palsy in a summer day camp

J.J.M. Alvalrehão¹, S. Oliveira¹, A.F. Santos², A. Gomes², A. Miranda², E. Salazar², S. Montenegro²
¹Aveiro University, AVEIRO, Portugal
²Associação do Porto de Paralisia Cerebral, PORTO, Portugal

Summer camps are an increasingly used strategy for skills development with children with disability. The purpose of
neurolsinability

S.A. Williams¹, N. Gibson², L. Jensen¹
¹Curtin University, PERTH, Australia
²Ability Centre, PERTH, Australia

Introduction

J.J.M. Alvalrehão

Barriers and Facilitators

Poster session 1

Poster presentation

2

Also positive correlation dependency observed between improvements by results of tests "Box and Block"
and "9-hole peg" (p<0.01), between dynamometry measurements and indicators of forementioned tests mild
correlation observed (p>0.05).

Also positive correlation dependency observed between improvements by results of tests “Box and Block”, “9-hole
peg” and speech development (p<0.05). Most meaningful changes happened in children aged up to 8 years what
indicates different rehabilitation resource for different age groups and necessity of restorative treatment onset for
activation of mechanisms of neuroplasticity as early as possible. Results of the study give evidence on interrelation
of fine motor function and speech, importance of integrated approach for rehabilitation of children with autism,
necessity of influence on mental and speech development as well as on motor sphere, fine motorics in particular.
New perspectives unveiled for studying of autism that can be useful for search of optimal complex rehabilitation
approach for these patients.

Barriers and Facilitators in a skills training program for children with Cerebral Palsy in a summer day camp

J.J.M. Alvalrehão¹, S. Oliveira¹, A.F. Santos², A. Gomes², A. Miranda², E. Salazar², S. Montenegro²
¹Aveiro University, AVEIRO, Portugal
²Associação do Porto de Paralisia Cerebral, PORTO, Portugal

Summer camps are an increasingly used strategy for skills development with children with disability. The purpose of

neurolsinability

S.A. Williams¹, N. Gibson², L. Jensen¹
¹Curtin University, PERTH, Australia
²Ability Centre, PERTH, Australia

Introduction

J.J.M. Alvalrehão

Barriers and Facilitators

Poster session 1

Poster presentation

2

Also positive correlation dependency observed between improvements by results of tests "Box and Block"
and "9-hole peg" (p<0.01), between dynamometry measurements and indicators of forementioned tests mild
correlation observed (p>0.05).

Also positive correlation dependency observed between improvements by results of tests “Box and Block”, “9-hole
peg” and speech development (p<0.05). Most meaningful changes happened in children aged up to 8 years what
indicates different rehabilitation resource for different age groups and necessity of restorative treatment onset for
activation of mechanisms of neuroplasticity as early as possible. Results of the study give evidence on interrelation
of fine motor function and speech, importance of integrated approach for rehabilitation of children with autism,
necessity of influence on mental and speech development as well as on motor sphere, fine motorics in particular.
New perspectives unveiled for studying of autism that can be useful for search of optimal complex rehabilitation
approach for these patients.

Barriers and Facilitators in a skills training program for children with Cerebral Palsy in a summer day camp

J.J.M. Alvalrehão¹, S. Oliveira¹, A.F. Santos², A. Gomes², A. Miranda², E. Salazar², S. Montenegro²
¹Aveiro University, AVEIRO, Portugal
²Associação do Porto de Paralisia Cerebral, PORTO, Portugal

Summer camps are an increasingly used strategy for skills development with children with disability. The purpose of

neurolsinability

S.A. Williams¹, N. Gibson², L. Jensen¹
¹Curtin University, PERTH, Australia
²Ability Centre, PERTH, Australia

Introduction

J.J.M. Alvalrehão

Barriers and Facilitators

Poster session 1

Poster presentation

2

Also positive correlation dependency observed between improvements by results of tests "Box and Block"
and "9-hole peg" (p<0.01), between dynamometry measurements and indicators of forementioned tests mild
correlation observed (p>0.05).

Also positive correlation dependency observed between improvements by results of tests “Box and Block”, “9-hole
peg” and speech development (p<0.05). Most meaningful changes happened in children aged up to 8 years what
indicates different rehabilitation resource for different age groups and necessity of restorative treatment onset for
activation of mechanisms of neuroplasticity as early as possible. Results of the study give evidence on interrelation
of fine motor function and speech, importance of integrated approach for rehabilitation of children with autism,
necessity of influence on mental and speech development as well as on motor sphere, fine motorics in particular.
New perspectives unveiled for studying of autism that can be useful for search of optimal complex rehabilitation
approach for these patients.

Barriers and Facilitators in a skills training program for children with Cerebral Palsy in a summer day camp

J.J.M. Alvalrehão¹, S. Oliveira¹, A.F. Santos², A. Gomes², A. Miranda², E. Salazar², S. Montenegro²
¹Aveiro University, AVEIRO, Portugal
²Associação do Porto de Paralisia Cerebral, PORTO, Portugal

Summer camps are an increasingly used strategy for skills development with children with disability. The purpose of

neurolsinability

S.A. Williams¹, N. Gibson², L. Jensen¹
¹Curtin University, PERTH, Australia
²Ability Centre, PERTH, Australia

Introduction

J.J.M. Alvalrehão

Barriers and Facilitators

Poster session 1

Poster presentation

2

Also positive correlation dependency observed between improvements by results of tests "Box and Block"
and "9-hole peg" (p<0.01), between dynamometry measurements and indicators of forementioned tests mild
correlation observed (p>0.05).

Also positive correlation dependency observed between improvements by results of tests “Box and Block”, “9-hole
peg” and speech development (p<0.05). Most meaningful changes happened in children aged up to 8 years what
indicates different rehabilitation resource for different age groups and necessity of restorative treatment onset for
activation of mechanisms of neuroplasticity as early as possible. Results of the study give evidence on interrelation
of fine motor function and speech, importance of integrated approach for rehabilitation of children with autism,
necessity of influence on mental and speech development as well as on motor sphere, fine motorics in particular.
New perspectives unveiled for studying of autism that can be useful for search of optimal complex rehabilitation
approach for these patients.

Barriers and Facilitators in a skills training program for children with Cerebral Palsy in a summer day camp

J.J.M. Alvalrehão¹, S. Oliveira¹, A.F. Santos², A. Gomes², A. Miranda², E. Salazar², S. Montenegro²
¹Aveiro University, AVEIRO, Portugal
²Associação do Porto de Paralisia Cerebral, PORTO, Portugal

Summer camps are an increasingly used strategy for skills development with children with disability. The purpose of

neurolsinability

S.A. Williams¹, N. Gibson², L. Jensen¹
¹Curtin University, PERTH, Australia
²Ability Centre, PERTH, Australia

Introduction

J.J.M. Alvalrehão

Barriers and Facilitators

Poster session 1

Poster presentation

2

Also positive correlation dependency observed between improvements by results of tests "Box and Block"
and "9-hole peg" (p<0.01), between dynamometry measurements and indicators of forementioned tests mild
correlation observed (p>0.05).

Also positive correlation dependency observed between improvements by results of tests “Box and Block”, “9-hole
peg” and speech development (p<0.05). Most meaningful changes happened in children aged up to 8 years what
indicates different rehabilitation resource for different age groups and necessity of restorative treatment onset for
activation of mechanisms of neuroplasticity as early as possible. Results of the study give evidence on interrelation
of fine motor function and speech, importance of integrated approach for rehabilitation of children with autism,
necessity of influence on mental and speech development as well as on motor sphere, fine motorics in particular.
New perspectives unveiled for studying of autism that can be useful for search of optimal complex rehabilitation
approach for these patients.
this work was to examine the barriers and facilitators for the performance of four typical daily activities in a summer camp.

Eight children (six boys) with cerebral palsy aged between 7-12 years old, five classified in GMFCS level I, with mild cognitive impairment, held for five days (10h-16h) diversified occupations with goals defined according to ICF. Preparing a simple meal, dressing, washing hands and telling a day event were performed everyday by all participants. Assessment included PEM-CY and assistance to accomplish the activities was classified in a six grade scale (no assistance, indirect oral clues, gestures, direct oral clues, direct support, substitution).

A total of 14 barriers (57% physical requests, 21% architectural barriers, 14% social demands, 8% cognitive demands) and 21 facilitators (attitudes of peers and formal careers) were identified. Most of the activities were performed without assistance (57%), but direct support was used in 19% and direct oral clues in 12% of the tasks. Social and cognitive demands were associated with communication activities while physical requests and architectural barriers with self-care activities. Direct oral clues were mostly used in communication activities. These programs allow children with Cerebral Palsy develop independence and autonomy skills and are an opportunity for increase the interaction with peers. Careful planning of these activities could diminish the number of environmental hindrances improving the experience of peer’s relationships.

**PP-099**
Poster presentation
Poster session 1 - timeslot 3

**Visual profile and cognitive visual dysfunctions in high functioning cerebral palsy**
J. Galli1, S. Micheletti2, A.F. Franzon2, L. Pansera4, L. Pinelli5, E. Fazzi6
1University of Brescia; ASST Civil Hospital of Brescia, BRESCIA, Italy
2ASST Spedali Civili of Brescia, BRESCIA, Italy
3ASST Civil Hospital, BRESCIA, Italy
4University of Brescia, BRESCIA, Italy
5ASST Spedali Civili, University of Brescia, BRESCIA, Italy

**Introduction:** spastic cerebral palsy is often associated to visual disorders, which directly threaten daily life functions and assume a relevant role, especially at school age. The aims of this study are both to investigate the correlation between neurovisual (ophthalmologic, oculomotor, perceptual) and visuocognitive features of a sample of school-age children affected by high-functioning CP and to determine which aspects of the overall neurovisual profile best characterise cognitive visual dysfunctions (CVDs). **Patients and methods:** thirty-one patients with CP and normal intelligence quotient (IQ) or mild cognitive impairment (15 females, 16 males; mean age 8 y 7 mo; range 6-11 y) underwent an assessment protocol which included neurological examination, cognitive assessment, evaluation of neurovisual and visuocognitive abilities. **Results:** ophthalmological and oculomotor abnormalities were present in 29 patients, CVDs in 20, while perceptual abilities in 12. Neurovisual and visuocognitive dysfunctions were more frequent in bilateral CP and in those with significant differences between higher verbal IQ and lower performance IQ. Fundus oculi anomalies, abnormal visual fixation, discontinuous smooth pursuit and reduced visual acuity were related to CVDs. **Conclusion:** neurovisual and visuocognitive dysfunctions are frequent symptoms also in higher functioning CP. The detection of CVDs can be guaranteed from the first years of life and is important to manage early tailored habilitative programs.

**PP-100**
Poster presentation
Poster session 1 - timeslot 4

**The experience of play for 6-12 year olds with high levels of physical disability due to Cerebral Palsy: An Interpretative Phenomenological Analysis**
N.E. Graham, A. Mandy, C. Clarke
University of Brighton, EASTBOURNE, United Kingdom

**Introduction** Children with disabilities are often described to be less able to participate in play than their typically developing peers. However, for this group of children play will look different. This study aimed to understand the experience of play from the perspective of children with high levels of physical disability. **Patients and methods** Six children functioning at GMFCS IV/V, MACS III/IV/V, and CFCS-III participated within three semi-structured interviews discussing their experience of play. Within the interviews children referred to a video of themselves playing which was taken at the start of the session. The use of visual methods such as the video, showing of toys, and drawing, allowed a greater depth of discussion. Interviews were videoed and transcribed, they were analysed using Interpretative Phenomenological Analysis. **Results** Interpretative themes were explored as a result of the children's interviews. Children do experience play in several ways that differ from their typically developing peers. Children experienced autonomy and were able to play independently when they had the support of adaptive equipment and carers. Children described participating in play as a chance to experience freedom and control through the suspension of reality; this was sometimes through playing characters who did not have CP or were superheroes.
Conclusion: The findings of this study provide an insight into the experience of play for children with severe CP. This is important for all health professionals working with this population in order that their ability to participate within play is recognized and promoted.

PP-101
Poster presentation
Poster session 1 - timeslot 1

Development of daily activities in children with cerebral palsy: factors for change in the performance of self-care, mobility and social functioning
M.J. de Leeuw1, B. Spek2, S. Verschure1, I. van der Ham1, T. Westendorp1
1Rijndam Rehabilitation, ROTTERDAM, The Netherlands
2University of Amsterdam, AMSTERDAM, The Netherlands

Introduction
Children with cerebral palsy (CP) experience various problems in performing daily activities. These children have limitations related to self-care, mobility and social functioning. Knowing factors that influence the change in performing on these domains, might influence the choice of treatment for children with CP.

The objective of this study is to identify factors for the changing performance of daily activities in children with CP.

Patients and methods
This study is a retrospective cohort study focusing on the development of an explanatory prognostic model, using the subscales of the Dutch version of the Pediatric Evaluation of Disability Inventory (PEDI-NL) as outcome measurement. All 150 to 200 participants in this study are patients diagnosed with CP (range: 4-7.5 years). The participants were treated by a multidisciplinary rehabilitation team during the period September 2014 - July 2016 at one of the locations of Rijndam Rehabilitation.

Results
This study started in September 2016 and the results will be available in the first quarter of 2017. In order to answer the research question, potential factors are selected after a literature search and following expert opinions. Examples of potential factors that are included in the analysis are age, gender, laterality of CP, classification levels (GMFCS, MACS, CFCS), ethnicity and level of education.

Conclusions
The results can be useful for professionals to choose appropriate treatment goals, taking into account the factors for change in performing everyday activities. This study can also be valuable for children with CP and their parents to set realistic goals and expectations.

PP-102
Poster presentation
Poster session 1 - timeslot 2

The coolest I know - a qualitative interview study of children with disabilities’ experiences of participation in adapted physical activities
A.J. Nyquist1, R.B. Johansen1, A.M. Ullenhag2
1Beitostølen Healthsport Center, BEITOSTØLEN, Norway
2Målardalen högskola & Beitostølen Healthsports Center, BEITOSTØLEN, Norway

Introduction:
Participation in physical activities has many health and well-being benefits and is an important goal for children and their families. To enable meaningful participation, one must understand what experiences children have when participating.

The aim was to get deeper understanding of how children 10-13 years old with disabilities experience participation in physical activities during a rehabilitation stay, using adapted physical activity and peer learning as main ingredients of intervention. Further aim was to explore how new skills and experiences gained from intensive rehabilitation can be transferred into meaningful participation with peers in local environment at home.

Patients and methods:
The results can be useful for professionals to choose appropriate treatment goals, taking into account the factors for change in performing everyday activities. This study can also be valuable for children with CP and their parents to set realistic goals and expectations.

Results:
Four main themes were derived from the interviews; “to learn and to teach new activities”, “belonging, solidarity and friendship”, “activity and participation enjoyment” and “participation on my own terms”. To get opportunities to try and to learn new physical activities in an intensive rehabilitation period seemed to be essential for transferring meaningful participation to the local environment, and were related to concepts such as activity competence, preferences and self-efficacy.

Conclusions:
The rehabilitation stay created a setting where children explored and learned a diversity of physical activities together with equal peers which embedded to friendship and a feeling of happiness and where the children could participate on their own terms.

Effect of Neurodevelopmental Therapy and Kinesiological Taping on Walking and Balance Parameters for Di George Syndrome: A Case Report

E. Kavlak, A. Ünal, F. Tekin, A. Al Sakkaf
Pamukkale University, DENIZLI, Turkey

Introduction: Di George Syndrome (DGS) is a congenital disease that is seen about one in every 4,000 live-births. Clinically, symptoms of the disease show a marked variability from patient to patient and also it is seen a typical facial expression (micrognathia, low-set ears, short philtrum) as well as frequent congenital heart defects, hypoparathyroidism and recurrent severe infections. General prophylactic treatment principles are applied for patients with combined T and B-cell deficiency. There is no specific physical therapy procedures for this syndrome. Symptomatic treatment is carried out according to common disorders.

Patient and Methods: 3.5 year-old girl with walking and balance disorders was admitted to Pediatric Rehabilitation Unit. Observational gait analysis, static and dynamic balance assessment was performed. 1 hour a day, 3 days a week using Neurodevelopmental Therapy (NDT) and clinical kinesiology taping by using correction were applied technique to lower extremities. Evaluations were repeated after 6 months.

Results: It was seen drop on medial longitudinal arch and calcaneovalgus for right foot, and also internal rotation and decreasing of stance-phase duration on right lower extremity, in pre-treatment assessment. Static and dynamic balance were “good” on sitting and crawling position, while “bad” for standing position. In post-treatment assessment, decreased internal rotation of the lower limbs and increased the duration for stance phase were found, while walking. Static and dynamic balance during standing was found “good”.

Conclusion: A patient-DGS with walking and balance problems has benefited from NDT and kinesiology tape. It is important to begin physiotherapy earlier, for these types of cases.

Effectiveness of Neurodevelopmental Treatment (Bobath Concept) on Postural Control and Balance in Cerebral Palsied Children

F. Tekin, E. Kavlak, U. Cavlak, F. Altug
Pamukkale University, DENIZLI, Turkey

Introduction: The aim of this study was to show the effects of an 8-week Neurodevelopmental Treatment (NDT) on postural control and balance in diparetic or hemiparetic Cerebral Palsied children (CPC).

Patient and Methods: 15 CPC (aged 5-15 yrs) were included in this study. All participants recruited from Denizli Yağmur Çocuklar Special Education and Rehabilitation Center. The Gross Motor Function Classification System and the Gross Motor Function Measure were used to evaluate the CPC. Balance ability was assessed using by a 1 Min. Walking Test (1MWT), Modified Timed Up and Go Test, and Pediatric Balance Scale. Functional Independence Measure for Children (WeeFIM) was used to evaluate the independence in terms of daily living activities of the CPC. Postural control was assessed using by Seated Postural Control Measure (SPCM). An 8-week NDT based intensive postural control and balance training was applied to the CPC in one session (60 min.) 2 days in a week. All participants were evaluated twice (before and after the treatment program).

Results: After the treatment program, all participants showed statistically significant improvements in terms of gross motor function (p<0,01). They also showed statistically significant improvements about 1MWT, MTUGT, PBS, and WeeFIM (p<0,01). SPCM-Alignment and SPCM-Function scores increased after the treatment program compared to before treatment (p<0,01).

Discussion: The results obtained from this study indicate that an 8-week NDT based intensive postural control and balance training is an effective approach in order to improve functional motor level and functional independency improving postural control and balance diparetic or hemiparetic CPC.

Participation at long term after Selective Dorsal Rhizotomy
**Introduction:** Research has shown that selective dorsal rhizotomy (SDR) has positive effects on gross motor function on short and long term. The long-term effects of SDR on participation, pain and fatigue, and the relation between these outcomes, are still mainly unknown.

**Patients and methods:** 18 adolescents/young adults with CP (age 16-25 years; 13 males), who had a SDR at least five years ago, participated in this study. Participation was assessed by using Life Habits 3.0; pain was assessed by the Brief Pain Inventory. For fatigue both the Checklist Individual Strength-20 and the Fatigue Severity Scale were used. The percentage of adolescents that experienced restrictions in participation in was calculated, and relations between participation and pain fatigue were examined.

**Results:** Median age of the participants was 21 years; Gross Motor Function Classification System (GMFCS)-levels were I (n=4), II (n=5) and III (n=9). For the total score of participation 70.6% of the participants encountered difficulties. For activities in daily life and social roles respectively 58.8% and 64.7% encountered difficulties. Least restrictions were experienced in communication, responsibility and interpersonal relationships. Most scores differed significantly between adolescents/young adults in GMFCS I/II and in GMFCS III. No significant correlations were found between participation and pain (p >0.05) or participation and fatigue (p >0.05).

**Conclusion:** A majority of the adolescents/young adults with CP who underwent SDR at least five years ago encountered difficulties in participation, especially in mobility and recreation, which was influenced by GMFCS-level. No relation was found between participation and pain and fatigue.

**PP-106**

Poster presentation
Poster session 1 - timeslot 2

**Correlation Between Hand Functions and Activities of Daily Living in Children with Cerebral Palsy**

E. Kavlak, F. Tekin, A. Ünal, H.A. Kavlak

1Pamukkale University, DENIZLI, Turkey
2Yagmur Çocuklari Special Education Center, DENIZLI, Turkey

**Introduction:** Aim of this study was investigating the correlation between hand function and activities of daily living in children with cerebral palsy.

**Patient and Methods:** 15 diparetic or hemiparetic cerebral palsied children whose GMFCS Level I, II or III were included the study. The subjects’ were being treated by Bobath Concept. We used Manual Ability Classification System (MACS) for assessing hand functions and Functional Independence Measure for Children (WeeFIM) for assessing independence in daily living activities.

**Results:** Subjects’ mean age was 120.4±31.69 months. According to MACS 7 subjects were both in Level I and II, and 1 subject was in Level III. According to GMFCS 3 subjects were in Level I, 8 subjects were in Level II, and 4 subjects were in Level III. Mean WeeFIM total point was 112.06±13.34. Results of correlation analysis showed that there was a statistically significant negative strong correlation between GMFCS and WeeFIM scores, and negative weak correlation (r=-0.286) between MACS and WeeFIM.

**Conclusion:** There was a strong correlation between gross motor function skills and activities of daily living in children with cerebral palsy. There was a moderate correlation between hand functions and gross motor function skills, and a weak correlation between hand functions and independence in activities of daily living.

**PP-107**

Poster presentation
Poster session 1 - timeslot 3

**Clinical research of the improvement of muscular tension in spastic cerebral palsy treated with the quintuplet therapy of chinese medicine**

H. Wang

Xi’an TCM hospital of encephalopathy, XIAN, China

【Abstract】Objective To observe the clinical curative effect of quintuplet therapy of Chinese medicine on the improvement of muscle tension in patients with spastic cerebral palsy. Methods 158 children with spastic cerebral palsy were randomly divided into treatment group (n = 79) and control group (n = 79). The control group was treated with Bobath therapy. The treatment group was treated with Bobath therapy and quintuplet therapy of Chinese medicine (oral Chinese herbs, acupuncture, massage therapy, medicated bath with Chinese herbs, acupoint catgut embedding). Before treatment and in 1st, 2nd and 3rd months after treatment, used the modified Ashworh scale to evaluate the standard of muscular tension. The MAS grade was transformed into score, named 1 grade was equal to 1 score, 1 + grade was to 1.5 scores, 2 grade was to 2 scores, 3 grade was to 3 scores and 4 grade was to 4 scores. The efficacy was observed, the score difference ≥1 score before and after treatment was taken as
Results 3 months after the treatment in the treatment group, 72 cases were effective, 7 cases had no effect, the effective rate was 91.14%; in the control group, 57 cases were effective, 7 cases had no effect, the effective rate was 72.15%, presenting the statistical significant difference (P < 0.05). Conclusion The quintuplet therapy of Chinese medicine is obviously effective in reducing the muscular tension in spastic cerebral palsy.

Understanding Frames: A UK survey of parents and professionals regarding the use of standing frames for children with cerebral palsy

J. Cadwgan¹, J. Goodwin², A. Colver¹, A.P. Basu¹, S. Crombie³, D. Howel¹, J. Parr¹, E. McColl¹, N. Kolehmainen¹, A. Roberts¹
¹Newcastle University, NEWCASTLE UPON TYNE, United Kingdom
²University of Newcastle, NEWCASTLE UPON TYNE, United Kingdom
³Sussex Community NHS Foundation Trust, SUSSEX, United Kingdom
⁴Robert Jones and Agnes Hunt Orthopaedic and District Hospital, OSWESTRY, United Kingdom

Introduction
Standing frames are widely recommended for children with cerebral palsy (CP). They have been proposed to improve body structure and function, activity, and participation but there is limited evidence that they do. This study aimed to identify current UK standing frame practice for children with CP and to understand professional and parental views about the benefits and challenges associated with standing frames.

Patients and Methods
Three samples of participants completed questionnaires: clinicians who prescribe standing frames (n=305); professionals (health and education) who work with children with CP who use standing frames (n=155); parents of a child with CP who has used a standing frame (n=91).

Results
Respondents were committed to using standing frames, although some reported concerns regarding the lack of evidence and potential harm. Perceived benefits of standing frames included improving body structure and function such as reducing the risk of hip subluxation, improving bladder/bowel function; improving activity such as motor abilities; and improving participation such as interaction with peers. Factors such as physical space and child-reported pain were challenges. Prescribing practice regarding frequency and duration is consistent across the UK. However, achieving the prescribed use is not always possible.

Conclusion
This survey reports UK standing frame practice. It provides information on perceived benefits and challenges to use, and prescribing clinicians, other professionals and parental engagement in the practice. This information is essential to inform the design of trials of the effectiveness of standing frame use in the postural management of children with CP.

Eating and Drinking Ability Classification System in a population-based sample of preschool children with cerebral palsy

K.A. Benfer¹, K.A. Weir², K.L. Bell¹, R.S. Ware², P.S.W. Davies¹, R.N. Boyd¹
¹The University of Queensland, SOUTH BRISBANE, Australia
²Griffith University, GOLD COAST, Australia

Introduction: To determine (i) the reproducibility of the Eating and Drinking Ability Classification System (EDACS); (ii) the proportion of children classified to each EDACS level in a population-based cohort of children with cerebral palsy (CP); (iii) the relationships between the EDACS and direct clinical mealtime evaluation, other classification systems and health outcomes.

Patients and methods: Cross-sectional population-based cohort study of 170 children diagnosed with CP at 36-60 months (mean=57.6 months (SD 8.3), 105 males). Functional abilities of children with CP were representative of a population sample (GMFCS I=74, II=34, III=21, IV=18, V=23). The EDACS was used as the primary classification of functional mealtime performance, rated from a single videoed mealtime. The Dysphagia Disorders Survey was used as a direct clinical assessment of feeding. Gross motor function was classified using the Gross Motor Function Classification System (GMFCS).

Results: 88.3% intra-rater agreement (kappa=0.84, p<0.001; ICC=0.95, p<0.001) and 51.7% inter-rater agreement
(kappa=0.36, p<0.001; ICC=0.79, p<0.001) on the EDACS classification. 56.5% of children were classified as EDACS I, with the remainder distributed approximately equally across other levels. There was a strong stepwise relationship between Dysphagia Disorders Survey and EDACS (r=0.96, p<0.001). Parent stress (OR=1.3, p=0.05) and feeding tubes (OR=6.4, p<0.001) were significantly related to EDACS, whereas undernutrition and respiratory conditions were not. Conclusion: The EDACS presents as a viable adjunct to clinical assessment of feeding skills in children with CP for use in surveillance trials and clinical practice. A rating addendum would be a useful contribution to the tool development to enhance reproducibility.

PP-111
Poster presentation
Poster session 1 - timeslot 3

Contextual information in the diagnostic assessment for autism spectrum disorder in pre-school children
A.E. O’Hare¹, L. Bremner², H. Souchon³, S. Tuck⁴, S. Kattera¹
¹Salvesen Mindroom Centre, University of Edinburgh, EDINBURGH, United Kingdom
²Queen Margaret University, EDINBURGH, United Kingdom
³University of Edinburgh, EDINBURGH, United Kingdom

Introduction Specialist diagnostic assessment for Autism Spectrum Disorder (ASD) should include wider contextual information but across Scotland it contributes the largest variation in waiting time for diagnosis. The aim of this study was to examine its role in early years educational settings.

Patients and Methods A randomised sample of pre-school children in whom contextual information gathered from home and school through standardised questionnaire (Gilliam Autism Rating Scale). Receiver Operating Characteristic (ROC) analysis included sensitivities and specificities at autism probability cut points, the area under the ROC curve (AUC) and 95% confidence intervals.

Results Only 4 nursery questionnaires were not returned. Parent/carer questionnaire had good agreement with the final diagnosis (AUC 0.81 95% CI 0.66, 0.96); nursery agreement was less robust (AUC 0.54 95% CI 0.25, 0.83).

Conclusions Nursery compliance was excellent. Parent/carer contextual questionnaire returns had good agreement with the final diagnosis of ASD but nurseries less so. Escalating the diagnostic process should be considered when there is a discrepancy between the parent/carer questionnaire report and the rest of the clinical assessment. Direct observation of nursery behaviour, or specialised clinical observation with the Autism Diagnostic Observation Schedule, should be considered.

PP-112
Poster presentation
Poster session 1 - timeslot 4

Effectiveness of pre programmed touch screen smart tablet gaming for the improvement of fine motor skills among children with cerebral palsy
D. Sharan, J.S. Rajkumar, R. Balakrishnan, M. Nagaiah
RECOUP Neuromusculoskeletal Rehabilitation Centre, BANGALORE, India

INTRODUCTION
Virtual games are reported to encourage physical and cognitive development in children. Recent developments like touch screen hand held device can provide a playful, motivating tool for training the impaired upper extremity in children with cerebral palsy (CWCP).

PATIENTS AND METHODS
This study investigated the effectiveness of pre programmed touch screen smart tablet gaming device (STGD) as a therapeutic intervention on fine motor skills in CWCP. The STGD utilised android based game applications on a touch screen based input method for use with the affected hand. 50 children with CP aged between 4 to 15 years were randomly divided into two groups. Group A (n=25) received the STGD along with the conventional hand function training (CHFT) and Group B (n=25) received only CHFT. All participants received 1 hour of CHFT and children in Group A played a set of 5 games (from 10 game choices) in the touch screen supervised by caregivers for a minimum of 60 minutes a day, 6 times a week for 6 weeks. Box and block test (BBT), Nine-hole peg test (NHP) and House functional classification (HFC) were the primary outcome measures. Other data like demographics of the participants, clinical measures, activity log and game statistics were also collected.

RESULTS
Group A showed significant difference in the scores of BBT (p<0.01), NHP (p<0.01) and HFC (P<0.05) compared to group B.

CONCLUSION
Pre-programmed touch screen gaming therapy can be included in the hand function rehabilitation programme in children with cerebral palsy to improve fine motor activities.
**COCP in the classroom: Effects of training and coaching teachers on equal participation in groups**

M.J.M. Heim¹, E. Brinkman², V.M. Jonker², A.M. Veen³

¹Kohnstamm Instituut UvA, AMSTERDAM, The Netherlands
²Heliomare Rehabilitation, WIJK AAN ZEE, The Netherlands

**Introduction**

COCP (Communicative Development of nonspeaking Children and their Communication Partners) in the classroom is a short training and coaching programme for teachers and teacher assistants to teach them ten different strategies to encourage equal participation of both speaking children and children who use Augmented and Alternative Communication (AAC) during group activities in the classroom. The effects of the training programme on (1) the teachers and teacher assistants, (2) the group interactions, and (3) the students’ participation, are being investigated in six toddler groups.

**Patients and methods**

Around 40 children with multiple disabilities participate in the study which adopted a multiple baseline design across groups with eight measurements (video observations) in each group. The dependent variables are (1) the application of the COCP strategies by the teachers and teacher assistants, (2) the quality of the group interactions, and (3) the level of participation of each individual student.

Three instruments are being used to analyse the video observation data: (1) coding of the ten teacher strategies with a seven point Likert scale, (2) assessment of the quality of the group interactions with the Classroom Assessment Scoring System (CLASS), and (3) coding of the level of participation of each child as passive, involved, active or equal.

**Results and Conclusion**

In this presentation we will present some preliminary results and conclusions regarding the effects of the training and coaching according to COCP in the classroom. The results will have important implications for the future use of AAC in educational settings.

**Effect of de-rotational straps on alignment, balance and gait in children with cerebral palsy post single event multi level surgery**

D. Sharan, J.S. Rajkumar, R. Balakrishnan

RECOUP Neuromusculoskeletal Rehabilitation Centre, BANGALORE, India

**INTRODUCTION**

Children with cerebral palsy (CWCP) sometimes walk with in-toed gait after single event multilevel surgery, leading to improper balance and risk of fall. De-rotational straps are a new and innovative option to correct the in-toed gait.

**PATIENTS AND METHODS**

A prospective experimental study was conducted among 60 CWCP who underwent Single Event Multilevel Lever Arm Restoration and Anti Spasticity Surgery (SEMLARASS), which included femoral and/or tibial rotational osteotomies, and were in-toeing due to dynamic factors (i.e., not due to bony torsion). The purpose was to study the effects of de-rotational straps on alignment, balance and gait. The CWCP were randomly assigned to 2 groups: Group A (n= 30) received balance training with de-rotational straps and Group B (n=30) received only balance training. Study duration was 5 weeks with 1 hour of intervention per day for 6 days per week. Paediatric Balance Scale (PBS), Dynamic Gait Index (DGI) and Physicians Rating Scale (PRS) were the primary outcome measures. Kinovea software was used to evaluate the lower extremity alignment. The measurements were performed at baseline, 5 weeks after the treatment and follow ups one month and 3 months later.

**RESULTS**

Group A showed significant improvement in the scores of PBS (p<0.05), DGI (p<0.05) and PRS (p<0.05) and lower extremity joint angle measurements (p<0.05) compared to Group B. These outcomes were maintained at 1 month and 3 months follow up.

**CONCLUSION**

Balance training with de-rotational straps can improve alignment, balance and gait in CWCP who in-toe after single event multilevel surgery.
Multidisciplinary behavioural feeding clinic - defining patient population, interventions and measuring outcomes
C. Edwards, V.B. Kelly, L. Spicer, A. dr Shipton
Guy's & St Thomas’ NHS Foundation Trust, LONDON, United Kingdom

Introduction:
The Behavioural Feeding Clinic is a multi-disciplinary National and Specialist service. We reviewed the clinical characteristics of the patients who attended and intervention received. Patients and Methods:
Records collected routinely were reviewed for the period of May 2015-2016. This includes diagnoses, age, gender, severity of the feeding problem and parental distress levels. An intervention was defined as a discrete piece of clinical work targeted at one area of difficulty; this data was collected from electronic patient databases. The descriptives of the data are presented as well univariate analyses of relationships between demographics and interventions received. Results: There were 123 appointments in the behavioural feeding clinic in this time, 76% of these were new patients. The age of patients was 3-16 yrs; the majority (85%) were male and had an autism diagnosis (54%). 22% of patients had a single appointment for assessment and therapy recommendations. All children received initial input from different disciplines at initial assessment. Thereafter the clinical need dictated input. Most of the children received 1-2 interventions sessions. Majority of intervention work is with the carer (36%) with a large proportion also involving liaison with local services (28%) and schools (22%). Clinicians most commonly provide interventions through phone calls (63%) but nearly a fifth (19%) of families received some intervention face-to-face.
Conclusions:
We defined the clinical characteristics of the children referred, the types of intervention delivered and professionals involved. We also identified the severity of the feeding problems of the children at initial presentation.

PP-116
Poster presentation
Poster session 1 - timeslot 4

Quality of Life in Children with Intellectual Disabilities and Comorbid Mental Health Health Problems
M. Nasr Farid, H. Azamm, R. El Fiky, O. El Shourbagy
Ain Shams University, CAIRO, Egypt

Introduction: There has been a growing interest in the quality of life (QoL) in the field of intellectual/developmental disabilities.Objective: To assess comorbidity of mental health problems (MHPs) in intellectual disability (ID) children and to evaluate their impact on the QoL of ID studied subjects. Patients and Methods: 30 mild-moderate ID children aged 5-10 years, with co-morbid MHPs were matched with ID children without MHPs, from outpatients clinics of Ain Shams University, Cairo, Egypt. All consenting participants’ IQs were estimated, their present mental status were screened adopting DSM-5 criteria, and use of CBCL, SDQ, and equipped with PedsQL for their current quality of life. Results: co-morbid mental disorders were seen in 86.7% of ID study individuals, most commonly as ADHD, mood disorders, ASD, anxiety disorders, and impulse control/conduct disorders in 23.3%, 16.7%, 13.3%, 13.3%, and 10% respectively. Co-morbid mental problems were recorded in 93.3%, described as being aggressive (26.7%), disruptive (23.3%), and socially-relating (20%). Aggressive behavior was commoner in boys, moderate degrees of ID, presence of co-morbid mental disorders, and seizures. Such MHPs were mediators of poor QoL of ID children. QoL had no difference between both groups in physical well-being, psychological and behavioral problems on top of intellectual development, but displayed significantly inadequate emotional well-being, social inclusion and interpersonal relations. Conclusion: co-morbid mental disorders, psychological and behavioral problems on top of intellectual disabilities have negative impacts on wellbeing of these individuals.

PP-117
Poster presentation
Poster session 1 - timeslot 1

An executive function in children and adolescents: delis rating executive function’s (D-REF) Turkish version, validity and reliability
G. Akyurek, G. Bumin
Hacettepe University, ANKARA, Turkey

Introduction: Children/adolescents with dyslexia (C/AwD) are at risk for deficits in aspects of executive function (EF) (1-6). The primary aim of this investigation was to measure and compare EF in different age groups of children/adolescents with dyslexia (n=206) and controls (n=152, age=8-17 years). Furthermore this study was to translate the Delis Rating Executive Functions (D-REF) into Turkish language and to evaluate the validity and reliability of the Turkish version of D-REF. Patients and methods: The DREF was culturally adapted using the internationally suggested method(7). Subjects were children/adolescents with dyslexia (n=206, 109 girls) between the ages 8-17 (12.2±3.5) who referred by a
physiatrist were recruited from the clinic of psychiatry at Ankara University Medical School Cebeci Hospital. They completed the Delis Rating Executive Functions (D-REF) and Behavior Rating Inventory of Executive Function (BRIEF) teacher and parent forms that contained items under consideration for inclusion in desired scales.

Results: The findings indicate that the D-REF is a reliable and valid tool for examining children and adolescent’s executive functions, focusing specifically on metacognitive manifestations of EF. Fit indices of the model supported the factor structure (p<0.05). Children and adolescent with dyslexia is associated with worse EF outcomes (p<0.05).

Conclusion: These findings suggest that the D-REF may be a useful tool to assess children and adolescent with EF deficits, and may be possible to identify risks early and provide individualized supports to promote optimal neurodevelopment.

PP-118
Poster presentation
Poster session 1 - timeslot 2

Sleep in children with cerebral palsy: a cross sectional-study
C. Imms¹, L. Timmers², C. Kerr³, M. Randall¹, A. Harvey⁴, D. Reddihough⁴, I. Novak⁵, P. Karlsson⁶, H. Smithers-Sheedy⁶, N. Shields⁶
¹Australian Catholic University, FITZROY, Australia
²Radboud University Medical Center, NIJMEGEN, The Netherlands
³Queen's University Belfast, BELFAST, United Kingdom
⁴Murdoch Children's Research Institute, MELBOURNE, Australia
⁵Cerebral Palsy Alliance, The University of Sydney, SYDNEY, Australia
⁶La Trobe University, BUNDOORA, Australia

Introduction
Disturbed sleep in children impacts behaviour, well-being, cognitive tasks, quality of life and the wider family. Higher rates of sleep disturbances are reported in children with cerebral palsy (CP) than in the general population. This study investigated (1) prevalence and nature of sleep disturbances, (2) their clinical correlates and (3) use of sleep interventions in children with CP.

Patients and methods
Children with CP, aged 3-18 years, attending five disability services organisations in Australia were invited to participate in a larger study that implemented routine clinical assessment procedures. The Sleep Disturbance Scale for Children (SDSC) was completed by parents of 420/846 eligible children. Additional clinical information was collected by allied health professionals. The child's pain was reported by parents.

Results
SDSC scores indicated a serious sleep disturbance in 24% of children (99/420). A further 81 children were 'at risk' for serious sleep disturbances. Excessive somnolence was the most common disturbance in children aged 3-5 years (50/209, 24%), whereas in older children (6-18 years) initiating and maintaining sleep was most problematic (62/211, 29%). Small significant associations (p<0.01) were found between SDSC scores and aspects of pain
(r=0.25-0.34). Weak associations (p=0.02) were noted between SDSC scores and Manual Ability Classification System (r=0.13), skin pressure (r=0.11) and visual impairment (r=0.14). The most commonly reported sleep interventions were an initial discussion, referral to a sleep clinic and equipment prescription.

Conclusion
The sleep quality of children with CP should be routinely assessed to identify if intervention is required, particularly when pain is also reported.

PP-119
Poster presentation
Poster session 1 - timeslot 3

Parenting stress and psychological well-being among parents of children with functional disabilities at early school age
E. Domellöf¹, B. Falck², M. Ternert³
¹Umeå University, UMEA, Sweden
²Västerbotten County Council, SKELLEFTEÅ, Sweden
³Stockholm County Council, STOCKHOLM, Sweden

Introduction
Parents of preschool-aged children with functional disabilities generally state increased parenting stress and psychological distress compared with parents of typically developing peers. Few studies have explored whether this difference persists among parents of children at early school age. This study investigated parenting stress and psychological well-being in parents of children at 7-12 years with disabilities in northern Sweden, compared with parents of children without disabilities.

Patients and methods
Participants consisted of 128 parents of children with functional disabilities (autism, intellectual disability or motor impairment) and 213 control parents. All participants completed two self-report questionnaires: Strengths and Stresses in Parenthood, a Swedish adapted version of the Family Impact Questionnaire, as a measure of parenting
stress and parental resources, and the Hospital Anxiety and Depression Scale, Swedish version, as a measure of psychological well-being.

**Results**

Parents of children with disabilities, autism in particular, reported significantly higher levels of parenting stress, increased risk for mental illness, and decreased psychological well-being compared with control parents. Measures of stress and well-being were strongly, negatively correlated in all groups, with the strongest associations found in parents of children with disabilities.

**Conclusion**

Findings suggest that in families of children with disabilities at early school age, factors such as social life, economy and partner relation are negatively affected and may create parenting stress and reduced psychological well-being. Increased attention to symptoms of anxiety and depression among parents of school-aged children with functional disabilities should be given.

PP-120

Poster presentation
Poster session 1 - timeslot 4

"Some semblance of normal"? A qualitative study of parents’ experiences of paediatric stroke

C. Mckevitt¹, A.L. Gordon², M. Topor³, A. Panton⁴, V. Ganesan⁵, A. Mallick⁶, E. Wraige⁶

¹King’s College Hospital NHS Foundation Trust, LONDON, United Kingdom
²Evelina London Children’s Hospital, LONDON, United Kingdom
³University of Surrey, GUILDFORD, United Kingdom
⁴The Stroke Association, LONDON, United Kingdom
⁵Great Ormond Street Hospital for Children NHS Foundation Trust, LONDON, United Kingdom
⁶Bristol Royal Hospital for Children, BRISTOL, United Kingdom

**Introduction**

Paediatric stroke is an important cause of mortality and disability but research in this area is relatively undeveloped. There are no published studies of patient and family experiences and needs in this population. This information is required to inform the development of appropriate services.

**Patients and methods**

Parents of children with haemorrhagic or ischaemic stroke were recruited from three regional specialist services in England. Semi-structured interviews using a topic guide aimed to explore parents' experiences. Interviews were conducted with 12 parents whose children had been diagnosed with stroke < 1 year, 1-5 years and > 5 years before. Interviews lasted between 1-2 hours; they were audio-recorded and fully transcribed for thematic analysis.

**Results**

Parents reported a wide range of consequences for their children, beyond those identified in the literature. They were satisfied with specialist acute care but less satisfied with primary/community, citing low professional awareness of paediatric stroke, and difficulties accessing services. Parents reported a wide range of information needs that were variably met. The impact on parents and families was considerable, including financial problems and consequences for health and well-being. Existing social networks were a supportive resource for some. Contact with other families experiencing childhood stroke was beneficial.

**Conclusion**

The experiences and types of unmet needs participants reported are not dissimilar to those identified by family carers of adults with stroke, and by parents of children with other long-term conditions. Strategies to address these needs should be developed in collaboration with children with stroke and their families.

PP-121

Poster presentation
Poster session 1 - timeslot 1

Effectiveness of play groups in early intervention

A. Validzik Pozgaj, M. Konkoli Zdesic

Day care centre Mali dom Zagreb, ZAGREB, Croatia

The birth of a premature child or a child with neuromuscular disorder and initiation of parenthood inevitably leads to a certain amount of change and stress in the lives of parents. The child's difficulties multiply affect the family. A parent under stress need: time, support, patience, a sense that others understand and that others want to help (Profaca, 2013). There is strong, consistent evidence in the research literature over the past 30 years that relationship-based intervention approaches are effective in increasing parents' responsiveness toward their children and improving the social, emotional, and communication outcomes in children with developmental challenges (MacDonald, 2004).

In order to determine the effects of play groups on parental stress, competence and responsivity we created sample of eight families that were not included in the program of early intervention but were included in preventive programm. Eight weekly individual parent-child sessions focused on helping parents use responsive teaching
strategies to encourage pivotal behaviors in their children. Results indicated that parents made significant changes in their style of interacting with their children and felt more competent in their parenting role.

Parents are faced with challenges in everyday activities trying to balance between child’s needs, work and partner roles. Empowering parental confidence and competence through a process of education and counseling is one way in which the child’s well-being is achieved by in the process of early intervention. Well-organized early intervention is family oriented, empowering parents in their parenting role.

PP-122
Poster presentation
Poster session 1 - timeslot 2

Developing a Paediatric Day Rehabilitation Service - Our journey so far
J.A. Hancock, M. dr Waugh, J. Macey, S. Price
The Childrens’ Hospital at Westmead, WESTMEAD, Australia

Introduction The aim of this project was to develop a Paediatric Day Rehabilitation Program that was feasible and acceptable to families and the NSW health care system.

Patients and methods Literature review of models of day rehabilitation and consultation with other day rehabilitation service providers was conducted. Staff within the Children’s Hospital at Westmead and families were consulted about their experiences and ideas for future day rehabilitation programs. A model of a Day Rehabilitation Program was implemented in 2016. Suitable patients with acquired neurological injury/ illness aged 0-16 years who would benefit from intensive rehabilitation were identified from current inpatient and outpatient services. Enrolled patients attended the hospital 3-5 days each week for intensive rehabilitation. Feedback interviews were conducted with parents of patients, surveys conducted with staff and costings analysed.

Results 75% of families consulted (n=37) felt their child could have benefited from day rehabilitation. To date 7 patients have participated in the program, with 4 scheduled in the immediate future. Consultations with all families, with involved rehabilitation staff and other consumers have further informed the specific components and modifications to the Day Rehabilitation Program. The program has been redefined and is being implemented, with positive clinical and process outcomes.

Conclusion Factors have been identified factors which need to be considered in the ongoing refinement of a Day Rehabilitation Program. The project has also highlighted the processes that are imperative in designing a service that meets the needs of families. Findings from the model currently being implemented will be discussed.

PP-123
Poster presentation
Poster session 1 - timeslot 3

A semi-structured interview with caregivers of children with CP using the components of ICF-CY core sets: a biopsychosocial framework
M. Maganti1, A. Battacharya2, S. Rao3, A. Dey1, B. Taparia1, S. Thiraviyaraj1, R. Shroff1, J. Chakraborty2
1Ashoka University, SONEPAT, India
2Apollo Gleneagles Hospital, KOLKATA, India
3National Institute for the Empowerment of Persons with Intellectual Disabilities, SECUNDERABAD, India

The perspectives of caregivers are integral for adopting a biopsychosocial approach emphasized by the International Classification of Functioning, Disability and Health (ICF). Keeping in view the Indian context, we wanted to investigate how the components from ICF-CY core sets can be used to trace the caregivers’ perspectives on functionality in children with CP. Specifically, we wanted to explore and understand how contextual and caregiving factors are crucial for understanding the implications and use of ICF-CY core sets in India.

The five components of the Vancouver validated ICF-CY core sets were used to generate open-ended interview questions based on eight broad areas. The participant pool comprised of caregivers attending clinical services at the National Institute for the Mentally Handicapped, New Delhi, India. We audio-taped semi-structured interviews with 3 caregivers of children with CP aged 4, 6 & 13 years.

From the qualitative analysis of three transcribed interviews the caregivers discussed issues related to environmental constraints, lack of facilities that limited the child’s functioning. Two of the caregivers had inadequate knowledge of child’s diagnosis. They expressed concern about child’s mobility and limitations in activities of daily living and restricted body functions. The caregivers’ perceptions and attitudes determined quality of care and opportunities provided to the child.

Caregivers can bring unique perspectives related to identifying context-specific environmental constraints and barriers that can restrict the functional abilities of the child. Identifying environmental barriers and documenting the child - environment interactions are critical for wider application of biopsychosocial framework emphasized by the ICF-CY core sets.
A change from Compliance to Adherence - Implementation of the principles of ‘Psychomotorik I’B’P’ in physiotherapy with children with CP

M. Zgorski-Lätsch, Y.M. Schneider-van Bragt, A. Jungo, A. Thijs, R.I. Hassink
Z.E.N. Biel, BIEL/BIENNE, Switzerland

Introduction
In therapy we use a paternalistic concept of compliance. A change towards a concept with active co-operation between patient and health professionals is needed. The didactic principles of “Psychomotorik I’B’P” are a practical tool to implement the theory in practice. It can realize the needed steps towards adherence.

Aim: Can adherence be improved by the didactic principles of “Psychomotorik I’B’P”?

Methods
First Step: Creating a leaflet of possible didactic principles in different clinical settings. We trained our physiotherapy team to implement these principles using experienced based results in daily work and studies.
Second Step: Submitting a questionnaire to evaluate the state of implementation, the impact of the principles of “Psychomotorik I’B’P” on the subjective perception of parents and child. This relates to adherence and to the success of motor learning.
Participants: 20 parents of ambulatory children (aged 1 - 10 years) diagnosed with CP, obtaining regular physiotherapy at the C.D.N.
Approach: Questionnaire with 21 Items concerning the didactic principles, the effect of motor learning, the effects on motivation, wants and needs and propositions from the parents.

Results
First evaluation shows that we achieved to implement most of the principles. It shows clear evidence of a positive effect on both the adherence and motor learning.

Conclusion
The didactic principles of “Psychomotorik I’B’P” seem to be successful tools to achieve adherence in physiotherapy. Next steps are to interview both children with CP (up to 18 years) and their parents as well as children with other diagnosis (muscular dystrophy, Trisomy 21 etc.).

Development of the VOST (Therapy-related Parental Stress Questionnaire; Vragenlijst Ouderlijke Stress als gevolg van Therapie van het kind)

L.W.M.E. Beckers1, J.J.W. van der Burg2, Y.J.M. Janssen-Potten3
1Maastricht University, MAASTRICHT, The Netherlands
2St. Maartenskliniek, NIJMEGEN, The Netherlands
3Adelante Centre of Expertise in Rehabilitation and Audiology, HOENSBROEK, The Netherlands

Introduction
Nowadays, parents of children with disabilities get a more active role in their child’s therapy. Although this is a positive development, the altered role may affect their psychosocial well-being and possibly increases parental stress. Consequently, adherence to treatment protocols may be at risk and treatment outcomes may be affected. This particular type of parental stress cannot be measured by the available instruments. The aim of this project was to develop a questionnaire to measure therapy-related parental stress.

Patients and methods
The construct of interest was explored by a focus group of parents of children with a disability and a remedial educationalist. The topics that resulted from the focus group discussion were used to develop a questionnaire. This questionnaire was pilot-tested in a small sample of parents regarding comprehensibility and applicability, by a digital survey.

Results
The project resulted in the VOST, which is a questionnaire consisting of 40 possible factors through which parents can perceive stress, divided over six domains. Parents are asked to select those factors that are applicable to themselves. For overall therapy-related parental stress, as well as for each domain separately, parents are asked to rate the amount of stress in the past two weeks on a Visual Analogue Scale (VAS). Eventually, parents rate which three factors have led to the most stress.

Conclusion
The VOST makes it possible to measure therapy-related parental stress in clinical practice and for research purposes. Further research will focus on its psychometric properties.
Innovation in habilitation - developing a new model for cross sectorial and interdisciplinary habilitation for children with Cerebral Palsy (CP)
P. de Liphay Behrend, H. Larsen, J. Jensen
Elsass Institute, CHARLOTTENLUND, Denmark

Introduction: This presentation is a part of the project; Encircle the family – Target the child. The project is a cross sectorial and interdisciplinary project with the aim to increase the quality in habilitation of children with CP 0-8 years of age. There is a gap between the knowledge we have as professionals concerning habilitation and what we do. Elsass Institute found a need to develop a new model, that focus on an early, well-coordinated and family centered intervention. Patients and methods: 415 interdisciplinary professionals and 63 families with children with CP participated. In this presentation we focus on the professionals’ outcomes. The methods used was participatory innovation in combination with Relational coordination to create better coordination, and action learning in the process of translating science into practice. The evaluating method was a combination of quantitative baseline questionnaire, qualitative interviews and study of literature on the field. Results: Many different subjects were evaluated. The following areas were highlighted: 74 % of the professionals got increased knowledge about CP; 60 % experienced that the project enhanced the quality in their habilitation with children with CP; 43 % experienced increased communication with other interdisciplinary professionals; 41 % experienced increased collaboration with the families. Conclusion: The use of the model enhances cross sectional and interdisciplinary habilitation and helps professionals in the process of applying new knowledge and interdisciplinary coordination into practice.

Healthy Parent Carers Programme: testing feasibility of a novel group-based intervention to improve the health and wellbeing of parents of disabled children
A. Borek¹, B. Mcdonald¹, M. Fredlund¹, S. Logan¹, C. Morris²
¹University of Exeter, EXETER, United Kingdom
²University of Exeter Medical School, EXETER, United Kingdom

Introduction: Parents of disabled children have increased risk of physical and psychological health problems and lower quality of life. Typically they prioritise their children’s health over their own, face specific barriers to health, and find standard public health advice inadequate.

Patients and Methods: We used Intervention Mapping to design the Healthy Parent Carers programme. The peer-led group-based intervention aims to improve health and wellbeing by developing knowledge and skills, tailoring behaviour change strategies, and empowering parent carers to make lifestyle changes. Parent carers were involved in all stages of identifying the issues, defining intervention objectives, and designing intervention components. A feasibility study was conducted to assess acceptability, adoption and implementation of the programme. Data were collected using standardised questionnaires (PHQ-9, EQ-5D, Warwick-Edinburgh Mental Well-being Scale) at baseline, end of programme and eight weeks after. Participants’ feedback was sought through feedback forms after each session and at the end of the programme; a focus group was held one week after the end of the programme.

Results: Seven parent carers participated in six weekly half-day sessions; all participants completed the programme, at most missing only one session. Qualitative feedback and the measures of health and wellbeing supported acceptability of the intervention and anecdotal benefits.

Conclusions: Involvement of intended users guided the research and intervention design, with a positive impact on those involved as partners with the researchers. The programme is feasible to deliver, acceptable and valued by the participants, and results suggest the intervention has the potential to improve health and wellbeing.

SURVEYING THE CHILDHOOD DISABILITY RESEARCH LANDSCAPE: BUMPS IN THE ROAD SEPARATE RESEARCHERS FROM PATIENTS
M.J. Purser, P. Rosenbaum
McMaster Children’s Hospital, CAMBRIDGE, Canada

INTRODUCTION: The International Classification of Functioning, Disability and Health (ICF) provides a framework for health-related domains, based on which research themes offered at meetings may be sorted. Families of children with disabilities tend to emphasize a focus on participation and activity, but do these views correlate with current
research topics? Systematic details of the current landscape of childhood disability research are largely unknown, with minimal literature available to describe the distribution of research across ICF themes, or the geographical origins of the work.

**PATIENTS AND METHODS:** All 776 abstracts submitted to the 28th European Academy of Childhood Disability (EACD) conference were reviewed and organized based on the ICF theme(s) reflected within the abstract. Internal quality control was performed according to expert opinion. Country of origin and patient age were also recorded. **RESULTS:** The ICF themes of the abstracts were categorized as follows: 35% centered on body structure and function, 26% on activity, 27% on environmental factors, 4% on personal factors, 4% on participation, 1% on future, 3% on other topics. **CONCLUSION:** There appears to be a discrepancy between the interests of childhood disability researchers and patients/families with the conditions of interest. Childhood disability research currently focuses predominantly on body structure and function, while patients and their families may value other ICF domains more. Further surveillance is needed to examine how common themes in childhood disability research will trend over time, and specifically whether these themes will better reflect the interests of patients and their families.

**PP-129**
Poster presentation
Poster session 1 - timeslot 1

The WWW-roadmap: Parents’ experiences with an online tool to guide their search for information and to prepare them for consultation with rehabilitation professionals.
M.W. Alsem¹, K. van Meeteren¹, R.C. Siebes², M. Verhoef³, J.M.A. Meily-Visser¹, M. Jongmans³, M. Ketelaar¹
¹De Hoogstraat Rehabilitation, UTRECHT, The Netherlands
²De Hoogstraat Rehabilitation, UMC Utrecht, UTRECHT, The Netherlands
³Utrecht University, UTRECHT, The Netherlands

**Introduction**
For parents of children with physical disabilities gathering information and preparing for the consultation with a rehabilitation professional are important requirements for the process of empowerment. Parents who are better informed are better able to support each other and become partners in negotiating care and supporting their child’s participation. Previous research shows that parents have difficulties formulating questions and finding information. Together with parents we designed a digital tool, the WWW-roadmap that aims to enable parents to explore their needs, help in their search for information, and refer to appropriate professionals. The objective of the current study is to describe experiences of parents with the tool.

**Patients and Methods**
Eleven parents of children with physical disabilities aged 1-11 years used the WWW-roadmap and were interviewed about their experiences with the tool.

**Results**
All parents were very positive about the WWW-roadmap. Parents underline the need for a simple and easy-to-use information tool like the WWW-roadmap: “I wished I had a tool like this years ago”. Presenting possible questions, information and sources for answers is appreciated by parents. The tool is considered feasible for use, especially during moments of transition and important decisions.

**Conclusion**
The WWW-roadmap seems a feasible tool to empower parents. Professionals should consider providing parents with the WWW-roadmap in order to help them thinking up questions and guide their search for information. Further effects on parental empowerment and on the consultation with rehabilitation professionals are under study in a large cohort study, and results are expected Spring 2017.

**PP-130**
Poster presentation
Poster session 1 - timeslot 2

The Unmet Needs of Paediatric Stroke Survivors
A.L. Gordon¹, L. Nguyen², A. Panton³, A. Mallick⁴, V. Ganesan⁵, E. Wraige¹, C. Mckevitt²
¹Evelina London Children's Hospital, LONDON, United Kingdom
²King's College Hospital NHS Foundation Trust, LONDON, United Kingdom
³The Stroke Association, LONDON, United Kingdom
⁴Bristol Royal Hospital for Children, BRISTOL, United Kingdom
⁵Great Ormond Street Hospital for Children NHS Foundation Trust, LONDON, United Kingdom

**Background:** Paediatric stroke has the potential for long term impact on the lives of children and their families. Child-centred intervention depends on understanding of needs. Little however is known about the support and care needs of this population. This study aimed to describe needs (met and unmet) in daily life of paediatric stroke survivors and their families and compare these findings with previously reported unmet needs of adult stroke survivors.

**Patients & Methods:** The survey was conducted with parents of children who had an ischaemic or haemorrhagic
Enteral feeding and its impact on family mealtime routines for caregivers of children with cerebral palsy: A mixed method study.

M. Russell
Creighton University, OMAHA, United States of America

**Introduction.** Enteral feedings have become part of the daily mealtime experience for many caregivers of children with cerebral palsy. The purpose of this study is to provide practitioners with better understanding of the impact enteral feedings of children with cerebral palsy have on family mealtime routines.

**Methods.** Using a mixed method triangulation design, data was obtained through an online survey that contained the Satisfaction Questionnaire with Gastrostomy Feeding (SAGA-8) and supplementary questions, and semi-structured phone interviews. Participants were caregivers of children with cerebral palsy who receive their primary nutrition through a gastrostomy tube.

**Results.** This study's cohort consisted of n=35 SAGA-8, and n=6 in-depth interviews. The mean age of children was 9.4 (6.94 SD) with a mean age of 3.4 (5.3SSD) when enteral feeding was introduced. While families’ overall situations positively changed after the gastronomy tube placement, environmental barriers and length of feeding time continued to present a challenge to mealtime routines. The mixed methods data analysis revealed that successful adjustment to having a child with a gastronomy tube and problem solving are closely linked and a consistent part of mealtime experience.

**Conclusion.** Findings highlighted the necessity of competent and comprehensive support from health professionals.
in achieving positive mealtime experience. Themes in the present study further indicated that caregivers benefit from a professional with knowledge in the development and integration of rituals and routines to support positive outcomes.

PP-133
Poster presentation
Poster session 1 - timeslot 1

The Impact of Learning the ICF-CY Framework as Clinical Reasoning Tool for Children with Cerebral Palsy
H. Demyati, P. Adair
University of Strathclyde, GLASGOW, United Kingdom

Cerebral Palsy (CP) is the most common motor disability in Saudi Arabia (SA). Learning how to use the International Classification of Functioning Disability and Health for Children and Youth (ICF-CY) model enables Paediatric Physiotherapists (PPTs) to consider environmental and personal factors in the management of a child with CP. Longitudinal quasi-experimental study, which examined the impact of attending two days of ICF-CY in-service training, which was developed for this study in SA. Phase 1 was conducted with PPTs (n=36) who attended the training, and used pre-and-post self-completion questionnaires to examine the impact on their clinical reasoning in the management of children with CP. In Phase 2, five months after the training, self-completion questionnaires were conducted to examine whether parents’ rating of their child’s physiotherapy differed between one group (n=40) where the child’s PPT had attended the training, and another group (n=40) where the PPTs had not attended. This study found a significant impact of ICF-CY training on PPTs’ factual, conceptual and procedural ICF knowledge, their decision-making process and on their intentions and attitudes to the application of environmental and personal factors in the management of a child with CP. However, a difference between the two groups of parents in their rating of the physiotherapy management of their children was not detected, with respect to the child’s physical impairment, physical activities, environmental and personal factors in physiotherapy management. These findings provide information on which to base future studies to investigate the possible effect of ICF-CY training on the quality of life.

PP-134
Poster presentation
Poster session 1 - timeslot 2

Cerebral Palsy in Moldova: subtypes, severity and associated impairments.
E. Gincota¹, G.L. Andersen², T. Vik³, R.B. Jahnsen⁴
¹Center of Early Intervention Voinicel, Akershus University College, CHISINAU, Moldova
²Vestfold Hospital Trust, TØNSBERG, Norway
³Children's and Women's Health, TRONDHEIM, Norway
⁴Oslo and Akershus University College, Faculty of Health Science, OSLO, Norway

Introduction
This is the first study on children with CP in Moldova, a pilot for a National Cerebral Palsy Register. The aim is to describe subtypes and severity of CP using the criteria of Surveillance of Cerebral Palsy in Europe (SCPE).

Patients and Methods: Children with CP born 2009-2010 were identified from the National Hospital Institute Mother and Child, where children from all over the country with neurological disabilities are referred. The findings were compared with a cohort of Norwegian children born 2009-2010 (N=234).

Results: In all, 207 children were identified; 22 had incomplete data, resulting in a study population of 185 children. Of these, 20% had spastic unilateral (Norway: 47%), 61% spastic bilateral (Norway: 43%), 12% dyskinetic (Norway: 5%). The proportions with ataxic and unclassified CP were similar in Moldova and Norway (5% and 2%, respectively). 23% of Moldovan children had severe vision and 5% severe hearing impairments (Norway: 5% and 2%, respectively), 50 % had active epilepsy (Norway: 21%) and 59% had intellectual disability (Norway: 22%).

Conclusion: Caution is required in the interpretation of the results, since we compare a hospital based population with a national based cohort. Our findings may still suggest that the causal pathways leading to CP are different in Moldova and Norway, and/or that in Moldova, children with milder symptoms of CP are less likely to receive specialist care. The findings may provide a basis for quality improvement of perinatal medicine as well as the care for children with CP.

PP-135
Poster presentation
Poster session 1 - timeslot 3

Prevalence and causes of cerebral palsy (CP) among children in rural Bangladesh - results from the Bangladesh CP Register (BCPR)
Conclusion: Our preliminary analysis shows that the burden of CP is high in Bangladesh. Many of the causes of CP may be preventable by interventions such as institutional delivery, improved perinatal and post-natal care.

PP-136
Poster presentation
Poster session 1 - timeslot 4

The status quo and perspectives of child cerebral palsy treated by traditional Chinese medicine in mainland China
H. Song
Xi'an TCM Hospital of Encephalopathy, XI'AN, China

Abstract
Objective: to discuss the advantage and deficiency of TCM therapy for cerebral palsy, and the application status in medical institutions of mainland China area. Methods: To analyze total of 208 medical institutions across the country and nearly six years to screen 679 literatures by clustering, measurement and frequency analysis, then we get the application and research status of TCM treatment and rehabilitation technology. Results: The proportion of public hospitals (89.9%) is more than private institutions (10.1%), but among them, only 5.9% have independent cerebral palsy rehabilitation center. Between the maternal and child care service centers only 4.3% set up independent cerebral palsy rehabilitation center, while 19.2% of children’s health care centers. 86.1% of medical institutions have put the technology of TCM into use, acupuncture and massage have been applied most widely. Conclusion: To strengthen the construction of cerebral palsy rehabilitation department, the combination of western and Chinese medicine technology, the combination of clinical and scientific research, to promote personnel training, to develop the new technology of TCM, we can achieve the early detection early intervention, early treatment of cerebral palsy, improve the life quality of the children.

PP-137
Poster presentation
Poster session 1 - timeslot 1

Comorbidities and Access to Health Care in a Canadian Cohort of Individuals with Down Syndrome.
O.S. Ipsiroglu1, N. Beyzaei1, D. Mckenna2, P. Hanbury2, M. Chan1, E. Tse1, M. Berger1, S.S. Stockler1
1University of British Columbia, VANCOUVER, Canada
2Down Syndrome Research Foundation, BURNABY, Canada

Introduction: Down syndrome (DS) is the most common congenital condition in Canada; however, an overview of access to healthcare is lacking. We conducted a survey to investigate access to healthcare and comorbidities in a Canadian population of individuals with DS to understand the main met/unmet needs.

Patients & Methods: An anonymous online REDCap survey for parents/caregivers of individuals with DS was conducted in 2015. The survey comprised 80 questions in 5 parts: (i) demographics, (ii) diagnoses, medications and supplements, (iii) development, (iv) sleep/wake-behaviours, and (v) feedback/testimonials.

Results: 349 responses were received. General practitioners and paediatricians were identified as the primary physician for 97% of individuals with DS. The most frequent comorbidities included: ophthalmic (141/46%); ENT & respiratory (124/40%); cardiovascular (109/35%); dermatological conditions (104/34%); endocrine (80/26%); diagnosed sleep problems (69/22%); gastrointestinal (64/21%); orthopaedic (57/18%); mental health conditions (40/13%); haematological (19/6%); and, immunological (17/6%).

Conclusion: Individuals with DS have multiple comorbidities that require specialized care. General practitioners and
paediatricians were identified as the primary health care provider by the majority of study respondents; this suggests that these physicians are integral. As these physicians are continuously confronted with changing guidelines, a standardized approach is needed for knowledge dissemination. We are developing a Down syndrome medical care app to standardize healthcare investigations and connect professionals across sub-specialities and multiprofessional teams.

PP-138
Poster presentation
Poster session 1 - timeslot 2

CP-Net: working together to improve quality of care!
L.B. Rehorst¹, M. Ketelaar², J. Voorman³, M. Klem⁴, M. Harmer-Bosgoed¹, J.G. Becher⁵
¹CP-Net, UTRECHT, The Netherlands
²De Hoogstraat Rehabilitation, UTRECHT, The Netherlands
³Merem - Rehabilitation Center De Trappenburg, ALMERE, The Netherlands
⁴BOSK, UTRECHT, The Netherlands
⁵VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands

Introduction
CP-Net is a network of service providers, persons with CP/parents and researchers, aiming to improve quality of care of people with CP. It is known that research evidence not ‘automatically’ transfers into clinical practice. In CP-Net, 20 rehabilitation teams with ‘knowledge-brokers’ in each team, work on the implementation of 72 recommendations from the Dutch CP-guideline. The objective of this study is to examine if this method leads to actual changes in clinical practice.

Methods
Since 2016 the activities in CP-Net are based on a purposeful selection of recommendations. During meetings and on a web-based forum, knowledge-brokers, persons with CP/parents and researchers share knowledge, experiences and best-practices, with a focus on ‘doing’ in practice. The stage of implementation for each recommendation in each team is registered using a simple color system; green (‘doing’, fully implemented), yellow (‘knowing’, team knows what to do), and red (‘orientation’). The first results are based on the period April-September 2016, in which we focused on implementation of 4 recommendations.

Results
In one recommendation a lot of discussion, but no change took place. In the 3 other recommendations, the percentage of teams in green changed from 11%, 26% and 16% to 16%, 32% and 21% respectively. In yellow it changed from 32%, 32%, and 63% to 42%, 42%, and 74%.

Conclusion
The model of collaboration in CP-Net leads to actual changes in clinical practice. The system supports transparency and collaboration. Follow-up is necessary to examine if this model supports improvement of quality of care.

PP-139
Poster presentation
Poster session 1 - timeslot 3

Childhood apraxia of speech - a case report
C. Barbeiro, M. Vasconcelo
Centro de Medicina de Reabilitação de Alcoitão, CASCAIS, Portugal

INTRODUCTION
Childhood apraxia of speech (CAS) is a motor speech disorder. Children with CAS have problems saying sounds, syllables, and words. This is not because of muscle weakness or paralysis. The brain has problems with planning to move the body parts needed for speech (e.g., lips, jaw, tongue). The child knows what he wants to say, but his brain has difficulty coordinating the muscle movements necessary for saying those words. The focus of intervention for CAS is on improving the planning, sequencing, and coordination of muscle movements for speech production. Isolated exercises designed to “strengthen” the oral muscles will not help with speech. CAS is a disorder of speech coordination, not of strength.

METHOD
Describe a case report.

RESULTS
3-year-old male, observed first PMR service at 2.5 years because of delayed language development, with good psychomotor development. Little expression and speech, limited to a few syllables, delayed language development with decreased expression; difficulties in oro-facial mobility and respiratory coordination; could not blow; could not keep his cheeks filled with air, did not chew. Tympanogram and audiogram were normal. Diagnosis of apraxia of speech, with deficit of phonological programming. Treatment was started on speech therapy and occupational therapy. Now, he presents gradual functional improvement resulting from the therapy.
Conclusions:
There is benefit in timely diagnosis for early intervention therapy for a better integration into school and the community.

PP-140
Poster presentation
Poster session 1 - timeslot 4

Course of employment in adults with cerebral palsy over a 14-year period
J.L. Benner1, S.R. Hilberink1, T. Veenis2, W.M.A. van der Slot2, M.E. Roebroeck1
1Erasmus University Medical Center, ROTTERDAM, The Netherlands
2Sophia Rehabilitation Centre, THE HAGUE, The Netherlands
3Rijnrad Rehabilitation, ROTTERDAM, The Netherlands

Introduction
Adults with cerebral palsy (CP) experience restrictions in participation, among them employment. In this prospective cohort study, the course of employment in adults with CP was explored over 14 years. Subgroups at risk for unemployment were identified. Patients and methods Sixty-five adults with CP (male 51%; baseline age 21-31 y; intellectual impairment 26%) participated. Self-reported employment status and work hours/week in 1996, 2000 and 2010 were documented. The course of employment (including sheltered work) and work hours/week were analyzed, using generalized estimating equations (GEE) analyses. Results Overall, the employment rate in adults with CP was stable over time (38-45%, p = 0.41), but lower than in the general population (75-86%, p < 0.001). Employment was specifically low in adults with intellectual impairment, bilateral CP, and in adults with GMFCS levels IV-V. Work hours/week declined (35.0 (7.9) to 31.2 (10.3), p = 0.03), specifically among females (32.3 (6.4) to 23.4 (7.4), p < 0.001). Similar to the Dutch general population, males worked mostly fulltime and females part-time.

Conclusion
Employment in adults with CP was low compared with the general population, but remained stable on the long term. Work hours/week, however, decreased, specifically in females with CP. Adults with more severe intellectual and physical limitations are at risk for unemployment. Employers may try to meet the needs of employees with CP, healthcare services may contribute by vocational interventions aiming at balancing personal capabilities and providing environmental support.

PP-141
Poster presentation
Poster session 1 - timeslot 1

'I only have CP now and then' - a study on children and youth with an 'invisible' disability.
R.B. Jahnsen1, G.L. Andersen2, S. Elkjaer1, S.J. Hollung2, T. Vik3, R.V. Vaehle4
1Oslo University Hospital, OSLO, Norway
2Vestfold Hospital Trust, TONSBERG, Norway
3Norwegian University of Science and Technology, TRONDHEIM, Norway
4Norwegian Cerebral Palsy Association, OSLO, Norway

Introduction
A disability is relative, time limited and dependent of the environment. Studies of persons with cerebral palsy (CP) often focus on functional limitations. However, in some persons with high function their disabilities may be more or less invisible. The aim of this study is to describe clinical characteristics of persons who experience “invisible” CP.

Patients and Methods
In this cross sectional study, data were retrieved from the Norwegian Cerebral Palsy Register (CPRN) and the national from 2002-2010. A child who had function corresponding to GMFCS, MACS and Viking Speech Scale level I was defined as having “Invisible” CP.

Results
Among 914 children with CP, 258 (28%) had “invisible” CP. Of these, 68% had spastic unilateral, 30% spastic bilateral, and two children had the ataxic CP-subtype. The proportion of these children having contractures, spasticity and pain was lower than in the remaining group of children with CP. Nonetheless, the mild degree of spasticity and minimally reduced range of motion could explain that when performing more complex motor functions, the children experience they have CP "now and then".

Conclusion
Nearly one third of the population with CP in Norway have an “invisible” disability with a low prevalence of secondary impairments. Since a disability is a relationship between individual resources and environmental demands, many children and youth with CP only experience their CP now and then. However, there is a need for studies of the experience of having an "invisible" disability.

PP-143
Poster presentation
Regional variations in the quality of life perceived by caregivers of children with cerebral palsy in south-east Asia

J.S. Rajkumar, D. Sharan, R. Balakrishnan, S. Tiwari
RECOUP Neuromusculoskeletal Rehabilitation Centre, BANGALORE, India

INTRODUCTION
Little is known about the quality of life (QOL) of children with cerebral palsy (CP) in South-East Asia. This study was conducted to compare the self-reported QOL perceived by the caregivers of children with cerebral palsy (CP) among 4 South-East Asian countries.

PATIENTS AND METHODS
A cross-sectional survey was conducted on 100 caregivers of CWCP aged between 3-20 years from 4 Southeast Asian countries: India (n=38), Malaysia (n=20), Maldives (n=15) and Sri Lanka (n=22). The survey was conducted using Paediatric Quality of Life (PQOL) questionnaire. Other data like demographics of the caregiver and child and GMFCS level were also collected. Data were statistically analysed between the 4 groups: Group A (India), Group B (Malaysia), Group C (Maldives) and Group D (Sri Lanka) to evaluate the regional variations on various parameters of QOL.

RESULTS
Overall, females were the predominant caregivers (83%; n=58) for CWCP. Most caregivers were biological parent (75%), followed by guardian (15%) and professional caregiver (5%). Comparatively, Group B reported significantly higher scores for the domains of social support and peers and social acceptance compared to the other 3 groups. Caregivers in Group A reported high emotional acceptance compared to the other 3 groups.

CONCLUSION
This survey revealed that regional variations existed among the caregivers of children with cerebral palsy in Southeast Asian countries regarding the perceived QOL. Several possible explanations for these findings are discussed. Similar studies can be done in other regions in the world to compare with the results of this study.

PP-144
Poster presentation
Poster session 1 - timeslot 4

Children with cerebral palsy born at term, non-admitted to neonatal intensive care, from the Portuguese National Register

D. Virella1, T. Folha2, M.G. Andrade3, A. Cadete4, R. Gouveia5, T. Gaia6, J.J.M. Alvarelhão7, E. Calado1
1Centro Hospitalar de Lisboa Central, LISBOA, Portugal
2Centro de Reabilitação de Paralisia Cerebral Calouste Gulbenkian, LISBOA, Portugal
3Federação das Associações Portuguesas de Paralisia Cerebral, LISBOA, Portugal
4Hospital Fernando Fonseca, AMADORA, Portugal
5Sociedade Portuguesa de Pediatria do Neurodesenvolvimento, LISBOA, Portugal
6Secção de Reabilitação Pediátrica da Sociedade Portuguesa de Medicina Física, LISBOA, Portugal
7Aveiro University, AVEIRO, Portugal

Introduction. Most children with cerebral palsy (CP) are born at term; circa 10% of children with CP have an identified causal post-neonatal event. Children with CP born at term, non-admitted to neonatal intensive care (NICU) are analysed. Patients and methods. Data from cross-sectional active surveillance of 5-years-old children with CP born in 2001-2009 were used. Children born and living in Portugal, born at term, with data on admission to NICU were included. SCPPE definitions and functional classifications (GMFCS, BFMC, MACS, VSC, IQ, vision and hearing) were used, as well as Portuguese scales for assessment of feeding ability, drooling control and school inclusion. CP type was determined by the predominant clinical features. Children admitted and non-admitted to NICU were compared. Results. From 1233 registered children born and living in Portugal, non-admission to NICU was reported in 318/557 children born at term children (57.1%; 95%CI 52.95-61.14). These children significantly less often were born by emergent caesarean section, had low Apgar score or early neonatal seizures; they had more often brain malformations and infections (congenital CMV) and an identified causal post-neonatal event was more frequent (18.5% vs. 2.2%). The profiles of clinical CP types and MRI findings were significantly different. Their functional evaluations were significantly better in every score. Epilepsy was less frequent (43.4% vs. 55.6%). Full or partial inclusion was more frequent (76.6% vs. 57.7%). Conclusion. In Portugal, more than half of 5-years-old children with CP born at term had no significant neonatal events; their functional status is generally satisfactory.

PP-145
Poster presentation
Poster session 1 - timeslot 1

Identification of long term needs and late effects in paediatric acquired brain injury (ABI) - A collaborative approach
A. Desai, K. James, L.J. Wales
The Children's Trust, SURREY, United Kingdom

Introduction
ABI is the biggest cause of disability in children and is lifelong. Paediatric ABI occurs on the background of development. Effects may be subtle and not become apparent until the impaired area of the brain fully matures. CYP with ABI referred to The Children’s Trust, Brain Injury Community Team (BICT), UK are often referred sometime after their ABI.

Patients and Methods
Thematic analysis on retrospective data of difficulties identified at initial assessment following referral to BICT (n=102).
Illustrative case study of intervention provided to support long term needs.

Results
Referrals to BICT ranged from 0 to 16 years after the date of injury (mean length: 0-12mths).
Multiple difficulties were identified: as many as 12 deficits for one individual.
7 themes were identified: executive function, cognition, communication, behaviour, emotion, physical difficulties, activity and participation. Communication (n=165) and executive function (n=240) being the largest areas of need.
Description of case study. Collaborative working of BICT with CYP, families, school and community services to support the impact of these persistent difficulties; including assessment and ABI education.

Conclusion
ABI sequelae may not be immediately apparent at the time of the injury.
Residual deficits such as social communication and interaction and learning continue to emerge as CYP develop and form part of the ‘hidden’ disability of ABI, which can impact long term participation within society.
Assessment and intervention of high level needs in CYP with ABI is needed. Examples where specialist ABI services and community therapy services have worked in partnership are encouraging.

PP-146
Poster presentation
Poster session 2 - timeslot 1

Physical and musical activity and their effect on premature infants at 5 years of age.
J. Spiegler, W. Göpel
University of Lübeck, LÜBECK, Germany

Introduction
There are no data about former very low birth weight infants and their participation in physical or musical activity at preschool age and its effect.

Patients and Methods:
Neonatal data of premature, very low birth weight infants were recorded at birth. At 5 years of age musical and physical activity was inquired, a follow up examination included cognitive (WPPSI III) and motoric testing (M-ABC, GMFCS).

Results:
537/888 former VLBW infants participated regularly in musical activity. Regression analysis showed that musical activity was correlated with female gender, having no bronchopulmonary dysplasia and higher maternal education. Suffering from an intraventricular haemorrhage, gestational age or z-scores of the birth weight did not influence musical activity. Linear regression analysis showed a positive effect of early musical education on IQ after controlling for influencing factors.
561/920 former VLBW infants participated regularly in physical activity. Regression analysis showed that physical activity was correlated with female gender, higher gestational age, higher z-scores of the birth weight, lower grades of intraventricular haemorrhage and higher maternal education. Linear regression analysis showed a positive effect of sport on Balance Scores of M-ABC after controlling for influencing factors.
150/264 children with a Gross Motor Function Classification Scale of ≥1 participated in musical activity compared to 126/281 in physical activity.

Conclusion:
Our data show that more children with a higher handicap participated in musical activity compared to physical activity. Early musical education was correlated with higher IQ-scores and should be encouraged in former VLBW infants.

PP-147
Poster presentation
Poster session 2 - timeslot 2

Affected connectivity organization in dyskinetic cerebral palsy: a connectome-based study.
Assessing corticospinal tract (re)organization in unilateral cerebral palsy based on mirror movement characteristics and diffusion measures

E. Jaspers¹, K. Kingels², C. Simon-Martinez², H. Feys², N. Wenderoth³
¹ETH Zürich, ZURICH, Switzerland
²KU Leuven, LEUVEN, Belgium
³ETH Zurich, ZURICH, Switzerland

Introduction
Structural reorganization of the corticospinal tract (CST) forms a primary source of variability amongst children with unilateral cerebral palsy (uCP). However, the CST-wiring pattern is not immediately apparent from the child's clinical presentation. Here we test the value of mirror movements (MM) in the paretic hand with respect to CST wiring, and whether diffusion measures of CST structural integrity aid further classification.

Patients and methods
We assessed MM, CST-wiring and structural integrity in 26 children with uCP (age 5-22 years; 15 boys; 13 right-sided; MACS I=7, II=9, III=10). MM in the paretic hand were quantified using a repetitive squeezing task with force handles. MM characteristics and CST diffusion measures were used to classify children into 3 MM groups (k-means clustering), which were compared against their individual CST-wiring pattern (based on transcranial magnetic stimulation, TMS).

Results
Contralateral, ipsilateral, and bilateral CST-wiring was seen in 8, 11, and 7 children respectively. The k-means clustering based on MM-strength and MM-synchronization grouped the children into 'low' (n=10), 'moderate' (n=11) and 'strong' (n=5) MM. Comparison against the individual child's wiring pattern showed high sensitivity (100%), specificity (89%) and accuracy (92%). However, within the 'moderate' and 'strong' MM-groups, classification accuracy was only 61% for ipsilateral vs. bilateral CST-wiring. This might be further improved based on CST diffusion measures.

Conclusion
We provide first evidence of the value of MM-strength and MM-synchronization in the paretic hand with respect to unraveling CST-(re)organization. Knowledge of structural integrity of the CST might help to further dissociate ipsilateral vs. bilateral CST-wiring patterns.
Audit of Neuroimaging in Cerebral Palsy
B.A. Watson¹, J.E. Bothwell², S. Mckinstry¹, P. Burns¹, G. Garcia Jalon³, M. Stewart¹
¹Belfast Health and Social Care Trust, BELFAST, United Kingdom
²Carlisle Health, Wellbeing Centre, BELFAST, United Kingdom
³Queen's University Belfast, BELFAST, United Kingdom

Introduction:
Evidence supports routine neuroimaging in the assessment of children with cerebral palsy (CP).¹,² The Surveillance of CP in Europe (SCPE)³ provide recommendations in the use of cranial ultrasound (cUSS) and magnetic resonance imaging (MRI) and a classification for MRI findings. However, SCPE also highlighted shortcomings in the use of MRI for the diagnosis of CP. This audit assessed the use of cUSS and cerebral MRI for children with CP in the Belfast Health and Social Care Trust (BHSTC).

Methods:
Retrospective audit using SCPE recommendations on cUSS and MRI in CP³ as the benchmark. Children born in BHSTC during 2000-2008 were identified by the Northern Ireland Cerebral Palsy Register (NICPR). Data on CP and birth history was provided by NICPR; data cUSS and MRI timing and results were obtained from records. MRI findings were independently classified by two neuroradiologists.

Results:
69 children were identified. Twenty-six underwent cUSS and 46 had MRIs. Although 19 children did have cUSS scans documented on day one, these were not repeated weekly until discharge as recommended. One preterm child had MRI done as recommended and 3 term child had MRI also as recommended.³ Conclusion and Recommendations:
Neuroimaging practice could better match current guidelines, particularly increased utilisation of weekly cUSS and neonatal MRI in high-risk infants. The quality control and documentation of bedside ultrasound should be improved. A further prospective study is needed to more accurately assess current neuroimaging practice and further evaluate the clinical validity of the SCPE MRI classification in our CP patient population.

The Hammersmith Infant Neurological Examination (HINE) asymmetry score improves identification of hemiplegic cerebral palsy in a neonatal intensive care (NICU) follow-up clinic.
N.L. Maitre¹, A. Guzzetta², M.A. Nelin¹, O. Chorna¹, F. d’Acunto³, D.M. Romeo⁴
¹ Nationwide Children’s Hospital, COLUMBUS, United States of America
² University of Pisa, Stella Maris Scientific Institute, PISA, Italy
³ Stella Maris Scientific Institute, PISA, Italy
⁴ Catholic University Rome, ROME, Italy

Introduction:
The HINE is a useful tool for early identification of CP, often delayed in NICU graduates. Hemiplegic infants especially can have scores over CP cutoffs. We hypothesized that use of the asymmetry score (AS) within the HINE could differentiate hemiplegia.

Methods:
This case-control study matched infants enrolled in a study for asymmetric CP with infants in a NICU follow-up clinic with generalized HINE implementation (2:1). Controls had same corrected and gestational ages as CP matches, and composite motor Bayley Scales of Infant Development >85. AS was the sum of 1 vs. 0 on 20 HINE items. CP diagnosis, GMFCS, Mini-MACS and BFMI were confirmed by neurodevelopmental physicians.

Results:
50 infants had CP, 100 did not (median corrected age 16 months, range [7,23]; median gestational age 31 weeks, [23,40]). CP was 51% quadriplegia (Quad) and 40% hemiplegia (Hemi). Median HINE scores were Quad 41.5 [21,67], Hemi 61 [47.5,70]. No CP infants had AS >2, Hemi had AS [6-17], Quad had AS [0-15]. For infants with HINE> 63 (Romeo, 2013), AS>5 had sensitivity and specificity of 100% for Hemi vs. no CP. One child with Quad had HINE 67/AS 7. Regression analyses showed AS was associated with GMFCS, Mini-MACS and BFMI (R² = 0.54, 0.42 and 0.43, all p<0.0001).

Conclusion:
In a NICU follow-up clinic, total HINE score combined with asymmetry score can help providers differentiate hemiplegia. Future studies could combine this score with GMA at 3 months to increase topographic predictions for CP.

Degeneration of the corticospinal tract and bimanual performance in children with unilateral cerebral palsy
S.W. Meijer¹, C.M. van Rijn¹, P.B.M. Aarts², D. Green², B. Hoare², B. Steenbergen¹, M.L.A. Jongsma²
¹ Radboud University Medical Center, NUMEGEN, The Netherlands
² Catholic University Rome, Italy
Introduction Degeneration of the corticospinal tract (CST) has been linked to diminished unimanual hand capacity in stroke patients. However, this relationship is less clear with respect to children with unilateral Cerebral Palsy (uCP). This study examined the relationship between degeneration of the CST and simple and complex motor behavior in children with uCP.

Patients and methods Forty-nine children (aged 5-23 years) with uCP were included in a prospective cohort study. Peduncle asymmetry was estimated from T1-weighted MRI scans measuring the surface of the cerebral peduncles from the interpeduncular space to the lateral sulcus. Unimanual capacity was assessed using the Box and Blocks test (BBT) \( (n=35) \) and the functional subtests stacking checkers and lifting light cans from the Jebsen-Taylor Test of Hand Function (JTTHF) \( (n=14) \). Bimanual performance was assessed using the Assisting Hand Assessment (AHA) \( (n=20) \) and the Children’s Hand-use Experience Questionnaire (CHEQ) \( (n=29) \).

Results We identified a trend between higher peduncle asymmetry and decreased unimanual capacity (BBT and JTTHF combined: \( r = .52 \)). No relationship between peduncle asymmetry and bimanual performance (AHA and CHEQ combined) was observed. Unimanual capacity was correlated with bimanual performance \( (r = .72) \).

Conclusion Using data from an international collaboration, we were able to compare neuro-anatomical data with measures of simple and complex hand function in a large sample of children with uCP. We demonstrated that the amount of secondary degeneration of the CST is associated with difficulties in simple unimanual capacity, but not with complex bimanual performance.

PP-152
Poster presentation
Poster session 2 - timeslot 3

Mosaic Trisomy 9 - Do genotype and phenotype predict neurodevelopmental outcomes?
M. Negoita, S. Viswanatha, P. Dasgupta Ghosh
Leeds Community Healthcare NHS Trust, LEEDS, United Kingdom

Introduction Mosaic trisomy 9 is a rare genetic abnormality with about 30 cases reported in medical literature. Associated symptoms vary in range and severity and neurodevelopmental outcomes. Patients and methods We present two children of similar ages from our Development Centre who have a diagnosis of mosaic trisomy 9, both secondary to mitotic nondisjunction. They have similar degree of mosaicism, but were diagnosed at different ages. We reviewed their clinical presentation, developmental progression and therapeutic interventions to ascertain a possible genotype-phenotype correlation with neurodevelopmental outcomes. The first child, born prematurely with Intrauterine Growth Retardation, Ventricular Septal Defect and duodenal atresia, needed prolonged postoperative hospital stay for establishing feeds and respiratory complications. The second child, born at term with obvious dysmorphic features had uncomplicated Ventricular Septal Defect and Pulmonary Stenosis. She developed subsequent complications due to diaphragmatic hernia needing surgical repair and now has secondary cardiac complications. Both have significant developmental delay and feeding difficulties. The first child is showing relatively better developmental progress than the latter who received earlier therapy input. Results The two cases with similar genotype of Mosaic Trisomy 9, had some common phenotype. Diagnosed at different ages, their medical interventions and therapy input varied with age due to their timing of acute complications. Their clinical severity impacted their neurodevelopmental progress. Conclusion We found genotype-phenotype correlation in our patients, but there was no evident direct link between their genotype and developmental outcomes. This requires further longitudinal research into correlating neurodevelopmental progress with corresponding genotype.

PP-153
Poster presentation
Poster session 2 - timeslot 4

An Investigation of Visual Perceptual Abnormalities in Children with Suspected or Diagnosed Congenital Cerebral Visual Impairment
H.E.A. Sakki\(^1\), R. Bowman\(^2\), R. Kukadia\(^3\), J.C. Sargent\(^4\), N.J. Dale\(^5\)
\(^1\)University College London, LONDON, United Kingdom
\(^2\)Great Ormond Street Hospital for Children NHS Foundation Trust, LONDON, United Kingdom

Introduction Childhood cerebral visual impairment (CVI) is poorly understood, with a heterogeneous symptom presentation of visual difficulties and high incidence of comorbidities. Alongside visual impairment, visual perceptual difficulties are commonly reported. Within a systematic investigation of ophthalmology, basic vision, cognition and comorbid conditions, this study explored whether children with suspected or diagnosed CVI have visual perceptual abnormalities.
Patients and methods
Children aged 5-16 years (recruitment ongoing, target n=40) with a previous diagnosis or suspicion of CVI and visual acuity (VA) better than logMAR 1.0 participated. Participants underwent ophthalmological examination, basic vision assessment (including near VA), cognitive assessment (verbal comprehension index - VCI of WISC-IV/WPPSI-V), and visual perception assessment (TVPS-3). Medical history and diagnoses were obtained from parent questionnaires and medical records.

Results
Paired t-tests showed that participants had significantly poorer TVPS-3 scores than VCI scores. Independent samples t-tests showed no effects of stereopsis, strabismus, cerebral palsy or previous CVI diagnosis on TVPS-3 scores. No Pearson correlations were found between TVPS-3 scores (total, basic, complex) and age, VA, gestational age or VCI. Sequencing correlated positively with VCI.

Conclusion
Although in the average range for VCI, participants showed significantly lower TVPS-3 scores (borderline-low range). Sequencing (working memory) has a high cognitive load, so a correlation with VCI was unsurprising. All other areas of visual perception were independent of cognition, age, basic vision, presence of comorbidities and previous diagnosis of CVI. These findings suggest that visual perceptual abnormalities may be a core clinical feature in the spectrum of CVI, even in children with normal VA.

PP-154
Poster presentation
Poster session 2 - timeslot 1
A case report of patient with Sotos syndrome caused by a Novel intragenic mutation in NSD1
N.E. Jeon, D.H. Jang
Incheon St. Mary's Hospital, SEOUL, South-Korea

Introduction
Sotos syndrome is an overgrowth disease characterized by distinctive facial appearance, learning disability, macrocephaly. The genetic cause of Sotos syndrome was found to be mutation of nuclear receptor set domain containing protein 1 (NSD1) gene.

Patients and methods
A 21-months-old boy visited our clinic because of delayed development. He was born at 41 weeks by cesarean delivery with a birth weight of 4.2kg. The patient had a patent ductus arteriosus (PDA) and umbilical hernia during neonatal period. He had prominence of forehead, macrocephaly and hypertelorism. He started to walk at 17 months and appeared to avoid eye contact with physician. The Bayley Scales showed that global delay developmental. Brain MRI discovered persistent cavum septum pellucidum and thinning of the corpus callosum. The patient was suspected of Sotos syndrome based on his clinical features. Chromosome analysis showed a normal male karyotype and an array comparative genomic hybridization identified a heterozygous intragenic NSD1 deletion of 13 nucleotides from 5675 to 5687 and replacing isoleucine with threonine at 1892th nucleotide position.

Results
We report a patient with Sotos syndrome caused by a novel intragenic mutation in NSD1(c.567_5687 del (p.Ile1892Thrfs*12), Heterozygous), resulting in a frameshift and premature stop codon at the NSD1 gene.

Conclusion
Sotos syndrome is a rare disease, so it may be difficult to diagnose without doubt. Sotos syndrome has risk of tumor development during childhood and should be evaluated regularly for surveillance of malignancy. Therefore, Sotos syndrome should be considered when encountering overgrowth and delay development in routine practice.

PP-155
Poster presentation
Poster session 2 - timeslot 2
Spastic paraparesis: have you checked cerebral peduncles?
S. Fiori1, R. Pasquariello1, D. Scelfo1, G. Astrea1, F.M. Santorelli1, G. Cioni2, R. Canapicchi1, R. Battini1
1IRCCS Fondazione Stella Maris, PISA, Italy
2IRCCS Fondazione Stella Maris, University of Pisa, PISA, Italy

Introduction
Spastic paraparesis is a clinical picture related to either brain injury (spastic diplegia) or genetic causes (hereditary spastic paraparesis). Brain injuries related to spastic diplegia determine a typical MRI appearance, involving periventricular white matter. No major MRI abnormality is typically detected in hereditary spastic paraparesis; in such cases, SPG genes analyses are often mutated. We report on a 6-year-old child presenting with spastic paraparesis investigated by structural and diffusion tractography MRI.

Materials and methods
The propositus was reported for a mild developmental delay with lower limb spasticity. Perinatal history was uneventful. Neither consanguinity between parents nor familiar history of developmental disorders was reported. Sequential brain structural MRI revealed no abnormalities compatible with periventricular leukomalacia. A NGS panel for known SPG forms did not reveal any significant mutation. At structural MRI,
Reliability and validity of the Pediatric Posterior Drooling Scale: a pilot study

K. van Hulst
Radboud University Medical Center, NIJMEGEN, The Netherlands

Introduction Anterior drooling is frequently reported in children with neurodevelopmental disabilities. Posterior drooling (PD) is often suspect in children with severe oropharyngeal dysphagia. PD may lead to recurrent respiratory problems or aspiration pneumonia. The pediatric posterior drooling scale (PPDS) is a screening tool to score the presence and severity of PD by use of cervical auscultation (CA). Previous research showed that CA may be used to evaluate post-swallow respiration. The aim of this pilot study is to assess interrater reliability and construct validity of the PPDS.

Patients and methods The PPDS scores the quality of breathing and swallowing on a 5 point scale. In 20 children the sound of a saliva swallow was recorded via CA and saved as a .m4a file. Three experienced speech language therapists applied the PPDS to the files. Interrater reliability was assessed with an intra-class correlation coefficient (ICC). Construct validity was determined by calculating correlation between scores on the PPDS and dichotomized Eating and Drinking Ability Classification System (EDACs) levels. We expected a high correlation between the PPDS and the dichotomized EDACS levels (Spearman’s Rho = .897).

Results Interrater reliability of the PPDS was excellent (ICC = .897). Analyses show a significant positive correlation between the PPDS and the dichotomized EDACS levels (Spearman’s Rho = .56, p < .05).

Conclusion In children with drooling both anterior and posterior drooling must be taken into account. The PPDS can be scored reliably and has the potential to be used in clinical care in children suffering from drooling. More research is needed to explore the PPDS in a larger sample size.
with a larger sample is needed.

**PP-158**
Poster presentation
Poster session 2 - timeslot 1

**Advanced technologies complementing occupational therapy in children with neuro-motor disorders undergoing rehabilitation**
A. Herzog, J. Lieber, B. Rückriem, H.J.A. van Hedel
University Children's Hospital Zurich, AFFOLTERN AM ALBIS, Switzerland

**Introduction**
During recent years, advanced technologies are more and more applied also in pediatric inpatient rehabilitation settings to complement conventional occupational therapy and improve body functions and capacities. While the expectations are that these systems can induce a higher therapeutic dosage and intensity and improve compliance due to motivating exergames, the evidence in children concerning its efficacy is still scarce.

**Patients and methods**
In this preliminary retrospective analysis, we included data from 30 children [7 girls; 20 children with cerebral palsy, 10 other diagnoses; age 12±6.1 years (median ± interquartile range)] who received conventional occupational therapy and advanced technologies with systems such as Armeo Spring, YouGrabber, or CHARM. We analysed changes in hand capacity tests [Box and Block test (BBT) and Nine-hole Peg test (NHPT)] and hand function test (dynamometry with the Jamar for grip and finger pinch strength) for the more affected hand.

**Results**
The time between assessments was 49±56 days during which the children received 16 sessions of occupational therapy and 14 sessions with advanced technologies (median values). While the BBT and NHPT improved significantly (p=0.002 for BBT and p=0.021 for NHPT), the dynamometry measurements did not. However, only the changes in grip strength correlated significantly with the number of robotic sessions (ρ=0.52) and the number of OT sessions (ρ=0.50).

**Conclusion**
These preliminary results show that a combination of conventional occupational therapy and exergames can improve hand capacity in children with neurological diagnoses. A dosage-response relationship was only found for changes in grip strength.

**PP-159**
Poster presentation
Poster session 2 - timeslot 2

**Test-retest reliability of a new fatigue index to quantitatively evaluate fatigue in children with cerebral palsy.**
L. Brauers1, K. Klingels2, R.J.E.M. Smeets3, P. Feys2, E.A.A. Rameckers4
1Adelante Rehabilitation Center, HOENSBROEK, The Netherlands
2Hasselt University, HASSELT, Belgium
3Maastricht University, MAASTRICHT, The Netherlands
4Adelante, Maastricht University, HOENSBROEK, The Netherlands

**Introduction**
Problems with arm and hand upper limb function in children with Cerebral Palsy (CP) cause limitations in daily activities. The main determinants for arm and hand upper limb functioning in CP are selectivity, spasticity, distal muscle strength (maximal voluntary contraction (MVC) and the ability to produce (sub)maximal isometric force over a prolonged period of time (muscle fatigue). Currently, no research on isometric muscle fatigue (IMF) in children with CP is available, and studies on IMF in the upper extremities are limited to other patient groups. IMF is calculated, based on a ratio between the Area Under the Curve (AUC) and the Hypothetical Area Under the Curve (HAUC).

**Purpose**
Current research tests the reliability of this method for quantitatively calculating IMF in children with CP.

**Patients and methods**
A sample of 59 children with CP between 13 and 18 years of age were measured with an isometric grip and pinch dynamometer. IMF was determined based on 30 seconds maximal voluntary contraction curve (MVC), from which time to peak, AUC and HAUC were calculated.

**Results**
Based on Intra Class Correlations (ICC), a fair to good test- retest reliability for quantitatively calculating IMF in children with CP is found. One aspect that may have interfered with this reliability is the variability in force generation and regulation and needs further investigation. This is especially evident in the children with MACS level 3.

**Conclusion**
The test- retest reliability for quantitatively calculating IMF in children with CP is fair to good.
Infants with cerebral palsy show reduced plantarflexor muscle volume prior to developing ankle contractures

M.C. Lund¹, M.S. Willerslev-Olsen², M. Kofoed-Hansen³, J. Lorentzen¹, J.B. Nielsen⁴

¹University of Copenhagen, COPENHAGEN N, Denmark
²The Elsass Foundation, University of Copenhagen, CHARLOTTENLUND, Denmark
³The Elsass Foundation, CHARLOTTENLUND, Denmark
⁴Elsass Institute, University of Copenhagen, COPENHAGEN N, Denmark

Impaired growth of muscles may be involved in the pathophysiology of contractures in children with Cerebral Palsy (CP). Since manifest contractures of ankle muscles may be observed in children with CP at age 3, part of these pathophysiological changes likely occur earlier. We consequently aimed to compare ankle plantarflexor muscle volume and stiffness in infants with CP and typically developing (TD) peers in the age group 0-5 years of age in order to determine a possible temporal relation between muscle growth and stiffness.

Methods: 32 infants with CP (GMFCS I-III) and 47 TD infants were recruited for the study. The volume of the medial gastrocnemius muscle was measured by 3-D ultrasound. Measurements of passive and reflex stiffness of the ankle joint plantar flexors were made by a hand-held dynamometer with which stretches below and above the stretch reflex threshold were applied.

Results: Muscle volume increased linearly with age in TD infants. Infants with CP initially showed similar muscle volumes as TD infants, but 15-20 months after birth muscle volume was reduced. Ankle joint stiffness and ankle joint range of movement were also initially similar in CP and TD infants. A significant increase of passive joint stiffness was observed in CP infants older than 30 months. Range of movement was reduced in CP infants older than 35-40 months.

Conclusion: These observations are consistent with the hypothesis that impaired muscle growth (possibly secondary to reduced neural activation and physical activity) is involved in the pathophysiology of contractures in children with CP.

Optimal muscle fascicle length for producing force may explain gait strategies in adults with cerebral palsy.

R. Frisk¹, J. Lorentzen⁵, L.A. Barber⁶, J.B. Nielsen⁴

¹University of Copenhagen, COPENHAGEN, Denmark
⁵Elsass Institute, CHARLOTTENLUND, Denmark
⁶The University of Queensland, SOUTH BRISBANE, QLD, Australia
⁷Elsass Institute, University of Copenhagen, COPENHAGEN, Denmark

Introduction
Gait patterns in subjects with cerebral palsy (CP) may be a compensatory strategy to ensure propulsion during gait. Structural muscle changes have been of major concern and are considered being significant contributors to impaired muscle activation. The ankle position at push-off may indicate the most sufficient muscle fascicle length for producing force. An investigation of this may give insights about mechanisms in gait pattern adaptations in adults with CP.

Patients and Methods
15 adults with CP and 15 typical developed (TD) controls participated. Maximum voluntary contractions (MVC) from the Triceps Surae muscle was measured in 7 different ankle positions throughout ankle range of motion with the subjects seated in a stationary dynamometer. Ultrasound recordings were obtained from the gastrocnemius muscle during muscle contractions, while tracking muscle fascicle length. Gait kinematics was obtained from treadmill walking by 3D gait analysis.

Results
The largest muscle fascicle length change during MVC was observed in a more plantar flexed ankle position in CP subjects compared with TD controls. The plantar flexed ankle position during MVC was correlated with push-off ankle position during walking.

Conclusion
Preliminary results indicate that gait pattern in subjects with CP reflects a compensatory strategy to ensure propulsion during gait, since optimal ankle position for MVC corresponds to the ankle position during push-off. Strength in different joint positions may contribute to decisions of clinical management of contractures and spasticity since interventions may influence the ability for sufficient muscle activation in subjects with cerebral palsy.

PP-162
Poster presentation
Age-related Alterations in Viscoelastic Properties of Biceps Brachii Muscle and It’s Effect on Motor Function in Children with Obstetrical Brachial Plexus Palsy

K. Delioglu, N. Kirdi, T. Firat, A. Meriç
Hacettepe University, ANKARA, Turkey

Introduction:
Obstetric brachial plexus palsy (OBPP) leads poor function due to motor and sensory disturbances as well as changes in the muscle tissue and joint structures. The purpose of this study was to investigate the changes in viscoelastic properties of the muscle include tone, stiffness and elasticity of the affected biceps brachii and it’s effect on elbow flexion in different age groups in children with OBPP.

Patient and Methods:
Sixty-one children with upper trunk injury aged between 1-36 months were enrolled to the study. Viscoelastic properties of the affected and healthy biceps brachii muscles were analysed with using Myoton-3 device. Unaffected arms of the children were accepted as control. Elbow flexion was assessed with using Active Movement Scale.

Result:
Muscle tone (p=0.006) and stiffness (p=0.004) was lower on the affected side than the healthy side in aged between 1-5 months (n=13). Muscle tone (p=0.004) and stiffness (p=0.003) values were higher on affected side in aged between 6-24 months (n=37). There was no difference in the viscoelastic properties of the affected and the healthy side in children aged between 25-36 months (n=11). Elasticity values were similar (p=0.05). There was no relationship between motor performance of the denervated muscle and the viscoelastic properties.

Conclusion:
Muscle tone and stiffness increase after fifth months, until 2 years of age. Increasing the muscle tone especially in first five months may be necessary. However, keeping the tone and stiffness in the physiological level until 2 years is essential. Physiotherapy regimes should be designated based on these findings.

Normative values for the morphology and structure of the medial gastrocnemius in children

F.L. Cenni1, S.H. Schless1, L. Bar-On1, B.M. Kalkman2, G. Molenaers1, K. Desloovere1
1KU Leuven, LEUVEN, Belgium
2Alder Hey Children’s NHS Foundation Trust, LIVERPOOL, United Kingdom

Introduction

Poster session 2 - timeslot 1

Adolescents with hemiplegic CP produce less concentric and eccentric power / mm muscle thickness on both the affected and the unaffected leg compared to TD adolescents.

F. von Walden1, R. Fernandez-Gonzalo2, E. Hjalmarsson3, O. Kvist4, S. Rindborg1, O. Kvitastein1, M. Reimeringer2, E. Pontén1
1Karolinska Institutet, STOCKHOLM, Sweden
2Belgian Nuclear Research Centre, SCK-CEN, MOL, Belgium
3Astrid Lindgren children’s hospital, STOCKHOLM, Sweden

Introduction: Young people with hemiplegic CP have reduced muscle strength in the affected leg. We have used non-gravity dependent, iso-inertial flywheel technology to measure both concentric and eccentric power and then related it to muscle thickness.

Patients and Methods: Three subjects with hemiplegic cerebral palsy (n=2 GMFCS I, n=1 GMFCS II) were compared with five typically developed subjects. A flywheel leg press was used to measure maximum concentric and eccentric power of both legs. Thickness of the vastus lateralis was measured bilaterally using ultrasound.

Results: All subjects were able to operate the flywheel leg press as intended. In hemiplegic subjects, both legs produced less amounts of concentric power/mm muscle (less affected side -41%, more affected side -53%, p<0.05) and eccentric power/mm muscle (less affected side -38%, more affected side -57%, p<0.05) as compared to control subjects. In patients with CP, the vastus lateralis muscle of the more affected leg was on average 24% thinner (p<0.05) than the muscle from the non-affected side, yet produced similar amounts of power per mm muscle.

Conclusion: These results show that adolescents with hemiplegic CP have a difficulty to recruit the muscle for maximal concentric and eccentric power, and that this deficit involves the less affected leg as well. This means that there is either a suboptimal recruitment of neuromuscular units in CP and/or there is less contractile material per cross sectional area in CP compared to control, in both the affected and the so called non-affected leg.
Normative values of muscle morphology and structure in typically developing children (TDC) can provide a reference by which pathological alterations can be quantified. In spastic cerebral palsy children, reduced muscle volume, length and increased echo-intensity (EI) have previously been reported in the medial gastrocnemius (MG). This investigation aims to provide normative values and growth rates of clinically useful parameters for the MG in TDC between the ages of 5-17.

Patients and Methods
Sixty-five TDC (10.0±3.2; 41 boys) were recruited. Children lay prone with 20° knee flexion and the ankle in a resting position. 3DUS was used to recreate the MG in 3D and a custom-made Python package was used for data processing. The Pearson’s correlation coefficients (R²) and the slope of the regression line were computed to investigate the relationship of the three parameters with age and body-mass.

Results
Significant high-positive correlations (R² > 0.7) with age and body-mass were found for both muscle volume and length, but not for EI. The mean rates of growth for muscle volume and length were 8.1 ml/year and 7.5mm/year, respectively. Significant high correlations (R² > 0.78) were also found between volume and length.

Conclusions
This investigation provides normative values for three parameters of the MG acquired using 3DUS. The normalisation per annum can predict the rates of growth, providing a reference for understanding deficits in pathological muscle. EI showed no relationship with age or body-mass, being constant throughout childhood. Future investigations on other lower limb muscles will make this database more comprehensive.

Pointing training: introducing a communicative tool to enhance pre-linguistic skills
F. de Osti
IRCCS E.Medea Associazione La Nostra Famiglia, TREVIISO, Italy

De Osti Federica, Simoni Eleonora
Associazione La Nostra Famiglia, IRRCS E.Medea, Treviso, Italy

Little is known about the origins of the pointing gesture but the most of the recently studies describe it as a performative behavior expressing children’s communicative intentions in the prelinguistic period. In typical development, age of emergence of the pointing gesture ranges from 8 to 15 months; however, in children with neurodevelopmental diseases this ability show often a late onset. The aim of this research was to identify the relation between cognitive and communicative skills and enhance linguistic development.

A neuropsychological assessment and training was conducted, on a single case study, for a 12-month-old boy (named Lorenzo) having a complex early onset pathology. Firstly, we assessed his cognitive development with a qualitative instrument (Uzgiris-Hunt, Piagetian Scale) and a Developmental Quotient (Bayley-III). Then an innovative training was conducted to promote the onset of pointing. Finally post-training and follow-up evaluations allowed us monitoring the development of trained and non-trained skills.

Pointing treatment implemented prelinguistic skills linked with Object Permanence Scale and Means-ends Abilities, so pointing become useful as a tool for enhance receptive vocabulary. Moreover cognitive developmental results achieved by different kind of tests (qualitative v. quantitative) seems to agree.

It seems that this training could be essential not only for communicative but also for cognitive development in children having developmental delays. The challenge for the future consist in create new instruments to assess cognitive development more predictable, based on strong reference theory, sharing research knowledge derived from studies on typical development.

Effect of perinatal risk factors on the gross motor development of preterm infants
F.J. Fernández Rego, C. Sánchez Martínez
University of Murcia, MURCIA, Spain

Introduction. Prematurity is one of the main problems of perinatal health care, due to its elevated incidence and morbidity shown in the short and long term. Overall, the aim of this study was to determine the effect of perinatal risk factors on the preterm infant’s gross motor development.

Patients and methods. Across-sectional study was carried out with 138 preterm infants, with gestational age (GA) ≤37 weeks, assessed since November 2012 to April 2015. The assessment was carried out managing the Perinatal Risk Inventory (PERI) to the hospital discharge report; in the interest of determining the level of perinatal risk. Moreover, the preterm infant’s gross motor was assessed by the Alberta Infant Motor Scale (AIMS).

We used three Spearman’s rho correlation coefficients to determine the association between the three risk levels (low, moderate and high) and the AIMS score. On the other hand, we used a linear regression analysis to show...
which risk factor is most influential on the gross motor development depending on the quarter of assessment during the first 18 months of life.

**Results.** Our results showed a significant relation between the perinatal risk factors and gross motor development. In addition, it should be noted that the intracranial hemorrhage and the GA explain a 9.3% of the variance found in the AIMS scores.

**Conclusion.** A higher perinatal risk level decreases the gross motor development of preterm infants. Intracranial hemorrhage and GA have been considered the most influential risk factors in the gross motor development of preterm infants.

PP-167
Poster presentation
Poster session 2 - timeslot 2

**Referral of schoolchildren to classifying diagnostics of neurobiological developmental delays or disorders. Case study: Center for Developmental disorders Plus.**

M. van den Eede, M. Leys, E. Cloet, A. Jansen

1Universtair Ziekenhuis Brussel, JETTE, Belgium
2Vrije Universiteit Brussel, JETTE, Belgium

**Introduction.** COS+ is part of University Hospital in Brussels, a multilingual and multicultural area. COS+ does specialized outpatient multidisciplinary assessment of children (7 - 18 years) with school difficulties. This research aims at mapping patient profiles, supposed reason for referral and diagnosis to find indications of adequate referrals.

**Patients and methods.** We analyzed socio-demographic background, type of referer, reason(s) for referral and diagnosis of 252 Dutch speaking children living in Brussels and consulting COS+ in the period 2009 – 2014. Bivariate descriptive statistics were used to test for associations between type of referral person and client characteristics (Chi-square). Moreover we tested for association between “reason for referral” and diagnosis (NDDD) (Kappa coefficients).

**Results.** The most common profile in the sample were boys (64.7%), eight or nine years old (37.7%), in the 3rd grade of primary regular schools (20.2%), raised in a bi- (45.2%) or trilingual (39.3%) traditional 2-parent family (74.2%). 12.7% only speaks Dutch. 20 languages were registered. 61.1% of referrals came from schools or Pupil Guidance Centers (CLB). Most were supposed learning disorder (57.1%) or attention deficit disorder (45.3%). Analysis shows low association between reason for referral and diagnosis (between $\kappa = 0.027$ and $\kappa = 0.321$). COS+ mainly diagnosed learning difficulties (78%) and delayed language development (63.7%).

**Conclusion.** The low association between reason for referral and diagnosis indicates that strategies need to be developed for more targeted referral policy and urges for early diagnosis.

PP-168
Poster presentation
Poster session 2 - timeslot 3

**Early cognitive development in spina bifida**

R. Elliott, T.A. Williams, A. Botman

1The Children's Hospital Westmead, WESTMEAD, Australia
2The Children's Hospital at Westmead, WESTMEAD, Australia

**Introduction.** Spina Bifida (SB) is the second most common disabling condition in childhood after Cerebral Palsy. Hydrocephalus is associated with SB and can lead to specific cognitive deficits in school aged children. Our study investigated early cognitive development of children with SB in order to guide clinical practice in relation to early identification of cognitive delay and the implementation of appropriate therapeutic intervention.

**Patients and Methods:** Longitudinal retrospective data of children from the Spina Bifida Service at the Children’s Hospital at Westmead, Sydney, Australia (2006-2016) were analysed to determine: (1) the proportion of children who scored below average (‘at risk’ or ‘delayed’) on routine, standardised developmental assessment; and (2) whether there were associations between performance on early developmental assessment and later neuropsychological measures.

**Results.** 49% of children with SB and hydrocephalus were deemed to be “at risk” or “delayed” in their cognitive skills. Of those below average on a cognitive screener, 67% also scored below average on IQ and 50% on a measure of executive functioning when tested at school age.

**Conclusion.** The large portion of pre-school aged children with SB and hydrocephalus who scored below average with respect to their early cognitive development indicates that cognitive delays can be detected earlier in development than previously reported. A high proportion of children who display early cognitive delay also show cognitive deficits in the school years. This highlights the need to consider early multi-disciplinary intervention that focuses on the child’s cognitive development in addition to their physical challenges.
**Modelling perinatal stroke in the rat: middle cerebral artery occlusion versus endothelin injection to the sensorimotor cortex.**

Newcastle University, NEWCASTLE UPON TYNE, United Kingdom

**Introduction:** In human neonates perinatal stroke is a significant cause of hemiplegic cerebral palsy and a suitable animal model is needed to test early intervention. We compared middle cerebral artery occlusion (MCAO) with injection of reversible vasoconstrictor endothelin-1 (Et-1) at postnatal day 12, comparable to birth in human.

**Methods:** Experiments carried out under UK government licence. Either the left middle cerebral artery was exposed by craniotomy (temporal bone) and electro-coagulated, or 400 pmol of Et-1 was injected at three sites in the sensorimotor cortex unilaterally. Appropriate sham procedures were also performed. Some animals later received injection of retrograde tracer to the contralateral cervical spinal cord. Most animals underwent cylinder and grid-walking tests following weaning. Immunohistochemistry was performed on brains sections from some animals 2-5 days post-surgery.

**Results:** In the MCAO model, hypoxia inducible transcription factor and activated microglia immunoreactivity was restricted to lateral cortex close to the occlusion site, but in the Et-1 model it was expressed in more dorsal sensorimotor cortex. Retrograde tracing showed depletion of corticospinal neurons at the Et-1 induced lesion site but an increase in labelled corticospinal neurons in contralateral cortex, compared to shams. However, no significant behavioural deficits were detected in either model. Conclusion: MCAO in rats does not primarily affect sensorimotor cortex as it would in humans. Et-1 injection produces a more appropriate model, including corticospinal projection reorganisation reported in human hemiplegics. It remains to be determined if failure to detect behavioural deficits reflects poor choice of test or nervous system plasticity.

**Monitoring of hip problems in Cerebral Palsy; is the 2007 guideline followed?**

N.W.M. Siebers1, E.J.K. Boldingh1, C. Bouwhuis1, D. Wezenberg1, T.P.M. Vliet Vlieland2
1Sophia Rehabilitation Centre, THE HAGUE, The Netherlands
2Leiden University Medical Centre, LEIDEN, The Netherlands

**Introduction**
In children with spastic cerebral palsy (CP) hip disorders are one of the most frequently occurring complications. The 2007 Dutch guideline for monitoring and intervention of hip disorders in CP emphasizes the importance of determining the migration percentage of the femoral head using X-ray imaging in children. Current study aims to determine the frequency of X-ray images and documentation of migration levels.

**Patients and Methods**
Patients registered in a rehabilitation center in the Netherlands with diagnosis of CP, and aged ≤12 years at moment of data extraction, were included (n=126). Of these patients information about the presence of X-ray images and associated migration percentage was obtained from the medical records.

**Results**
In 78 of the 126 included patients (61.9%) an X-ray image was taken. In 13 (16.7%) cases this X-ray was performed within the recommended age range 12-18 months. In one of these 13 patients information on the migration level of the femoral head was documented. When considering all X-ray images (n=282) preformed, migration of the femoral head was documented in 119 (42.2%) of all cases. Patients aged 12 months at time of implementation of the guideline were equally likely to have had an X-ray as the older generation.

**Conclusion**
In the majority of children with CP children the presence of X-rays is not registered in the medical records and, if available, their description is incomplete. As a result more awareness of the importance of adequate monitoring of hip deformities using X-ray images and its documentation is warranted.

**Applications of Optical Coherence Tomography (OCT) in a neurological pediatric population: preliminary data**

A. Trabacca1, E. Lucarelli1, F. Craig2, M. Ciccarelli1

1Sophia Rehabilitation Centre, THE HAGUE, The Netherlands
2Leiden University Medical Centre, LEIDEN, The Netherlands
Introduction The development of Optical Coherence Tomography (OCT) permits the pediatric neuroscientist to visualize and quantify the retinal nerve fiber layer (RNFL) with unprecedented resolution. Recent years have seen an increase in the use of RNFL evaluation as an easy-to-use, reproducible, proxy-measure of brain structural abnormalities. The current study aims to investigate RNFL thickness in children with neurological or neurodevelopmental disorders, in order to obtain diagnostic and prognostic outcomes in specific pediatric diseases.

Patients and methods Twenty children with neurodevelopmental disorders or neurological disorder were subjected to neuropsychological, ophthalmomologic, and neuropsychological evaluation, visual evoked potentials (VEP), and OCT by Spectralis (Heidelberg Engineering).

Results A reduced global RNFL thickness were found in five children with spastic paraplegia. Three children with microcephaly showed a reduced global, inferior and nasal RNFL. No significant reduction was found Autism Spectrum disorder (N=3), motor coordination disorder (N=5), intellectual disability (N=2), neuromuscular disorders (N= 2).

Conclusion The preliminary data suggest that RNFL evaluation could help in the development of biological markers of spastic paraplegia and microcephaly pathophysiology. These preliminary data are included in a three-year study began in June 2016. We plan to broaden the sample and identify possible correlations between RNFL thickness and neuropsychological impairments.

Prevalence of vitamin D disbalance among cerebral palsy children and adolescents

P. Diaz Borrego 1, B. Romero Romero 2, M.D. Romero Torres 3, M. Rodriguez-Piñero Durán 1, J.A. Conejero Casares 1

1 Servicio Andaluz de Salud, SEVILLE, Spain
2 University Hospital Virgen Macarena, SEVILLE, Spain

INTRODUCTION:
Vitamin D deficiency has been associated with skeletal and extra-skeletal outcomes. The aim of this study is to determine the prevalence of 25-OH-vitamin D disbalance among cerebral palsy children (CP) in Virgen Macarena Health Area and to analyze the relationship with other musculoskeletal conditions.

PATIENTS AND METHODS:
A cross-sectional study. Analysis of a consecutive sample of CP children attending an outpatient Pediatric Rehabilitation Clinics. Data collection: demographic data, Gross Motor Function Classification System (GMFCS), Manual Ability Classification System (MACS), Body Mass Index (BMI) adapted for CP patients, 25-OH-vitamin D blood levels (deficient: under 10ng/ml, insufficient: 10-30ng/ml, sufficient: 30-50ng/ml, desirable: more than 50ng/ml), and musculoskeletal features. Blood analysis was carried out at the end of summer.

RESULTS:
20 CP patients. Mean age: 8 (range from 3 to 18 years). Gender: female 60%. GMFCS: IV-V levels 55%, MACS: IV-V levels 40%. BMI: normal weight 78%. The mean 25-OH-D blood levels among children was 29,6ng/ml (sufficient level), range from 25 to 46,9ng/ml. No found desirable levels in the sample. There wasn’t correlation among GMFCS, BMI and vitamin D levels. One non-traumatic bone fracture.

CONCLUSIONS:
There’s not a high prevalence of vitamin D deficiency among CP children in our area. But 25-OH-vitamin D blood levels were lower than desirable ones, even blood extractions were done in summer season. Because of that, the vitamin-D deficiency risk is suspected to be multifactorial. We recommend blood control in CP children and regular exposure to sunlight or vitamin D supplementation as preventative measures.

Developmental function in infants with Congenital Heart Disease: influence of Personal and Environmental factors

M. Silva 1, M. dr Jones 2

1 Evelina London Children's Hospital, LONDON, United Kingdom
2 Brunel University, UXBRIDGE, United Kingdom

Introduction: Previous research has shown the home environment significantly influences infant’s motor and cognitive development. Infants with Congenital Heart Disease (CHD) are considered to be at high risk of developmental delay (DD) following cardiac surgery. This study aims to investigate a relationship between environmental factors, personal factors and developmental function (DF) in infants with CHD prior to cardiac surgery. Patients and Methods: In this quantitative observational cross-sectional study, a convenience matched
sample of 17 term infants with CHD (11 females; mean age = 8.43 ± 5.01 months) and their parents was used. Infants were recruited from 3 out-patient cardiac clinics at the Royal Brompton Hospital from May to September 2013. Infants were assessed with the Bayley Scales of Infant and Toddler Development 3rd edition (BSID-III). Parents completed the Affordances in the Home Environment for Motor development – Infant Scale (AHEMD-IS), the Bayley Socio-Emotional and Adaptive Behaviour questionnaire and a questionnaire developed by the author. Results: Approximately half of infants assessed presented with DD, particularly affecting their gross motor and receptive language (47.1%). Male infants presented with lower BSID-III language scores. Poorer language function was also present in infants who had a previous hospital admission. Conclusions: Infants with CHD may present with DD prior to cardiac surgery and should be considered for regular developmental screening. Although limited correlations between DF and home affordances function were found, various personal and environmental factors were related to poorer developmental function. Further research is needed to investigate further factors contributing to DD in this population.

**PP-174**
Poster presentation
Poster session 2 - timeslot 1

**Using consensus methods to determine which early-motor signs should prompt referral for diagnosis of cerebral palsy.**
Z.B. Boychuck¹, J. Andersen², D. Fehlings³, A. Kirton⁴, M. Oskouï⁵, M. Shevell⁶, A. Majnemer⁷
¹McGill University, MONTREAL, QUEBEC, Canada
²Glenrose Rehabilitation Hospital, EDMONTON, Canada
³Holland Bloorview Kids Rehabilitation Hospital, TORONTO, Canada
⁴Alberta Children's Hospital, CALGARY, Canada
⁵Montreal Children's Hospital - McGill University Health Centre, MONTREAL, QUEBEC, Canada

**Introduction**
Early-identification and early-intervention is considered best-practice for children suspected of having cerebral palsy (CP). An environmental scan of referral practices of physicians across Canada demonstrated that primary care practitioners refer for diagnosis significantly later than medical specialists, and that certain subsets of children with CP are experiencing significant delays. This study is part of a larger integrated knowledge translation (iKT) project aiming to decrease these delays by increasing awareness of the early motor signs of CP amongst primary care practitioners and parents. The objective of this study was to generate the content for an educational iKT intervention.

**Methods**
Nominal group technique was conducted to answer: “What early clinical signs or attributes of CP should prompt referral for diagnosis?”. Participants (n=13) included content-experts (pediatric neurologists, developmental pediatricians, rehabilitation specialists, researchers) and knowledge-users (primary care physicians, parents of children recently-diagnosed with CP).

**Results**
Six attributes were identified that should prompt referral for diagnosis: Early handedness < 12 months; stiffness or tightness in the legs between 6-12 months; persistent listning > 4 months; persistent head-lag > 4 months; delayed sitting/not sitting unsupported > 9 months; any asymmetry. Also, two attributes were identified that should be considered as ‘warning signs’: Persistent startle reflex > 6 months; consistent toe-walking or asymmetric > 12 months.

**Conclusion**
Knowledge-translation tools are urgently needed to assist primary care providers in the early detection of CP. Following validation of the content using international experts as part of a Delphi process, a user-friendly tool will be developed.

**PP-175**
Poster presentation
Poster session 2 - timeslot 2

**Impact of Early Intensive Rehabilitation in Children with Developmental Delay**
S.S. Yang, M.S. Jeon, B.O. Kim
Chungnam National University Hospital, DAEJEON, South-Korea

**Introduction**: To know the effectiveness of early intensive developmental intervention on functional outcomes in children with delayed development **Patients and methods**: Records of 99 pediatric patients who received intensive developmental intervention at day hospital from 2014 to 2016 were reviewed. We categorized children as 3 age groups and 4 diagnostic groups. GMFM, developmental evaluation with BSID-3rd edition or Denver Developmental Screening Test (DDST) and weeFIM® were scored before and after the intervention of 13-weeks. Statistical analysis were done between 4 diagnostic groups (group A: Cerebral palsy due to HIE, group B: Other brain injury, group C: Genetic disorder, group D: Unknown origin of developmental delay) and 3 age groups (group 2: from 12 months to 24 months of age, group 3: from 25 months to 36 months of age, group 4: from 37 months to 72months of age).
Result: Children who got the intensive rehabilitation program showed the improvements of functional outcomes, regardless of whether they were any diseases category or age group. Especially there were significant improvements of GMFM, wee FIM score and all subsets of BSID. Children less than 24 months of age showed more improvement in BSID (gross motor subset) and GMFM than other groups. (p<0.05) There were no differences between different diagnostic groups about amount of improvement of GMFM, wee FIM, DDST, BSID scales.

Conclusion: These findings suggest us that the intensive developmental intervention program based on day hospital may be toward toddler or the younger age of children.

PP-176
Poster presentation
Poster session 2 - timeslot 3

Muscle elastography using arfi imaging in congenital muscular torticollis
M.S. Jeon1, S.S. Yang1, J.S. Jung2
1Chungnam National University Hospital, DAEJEON, South-Korea
2Hallym University Sacred Heart Hospital, HWASUNG, South-Korea

Objective: To investigate the Sternocleidomastoid muscle (SCM) stiffness through elastography using acoustic radiation force impulse (ARFI) imaging and to inquire the relationship between the severity of muscle stiffness and cervical range of motion (ROM) in infants with congenital muscular torticollis.

Subjects and Methods: 19 babies less than three months old who had muscular neck mass were enrolled in the present study. ARFI imaging was obtained by one physiatrist using an ultrasonography system with 9L4 linear transducer (Virtual Touch Imaging, ACUSON S2000 Ultrasound Unit, Siemens, Mountain View CA) at first visit and 3-month after diagnosis. Shear-wave propagation velocity (meter per second) was measured by scanning the longitudinal plane on bulbous portion of SCM. We also measured thickness of SCM mass through ultrasonography and cervical range of motion using arthrodial goniometer. Wilcoxon signed rank test was used to compare shear-wave propagation velocity between bilateral SCM muscles and simple correlation analysis was used to inquire the relationship between variables.

Result: The initial mean transverse diameter of affected muscles was 12.21±2.68mm and the mean shear-wave propagation velocity was 2.35±0.46m/sec. Shear-wave propagation velocity of affected muscle is significantly higher than that of unaffected muscle (p<0.05). As ROM of neck increased, the shear-wave velocity was reduced significantly after 3 months in spite of remaining mass (p<0.05).

Conclusion: ARFI elastography could reflect the stiffness of tumorous sternocleomastoid muscles in congenital muscular torticollis. It might be helpful to predict the improvement of cervical ROM.

PP-177
Poster presentation
Poster session 2 - timeslot 4

Early intervention in infants with down syndrome through the caretoy system: a pilot study
E. Inguaggiato1, G. Sgandurra1, S. Bargagna2, E. Beani1, M. Orlando1, G. Cioni2
1IRCCS Fondazione Stella Maris, CALAMBRONE, PISA, Italy
2IRCCS Fondazione Stella Maris, University of Pisa, CALAMBRONE, PISA, Italy

Introduction
Down Syndrome (DS) is the most common genetic cause of intellectual disability. Early Intervention (EI) programs seem to improve their neurodevelopmental outcomes. The CareToy system (CT, www.caretoy.eu) is an innovative tool that allows to provide highly customized, home-based EI in the first year of life. CT system has been recently validated in preterm infants through an RCT study showing positive short-term effects. The goal of this pilot study was to evaluate the feasibility of the use of CT in infants with DS.

Patients and Methods
Infants with DS aged 3-9 months were recruited and allocated in the CT or in the SC group. CT group performed CT training added to ordinary care for 4 weeks while SC group followed the ordinary care. All children were assessed with Infant Motor Profile (IMP) before (T0), after the CT training/SC period (T1) and in follow-up (T2, 4 weeks after T1).

Results 5 infants were allocated in the CT group and 5 infants in the SC one. All infants allocated in the CT group performed CT activities. The library of CT activities was suitable for infants with DS; parents and infants reported good compliance to CT intervention. Preliminary results were promising: the mean difference changes in IMP total score, over the intervention period, were higher in the CT vs SC group.

Conclusions The CT System seems to be a feasible device to provide EI also in infants with DS. A study to evaluate the effectiveness of the CT intervention versus SC has been already planned.

PP-178
A pilot study to evaluate the usefulness of a screening questionnaire in assessing feeding problems & undernutrition in children with CP

J. Kraus
University Hospital, PRAGUE, Czech Republic

Introduction: Feeding issues are common in children with cerebral palsy (CP). Objective: To determine if a screening questionnaire could be helpful in detecting (early) feeding issues & undernutrition. Patients and methods: Parents of 201 children with CP, aged 1-18 (median 7) years were asked to complete a new screening questionnaire which covered 5 categories: respiratory issues, duration of feeding, stress at mealtimes, body weight and gastrointestinal issues. Items were indicated as ‘yes’/‘no’, where ‘yes’ was considered a ‘red flag’. Demographic and clinical data included age, CP type, Gross Motor Function Classification System (GMFCS), weight & arm circumference. Ordinal logistic regression and logistic regression were used to look at the association between GMFCS and presence of ‘red flags’. Results: GMFCS included, I = 14.4%, II = 28.4%, III = 14.9%, IV = 25.4%, V = 16.9%; hemiplegic 16.4%, diplegic 32.8%, triplegic 5.5% and quadriplegic 44.8%. 85(42.3%) children had at least one red flag with ‘respiratory issues’ 33(16.4%), ‘stress at mealtimes’ 26(12.9%), ‘weight loss’ 19(9.5%), ‘gastrointestinal issues’ 17(7.5%). Having a red flag was significantly associated with higher GMFCS score; proportional odds ratio (POR) = 2.3(95%CI:1.8-3.0) and significantly increased with each additional limb affected POR = 1.8(95%CI:1.4-2.3). Increased weight (kg) (OR = 0.97;95%CI:0.95-0.99) and arm circumference (OR=0.91;95%CI:0.82-1.00) were associated with fewer red flags. Conclusion: This screening questionnaire appeared helpful in detecting children most at risk of feeding issues (and undernutrition). Further studies including validation, are recommended to confirm the usefulness of this questionnaire in practice.

Acknowledgements: Garvey J., at Nutricia for her support.

PP-179
Poster presentation
Poster session 2 - timeslot 2

The dynamic thumb-in-palm pattern in children with spastic cerebral palsy and its effects on hand function

J.Y. Choi1, E.S. Park1, S. Jung2
1Severance Hospital, Yonsei University College of Medicine, SEOUL, South-Korea
2Dongtan Sacred Heart Hospital, Hallym University College of Medicine, HWASEONG, South-Korea

Introduction: Dynamic thumb-in-palm (TIP) pattern is common and complex problem in children with spastic cerebral palsy (CP). The aim of the study is to investigate the patterns of dynamic TIP in children with spastic CP and the effects of dynamic TIP on upper arm function.

Patients and methods: Prospective, cross-sectional study with 106 children with spastic CP and dynamic TIP. House TIP classification while grasping a small/large object, manual ability classification system, modified House functional classification, Melbourne assessment of unilateral upper limb function (MUUL), Shriners Hospital Upper Extremity Evaluation for hand (SHUEE), Zancolli classification, and degree of swan neck deformity were assessed.

Results: House TIP Types I and II can be subdivided when considering the condition of the interphalangeal (IP) joint. The hand functions were significantly different between the subtypes of type I. In addition, there were significant differences in hand function between the four types of House TIP classification. The type I pattern had the highest MUUL score. The SHUEE thumb segment assessments were more strongly correlated with MUUL score than with TIP severity.

Conclusions: The House TIP classification is useful for categorizing the abnormal pattern of TIP; however, its subdivisions are needed when considering the IP joint. In addition, in children with spastic CP, the thumb SHUEE assessments seem to be useful in assessing the impact of dynamic TIP on hand function.

PP-180
Poster presentation
Poster session 2 - timeslot 3

Natural evolution of gait in children with Hereditary Spastic Paraplegia

A.V. van Campenhout, E. Papageorgiou, P. Neut, K. Desloovere
KU Leuven, PELLENBERG, Belgium

Introduction Hereditary spastic paraplegia (HSP) is a group of inherited neurodegenerative disorders characterized by lower limb spasticity and muscle weakness leading to progressive gait problems. The natural evolution of their gait has not been documented by means of consecutive 3D gait analysis (GA). Patients and Methods: HSP children who received at least two 3D GAs with minimal follow-up of 4 years, without intervening surgery or ITB pump were included. The primary outcome measure was the Gait Profile Score (GPS) with Movement Analysis Profile (MAP)
and selected gait parameters as secondary outcome measures.

Results: 13 of 106 HSP patients fulfilled all inclusion criteria; 4 SPG3A, 3 SPG4 and 6 unknown genetic diagnosis. At baseline (age average 7.8 y) GPS was 8.96 (±3.9) with the MAPs mostly elevated for all levels in the sagittal plane and for hip and foot in the transverse plane. At 5.3y (range 4-9y) follow-up, GPS increased significantly to 13.34 (±5.1), representing a decline in gait. Gait was significantly slower with more hip and knee flexion during stance and more internal foot progression. There was no significant correlation between genetic diagnosis and gait evolution, although only 1 of the 4 SPG3A patients had a worsening gait at follow-up in comparison to 6 out of 10 children with other diagnosis. Conclusion: Children with HSP showed a decline in gait, mostly in the sagittal plane, leading to a slower and more flexed gait. A larger group is required to confirm the trend that children with SPG3A might have a better prognosis.

PP-181
Poster presentation
Poster session 2 - timeslot 4

Relationship of well-known hand classification systems (Zancolli and House Thumb) with unilateral upper limb capacity and bimanual performance in children with unilateral cerebral palsy.
A.J.M. Schreven
Radboud University Nijmegen, NIJMEGEN, The Netherlands

Introduction
This study investigates whether well-known hand classification systems, which can be used instantly, are predictive of unimanual capacity and bimanual performance in children with unilateral cerebral palsy. Secondly, we investigated if the relationship between unimanual capacity and bimanual performance is dependent on the overall level of manual functioning in these children.

Patients and methods
In this historic cohort study, 73 children with unilateral cerebral palsy, aged 2–16 years (median 7.7 years), were included. Unimanual capacity and bimanual performance were measured as dependent variables using the Melbourne Assessment of unilateral Upper Limb Function (MUUL) and the Assisting Hand Assessment (AHA), respectively. Independent variables were the Zancolli classification for wrist deformity and the House Thumb classification for thumb deformity. The MACS (Manual Ability Classification System) evaluated overall level of manual functioning. One-way ANOVA and linear multivariate regression were used for analysis.

Results
A significant linear trend was found between the Zancolli and both the MUUL and the AHA. Zancolli, age and sex accounted for 70% of the variance of the MUUL. Zancolli and sex explained the AHA variance by 61%. The House Thumb classification was excluded from the model because no specific trend was found. The correlation between the MUUL and the AHA was not significantly different for separate MACS levels.

Conclusion
The Zancolli classification can be used to predict the outcome of the MUUL and the AHA, which allows clinicians to better inform parents and select diagnostic tests more specifically when treating children with unilateral cerebral palsy.

PP-182
Poster presentation
Poster session 2 - timeslot 1

Can initial assessment findings predict future mobility of children with spina bifida?
A. Botman1, S. Taylor1, R. Quinlan1, R. Harris2, M. Paulka2, V. Pacey1
1The Children's Hospital at Westmead, WESTMEAD, Australia
2Macquarie University, SYDNEY, Australia

Introduction
Current evidence suggests motor lesion level, orthopaedic surgery and ventriculoperitoneal shunt (VPS) history predict future mobility in children with Spina Bifida (SB). This study aims to determine whether physical assessment findings and comorbidities before three months of age can predict the peak mobility level a child with SB can achieve prior to starting school.

Patients and methods
Retrospective data of modified manual muscle testing results, congenital lower limb deformity, demographic and medical characteristics for all children with SB managed at the Children’s Hospital at Westmead, Sydney, Australia (2005 – 2015) were collected. Stepwise multiple regression was undertaken to ascertain whether any combination of findings could predict future mobility.

Results
54 children (34 male) with lumbosacral level SB (37 myelomeningocele, 14 lipomeningocele, 3 meningocele) were included. 82% of the variance in the age walking commenced could be accounted for by VPS status, ankle plantarflexion and knee extension strength. Hip and knee extensor strength predicted 51% of the variance in the
peak mobility a child achieved before starting school, assessed with the Hoffer Scale. The addition of VPS status raised the predictability to 62% of the variance when the Hoffer Scale was modified to account for orthotic use (all p<0.05).

**Conclusion**
The presence or absence of a VPS and hip, knee and ankle strength before three months of age can explain significant variance in the future mobility status of a child with SB. These findings may increase clinicians' confidence to predict a child's future mobility when assessing the neonate with SB.

**PP-183**
Poster presentation
Poster session 2 - timeslot 2

**Using initial physical assessment findings, it is possible to predict the age a child with spina bifida will commence independent walking: a retrospective chart audit**
A. Botman1, R. Quinlan1, S. Taylor1, M. Paulka2, R. Harris2, V. Pacey1
1The Children's Hospital at Westmead, WESTMEAD, Australia
2Macquarie University, SYDNEY, Australia

**Introduction**
The majority of research into predictors of walking in children with Spina Bifida (SB) has focused on the maximum ambulation that is achieved based on physical assessment findings obtained after walking has already commenced. Predictors of age of walking are unknown, but important to inform clinical practice. This study aims to investigate whether physical assessment findings in the first two months of life of a child with SB can predict the age of independent walking.

**Patients and methods**
Retrospective data of initial modified manual muscle testing results, congenital lower limb abnormalities, and demographic and medical characteristics for 51 children (28 male) with SB managed in the Spina Bifida Service at The Children’s Hospital at Westmead, Sydney, Australia (2005-2015) was collected. A stepwise linear regression was performed with the age that walking was achieved as the dependent variable and type of SB, level of SB, congenital abnormality of hip, knee or foot, hydrocephalus, VP shunt, and the presence of neurogenic bladder or bowel as the independent variables.

**Results**
All children in the study achieved independent walking between 9 and 36 months. 83% of the variance in age of achieving walking was predicted by three factors: ankle plantarflexion strength, VP shunt history and knee extension strength (p<0.05).

**Conclusion**
Children who have better ankle plantarflexion and knee extension strength, in the absence of a VP shunt, will achieve walking earlier in life. These findings may assist in the management of patients with SB in order to reach their maximal mobility potential.

**PP-184**
Poster presentation
Poster session 2 - timeslot 3

**The effects of gestational age on Bayley III Scale in preterm infants at corrected 12 months of age**
B. Kepenek-Varol1, M. Caliskan2, E. Eraslan2, Z. Ince2
1Bezmialem Vakif University, ISTANBUL, Turkey
2Istanbul University, ISTANBUL, Turkey

**Introduction:** Prematurity is the most important risk factor for abnormal neurological outcomes. The latest revision of Bayley III Scale is commonly used to identify infants at risk for developmental impairment and includes distinct composite scores; cognitive, language, and motor. The aim of this study was to compare the scores of Bayley III Scale between moderate preterm and extremely preterm infants at corrected 12 months of age. Patient and methods: Nine moderate preterm (range: 25-31 weeks) and 11 extremely preterm infants (range: 32-33 weeks) were included in the study. Mean ages of moderate and extremely preterm infants was respectively, 27±2.04 and 32.4±0.5. The latest revision of Bayley III Scale was used to assess motor, cognitive, and language development for each infant. Mann-Whitney U test was used to compare differences between Bayley III scores of moderate and extremely preterm infants. Results: No statistically significant difference was found in cognitive (p=0.609), language (p=0.579), and motor (p=0.594) parameters of Bayley III Scale between moderate and extremely preterm infants. Conclusion: We found no significant differences between moderate and extremely preterm infants in the present study. It was a limitation of our study was that we could not recruit more patients and studies should be done with more cases in the future.
**PP-185**

Poster presentation  
Poster session 2 - timeslot 4

**Spontaneous arm movements and asymmetrical development in infants with perinatal stroke**  
J.C. Heathcock, A. Chaudhari, J. Mazzerella, M. McNally  
The Ohio State University, COLUMBUS, United States of America

Introduction: Infants with perinatal focal stroke (PS) are at high risk for hemiplegic cerebral palsy (CP). Asymmetrical development of tone, posture, and function are prominent in the arms as movements like reach-and-grasp become more refined in the second year of life. The objective of this study was to determine if spontaneous asymmetrical arm movements could be measured with clinical behavioral and biomechanical methods at 2 months of age, well before common ages of diagnosis of hemiparetic CP.

Methods: Thirty-nine full-term infants (19 with PS & 20 with typical development (TD)) participated. PS was confirmed with MRI. Infants were seated in a custom made chair with a secure strap that allowed free movement of the arms at 8 and 10 weeks of age. Six standardized 30-second trials were completed to elicit arm movements using social- or toy-encouragement. Video recordings, biomechanical analysis with a 10-camera VICON motion capture system, and the Bayley-III were used to measure fine motor skills and arm asymmetry.

Results: Differences between groups are reported with TD performing better than PS. One-way ANOVA revealed a statistical difference (P<.05) between group for distance (1955 mm), average velocity (33 mm/s), peak velocity (55 mm/s), and number of movement units (2 MU, coordination) and a trend (P< .1) between sides (asymmetry) on the Bayley-III.

Conclusions: Assessments and interventions could target previously unknown deficits observed at 2 months of age such as velocity, coordination, and asymmetry to accurately assess and support optimal reach-and-grasp development.

**PP-186**

Poster presentation  
Poster session 2 - timeslot 1

**A First Observational Study in the CARE Lab: Toward a Novel Approach in Pediatric Rehabilitation**  
I. Olivieri, P. Meriggi, A. Castagna, M. Mazzola, M. Mandra, T. Lencioni, C. Fedeli, E. Brazzoli, A. Marzegan, M.L. Rodocanachi Roidi  
IRCCS Fondazione Don Carlo Gnocchi Onlus, MILANO, Italy

**Introduction**  
The technological evolution, in particular virtual reality, is playing a key role in the upcoming change in clinical and pediatric rehabilitation (PR) field. To foster the positive outcome in PR in using hi-tech solutions, a CARE (Computer Assisted REhabilitation) Lab, and a suitable software architecture, VITAMIN (VIrtual realiTy plAtform for Motor and cognItive rehabilitatioN), have been realized in our center.

**Patients and methods**  
Six subjects (10±2 years) with hemiparetic cerebral palsy, two subjects with Manual Ability Classification System score II and four subjects with score III.

**Rehabilitation protocol**  
Ten weekly sessions: rehabilitation games (VITAMIN) designed to improve frontal and lateral reaching with paretic upper limb, and other exercises for prono-supination and tracking movements (VRRS-Khymeia).

**Assessment protocol:**  
Melbourne Assessment of Unilateral Upper Limb Function scale (MA2)  
Range of Motion (ROM), Modified Ashworth scale (MAS); Abilhand-kids  
Kinematic (optoelectronic) and electromyographic analysis  
Satisfaction self-report questionnaire

**Results**  
All subjects improved the final score in MA2 (Median Values @T0: 61.1%, 92.0%, 52.6%, 52.4%. @T1: 81.5%, 96.0%, 65.8%, 61.9%). Active ROM, MAS, and Kinematic assessment (e.g. in similarity indexes, compared to healthy children, of the Flex/Ext of Shoulder joint). The user satisfaction questionnaire reported an increase in functionality as by the caregivers at T1.

**Conclusion**  
Despite the limited subjects and sessions’ number, the increase as appear in the assessments at T1 seems to sustain the efficacy of quantitative personalized gaming approach in PR. Adequate and larger studies are required to validate this novel approach, and extend it to the home settings.

**PP-187**
Assessing gait asymmetry in unilateral spastic cerebral palsy
A. Ledebt1, C.K.M.R. Formiga2, G.J.P. Savelbergh1
1VU University Amsterdam, AMSTERDAM, The Netherlands
2State University of Goiás, GOIANIA, Brazil

Introduction
Unilateral cerebral palsy (UCP) is often associated with asymmetric gait patterns although at variable degrees. Recent literature in patients with stroke or leg amputation revealed that step length alone is not a valid indicator as it may mask asymmetries for foot placement and trunk progression. The aim of this study was to investigate the symmetry of gait according to three spatial indices including step length asymmetry (SLA) and its two components, trunk progression asymmetry and forward foot placement asymmetry in individuals with UCP.

Patients and Methods
The study included 37 participants aged between 5 and 16 years with unilateral spastic cerebral palsy. They were all able to stand and walk independently without the use of assistive devices for walking (GMFCS level I and II). Three-dimensional coordinates of pelvis, thigh, leg and feet were recorded by a 06 Pulnix® infrared cameras (sample rate 120 Hz).

Results
Only 7 of the 37 participants showed a symmetric gait according to all three indices. For the other 30 participants, asymmetry was present and as expected, showed a large variation in orientation and magnitude across participants: 10 participants showed no SLA whereas trunk progression and/or forward foot placement were asymmetric; and 20 others, showed variable direction of SLA, either with shorter or larger steps on the affected side.

Conclusion
These results imply that calculating trunk progression and forward foot placement may be more useful than step length alone in revealing the different solutions adopted by individuals with CP to cope with their impairments.

Integrated assessment of locomotor activity with wearable sensors and functional electromyography in Rett syndrome
M. Dipaola1, V.F. Gestra2, E.E. Pavan3, F. Scotti2, C.A. Frigo3, P. Cavallari1, M.L. Rodocanachi Roidi2
1Università degli studi di Milano, MILAN, Italy
2IRCCS Fondazione Don Carlo Gnocchi Onlus, MILAN, Italy
3Politecnico di Milano, MILAN, Italy

Introduction
In Rett syndrome (RTT) the progressive loss of walking is one of the most disabling symptom. Gait is characterized by ataxia, apraxia and, sometimes, dynamic equinus foot. As RTT girls have great difficulties in the execution of a task on command, the use of wearable sensors can open new perspectives in understanding gait abnormalities and better define motor intervention.

Patients and Methods
We enrolled eight RTT children (mean age 10 ± 4 years) able to walk unassisted and eight healthy control subjects (mean age 10 ± 4 years). Clinical evaluation was performed using the Rett Assessment Rating Scale (RARS_Body; mean value 1.65 ± 0.63). A surface electromyography (EMG) system (FREEEMG 1000 BTS s.r.l., Italia) was used to record muscle activity of soleus, tibialis anterior, biceps femoris, rectusfemoris e gluteus maximus muscles in both legs. An IMU sensor (BTS G-WALK s.r.l., Italia) was positioned on the lower back (L5), synchronized with the EMG system to recognize each stride. All subjects were instructed to walk barefoot spontaneously after a vocal prompt along a straight trajectory about 11.5m long. The EMG activity in each stride was assessed and compared to healthy subjects.

Results
RTT children showed an altered locomotor pattern characterized by a segmented and dyssynergic EMG activity, particularly in distal segments, non functional to the execution of the step. Moreover, spasticity and tonic activation were recorded in the antigravity muscles.

Conclusion
Our preliminary results encourage the identification of specific physio-pathological EMG pattern to better define motor rehabilitation programs in RTT.
Sensitivity of an upper limb motion analysis protocol to changes in kinematics and muscle activity after constraint induced therapy in children with hemiplegia

A. Sarcher1, S. Brochard2, M. Raison2, F. Leboeuf1, B. Perrouin-Verbe1, G. Letellier5, R. Gross1
1University Hospital of Nantes, NANTES, France
2University Hospital of Brest, BREST, France
3École Polytechnique de Montréal, MONTRÉAL, Canada
4University of Salford, SALFORD, United Kingdom
5Établissement de Santé pour Enfants et Adolescents de la région Nantaise, NANTES, France

Introduction: Quantified evaluation of the motor function improvement of the involved upper limb (IUL) of hemiparetic children after constraint-induced movement therapy (CIMT) is currently lacking. The objective is to discuss the validity of an upper limb motion analysis protocol to quantify this improvement.

Patients and methods: This preliminary study includes 5 hemiparetic children who followed a CIMT within a rehabilitation center and 3 typically developing (TD) children. The upper limb motion analysis protocol was followed 1 month before and after CIMT for hemiparetic children and twice a week apart for TD children to evaluate its reliability. The protocol involved performing active simple upper limb movements. Upper limb kinematics was computed from the positions of 29 markers. Activation from 8 upper limb muscles was recorded by surface EMG.

Statistical parametric mapping (SPM) was used for statistical analysis.

Results: Reliability of the protocol in TD children was excellent: SPM found no statistical differences inter session, and ratio “inter session error” - “inter trial error” was above 0.80 for all kinematics and muscle activation data, meaning that experimental errors were low. Preliminary results for one hemiparetic child showed that she had a reduced supination active range of motion (AROM) and an antagonist activation of the pronator quadratus during supination compared to TD children. After CIMT, SPM found an improvement of her supination AROM, but no differences for biceps, pronator teres and pronator quadratus activation.

Conclusion: The proposed upper limb motion analysis protocol was reliable, useful for diagnosis and sensitive to changes after CIMT.

PP-190
Poster presentation
Poster session 2 - timeslot 1

Does intensive bimanual training improve upper extremity range of motion in children with unilateral cerebral palsy?

D. Ebner-Karestinos
Université Catholique de Louvain, BRUSSELS, Belgium

Introduction: Hand and arm bimanual intensive therapy including the lower extremities (HABIT-ILE) has demonstrated improves in functional abilities in children with unilateral spastic cerebral palsy (USCP). However, it is unknown whether this intervention may improve children’s upper extremity (UE) range of motion (ROM). We aimed to investigate the effect of HABIT-ILE on the more-affected UE ROM in children with USCP.

Patients and methods: This retrospective study is based on the data of 21 children with USCP (16 girls; mean age 9.16±1.74 years) who participated in an RCT, involving 90 hours of HABIT-ILE over 10 days. Using a standard goniometer, passive (pROM) and active (aROM) ROM, and angle of catch (AoC) were assessed on the wrist, elbow, forearm and shoulder joints of children’s more-affected UE. These measures were assessed twice before intervention and once after.

Results: Test-retest reliability was measured through ICCs on all measures (p<0.012), with a maximum mean difference between the 2 initial assessments of 2.18°. Significant increases of pROM in wrist extension with fingers kept extended (mean change±SD: 15.52±15.81; p<0.01) and with fingers kept flexed (13.71±17.25; p=0.002) were observed. The aROM increased in wrist extension with fingers kept extended (22.43±24.27; p<0.001), flexed (9.33±12.16; p=0.002) and in forearm pronation (17.40±21.28; p=0.029). The AoC increased only in wrist extension with fingers kept extended (9.20±6.56; p=0.002).

Conclusion: HABIT-ILE not only improves functional abilities but also increases ROM of the more-affected wrist in children with USCP. This increase in aROM and pROM might alleviate spasticity as shown by the AoC increase.

PP-191
Poster presentation
Poster session 2 - timeslot 2

New data- based including on additional, modern related biologic parameters- regarding possible relationships between bones' metabolic status and functional impairments, in children with cerebral palsy

C.G. Morcov1, L. Padure2, G. Onose3
1Dr. Nicolae Robanescu National Pediatric Rehabilitation Centre, BUCHAREST, Romania
2, Carol Davila, University of Medicine and Pharmacy, BUCHAREST, Romania

Introduction: We aimed to study the in vivo bone mineralization of children with cerebral palsy (CP) and compare with healthy children using advanced radiographic and magnetic resonance imaging (MRI). We hypothesized that CP children would show impaired bone mineralization compared to healthy children.

Patients and methods: This prospective study included 25 children with CP (13 boys; mean age 7.97±2.63 years) and 25 healthy children (13 boys; mean age 7.97±2.54 years) matched for age and sex. Dual-energy X-ray absorptiometry (DEXA) was used to assess bone mineral density (BMD) at the lumbar spine and hip, while MRI was used to assess bone and muscle thickness at the hip and knee.

Results: Children with CP showed lower BMD at the lumbar spine (p<0.001) and hip (p<0.001) compared to healthy children. The mean bone thickness at the hip was lower in CP children (p<0.01) compared to healthy children, while the mean muscle thickness was similar in both groups (p=0.73).

Conclusion: Our findings suggest that children with CP have impaired bone mineralization compared to healthy children, which may contribute to their increased risk of fractures. These results highlight the need for targeted interventions to improve bone health in children with CP.
Introduction. This study aimed, using additional biologic parameters, to obtain new data regarding possible changes in bone metabolism, mainly, considering the severe impairments of mobility in some cases of children with cerebral palsy.

Patients and methods. We analyzed 34 patients, aged between 4 and 11 years, divided into 2 main groups (cerebral palsy vs. scoliosis), the first, sub-divided into Ambulant/Non-Ambulant.

The evaluating parameters used were: FIM scale, BMI, serum TSH, FT4, urinary calcium and phosphorus concentrations (24 hours urine collection); in addition, some newly accessed: Flanagan’s QoL, PTH, 25-OH Vitamin D, Beta CrossLaps and Osteocalcin, serum values.

Results. There were no significant differences (p > 0.05) between all the groups/sub-groups, except for FIM and QoL. Cerebral palsy, including non-ambulatory, and scoliosis showed similar values for PTH, 25-OH Vitamin D and TSH; additionally cerebral palsy group was similar to scoliosis group.

In order to evaluate the parameters’ contributivity and correlations, first PCA, then Spearman rank correlation coefficient matrix – Spearman’s rho – were used. The values were close to 0 (i.e. showing non-correlated items) except for FIM and QoL, Osteocalcin and Beta CrossLaps, FIM and Osteocalcin.

Conclusions. Processing of the available data, taking into account the coefficients above, indicate very few significant/highly significant correlations among parameters. Namely, values of Beta CrossLaps apparently correlate with PTH and FT4, which result should be confirmed by a larger sample study.

PP-192
Poster presentation
Poster session 2 - timeslot 3

Sensorized object for assessing manipulation capabilities in children with hemiplegia

F. Cecchi1, I. Mannari1, F.P. Falotico1, E. Beani2, G. Cioni3, C. Laschi1, P. Dario1, G. Sgandurra3
1Scuola Superiore Sant'Anna, PONTEDERA (PI), Italy
2IRCCS Fondazione Stella Maris, PISA, Italy
3IRCCS Fondazione Stella Maris, University of Pisa, PISA, Italy

Introduction

Existing motor pattern assessment methods for children, such as digital cameras and optoelectronic systems are very few and suffer from object obstruction and require complex setups. New technological tools such as sensorized objects can help in assessing the manipulation capabilities in a quantitative but ecological way and the sensitivity to a therapy. The present study aims to assess reaching and grasping capabilities by means of a sensorized object that allows different grasping tasks.

Patients and Method

Six hemiplegic children (mean age 10.57±3.73 years) were assessed through the Assisting Hand Assessment (AHA) and the sensorized object. The object allowed to perform three different tasks at increasing level of difficulties (unimanual lifting, bimanual placing near and bimanual cooperation, holding and pulling). Two load-cells and a switch embedded into the object allowed the measurement of the following parameters: grasping time, maximum grasping force and delay time between unaffected and affected hand in reaching the object.

Result

Grasping time and maximum force show a positive trend highly correlated to AHA score, except for the third task where the values are the same for all the children. Delay time has a negative correlation highlighting that more impaired children first reached the object with the unaffected hand while less impaired children reached the object with both hand simultaneously.

Conclusion

The developed sensorized object allowed to measure reaching and grasping parameters and the extracted parameters correlated with the AHA score. The object could represent a useful tool for assessing the manipulation capabilities in hemiplegic children.

PP-193
Poster presentation
Poster session 2 - timeslot 4

Dalamanpridine in hereditary spastic paraplegia type 11: an open, single center study

G. Astrea1, R. Battini1, M.C Coluccini1, R.A. Rubegni1, P.S. Perazza1, S. Frosini1, L.S. Lenzi1, G. Cioni2, F.M. Santorelli1
1IRCCS Fondazione Stella Maris, CALAMBRONE-PISA, Italy
2IRCCS Fondazione Stella Maris, University of Pisa, CALAMBRONE-PISA, Italy

Background

Spastic paraplegia 11 (SPG11) is characterized by progressive spasticity and weakness in the lower limbs frequently associated with mild intellectual disability, peripheral neuropathy and pseudobulbar involvement. Less frequent findings include cerebellar signs, retinal degeneration, and easy fatigability. Onset occurs mainly during infancy or adolescence (usually before age 25 years). Most affected individuals become wheelchair bound one or two decades after disease onset. There is no pharmacological treatment for SPG11 other than palliative

PP-192
Poster presentation
Poster session 2 - timeslot 3

Sensorized object for assessing manipulation capabilities in children with hemiplegia

F. Cecchi1, I. Mannari1, F.P. Falotico1, E. Beani2, G. Cioni3, C. Laschi1, P. Dario1, G. Sgandurra3
1Scuola Superiore Sant'Anna, PONTEDERA (PI), Italy
2IRCCS Fondazione Stella Maris, PISA, Italy
3IRCCS Fondazione Stella Maris, University of Pisa, PISA, Italy

Introduction

Existing motor pattern assessment methods for children, such as digital cameras and optoelectronic systems are very few and suffer from object obstruction and require complex setups. New technological tools such as sensorized objects can help in assessing the manipulation capabilities in a quantitative but ecological way and the sensitivity to a therapy. The present study aims to assess reaching and grasping capabilities by means of a sensorized object that allows different grasping tasks.

Patients and Method

Six hemiplegic children (mean age 10.57±3.73 years) were assessed through the Assisting Hand Assessment (AHA) and the sensorized object. The object allowed to perform three different tasks at increasing level of difficulties (unimanual lifting, bimanual placing near and bimanual cooperation, holding and pulling). Two load-cells and a switch embedded into the object allowed the measurement of the following parameters: grasping time, maximum grasping force and delay time between unaffected and affected hand in reaching the object.

Result

Grasping time and maximum force show a positive trend highly correlated to AHA score, except for the third task where the values are the same for all the children. Delay time has a negative correlation highlighting that more impaired children first reached the object with the unaffected hand while less impaired children reached the object with both hand simultaneously.

Conclusion

The developed sensorized object allowed to measure reaching and grasping parameters and the extracted parameters correlated with the AHA score. The object could represent a useful tool for assessing the manipulation capabilities in hemiplegic children.

PP-193
Poster presentation
Poster session 2 - timeslot 4

Dalamanpridine in hereditary spastic paraplegia type 11: an open, single center study

G. Astrea1, R. Battini1, M.C Coluccini1, R.A. Rubegni1, P.S. Perazza1, S. Frosini1, L.S. Lenzi1, G. Cioni2, F.M. Santorelli1
1IRCCS Fondazione Stella Maris, CALAMBRONE-PISA, Italy
2IRCCS Fondazione Stella Maris, University of Pisa, CALAMBRONE-PISA, Italy

Background

Spastic paraplegia 11 (SPG11) is characterized by progressive spasticity and weakness in the lower limbs frequently associated with mild intellectual disability, peripheral neuropathy and pseudobulbar involvement. Less frequent findings include cerebellar signs, retinal degeneration, and easy fatigability. Onset occurs mainly during infancy or adolescence (usually before age 25 years). Most affected individuals become wheelchair bound one or two decades after disease onset. There is no pharmacological treatment for SPG11 other than palliative
therapies and continuous care by a multidisciplinary team. Dalfampridine (4-aminopyridine, 4-AP) is a potassium-channel blocker recently suggested to improve walking abilities and reduce fatigue in people with MS. **Aim of the study** To test if daily use of Dalfampridine in patients with SPG11 could be safe and able to relief symptoms. We performed a prospective, uncontrolled, proof of concept, open clinical trial. **Methods** Three SPG11 patients harboring different loss-of-function mutations received Dalfampridine 10 mg twice daily for 6 months. Efficacy assessment was based on walking ability improvement, fatigue rating scales and patient-reported outcomes before (T0) and after (T1) treatment. **Results and Conclusions** Dalfampridine appeared to be safe and it was subjectively considered to relief muscle cramps and fatigue. However, double-blind, placebo-control studies are need to appreciate the efficacy of 4-AP in SPG11 disease.

**PP-194**

**Poster presentation**

**Poster session 2 - timeslot 1**

**Temporal-spatial gait parameters in children with Cerebral Palsy: correlates of impaired selective motor control**

J. Zhou, E. Lowe, K. Cahill-Rowley, J. Rose

Stanford University, STANFORD, United States of America

**Introduction**

Cerebral palsy (CP) is the most common movement disorder in children, characterized by four interrelated motor deficits: weakness, short muscle-tendon units, spasticity, and impaired selective motor control. Motor and gait deficits are important to identify in the pediatric clinic and temporal-spatial (TS) gait parameters are readily assessed in the clinic. Identification of children with specific motor deficits can guide more strategic intervention to improve motor function. This study examines TS gait parameters that may provide correlates of impaired selective motor control in children with CP.

**Patients and Methods**

Normalized velocity, cadence, step length, step length right-left differential, %single limb support (SLS), %SLS differential, and step width were calculated for 9 children with diplegic CP, 7 hemiplegic CP, and 4 quadriplegic CP, age 7-11 years, using 3D motion capture; in addition, the Selective Control Assessment of the Lower Extremity (SCALE) was performed.

**Results**

Mean SCALE values for the left and right limbs were 5.5 3.02 and 5.7 2.92, respectively. SCALE values of the right and left limb correlated to normalized step length on the right (rho=.531, p=0.016; rho=.501, p=.024), respectively. The SCALE differential was significantly correlated with %SLS differential (rho=.601, p=0.005), and normalized step width (rho=-.483, p=.031). Normalized velocity and cadence did not correlate with SCALE.

**Conclusion**

Findings suggest that %SLS differential correlates strongly with SCALE differential and is a promising TS gait parameter that may help identify impaired selective motor control in children with spastic CP.

**PP-195**

**Poster presentation**

**Poster session 2 - timeslot 2**

**The effect of ankle foot orthosis stiffness on gait stability related parameters in Cerebral Palsy**

P.J. Meyns1, Y.L. Kerkum2, A.I. Buizer3, J.G. Becher1, M.A. Brehm2, J. Harlaar1

1VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands

2OIM Orthopedie, ASSEN, The Netherlands

3Academic Medical Center, University of Amsterdam, AMSTERDAM, The Netherlands

**Introduction**

Tuning Ankle-foot orthosis (AFO) stiffness can lead to changes in lower limb kinematics in children with Cerebral Palsy (CP). However, varying AFO stiffness can also change trunk movements. The cause of altered trunk movements when wearing AFO’s is unclear. As increased trunk movements were related to decreased stability, we examined the effect of varying AFO stiffness on gait stability in CP.

**Patients and methods**

15 children with spastic CP (11 boys/4 girls, 10±2 years, GMFCS-level I-III) were prescribed with a spring-hinged AFO (NeuroSwing®, Flor&Gentz®). Stiffness was set rigid (3.8Nm-deg-1), stiff (1.6Nm-deg-1) and flexible (0.7Nm-deg-1). 3D-gait analysis was performed at comfortable speed for each configuration. Spatiotemporal gait parameters (double-support-time[s], step width[m]) and center-of-pressure excursion (CoP[m]) in the antero-posterior and medio-lateral direction were assessed. Differences between conditions were analyzed using GEE.

**Results**

Antero-posterior CoP was significantly larger for all AFO’s compared to shoes-only (p<0.001). The rigid and flexible AFO tended to result in larger CoP compared to the stiff AFO (p=0.061, p=0.063, resp.). Medio-lateral CoP was larger for all AFO’s compared to shoes-only, although only significant for the rigid AFO (p=0.037).

No significant differences in spatiotemporal parameters were found.
Conclusion Tuning AFO stiffness has a significant impact on center-of-pressure excursion during walking in CP. Although the changes in antero-posterior CoP are likely related to the stiff AFO footplate, the changes in medio-lateral excursion might be associated with altered gait stability. The absence of changes in spatiotemporal parameters might indicate that these measures are not sufficiently sensitive to measure changes in gait stability.


PP-196
Poster presentation
Poster session 2 - timeslot 3

Immediate effects of quick trunk movements exercise on sit-to-stand movement in children with spastic cerebral palsy: A pilot study
A. Abdolrahmani, R. Yonetsu, S. Hiroyuki
Osaka prefecture university, OSAKA, Japan

Introduction Children with cerebral palsy (CP) often demonstrate impaired sit-to-stand (STS) movement performance. This pilot study aimed to examine the immediate effects of quick seated trunk exercise (STE) on STS movement in children with CP.

Patients and methods Five children with spastic CP (hemiplegia, 3; diplegia, 2; age 6-17 years) received five sessions of natural STE at a self-selected speed as control intervention. Following a 50-min rest time, five sessions of the quick STE were conducted as an experimental intervention for each child. Each session of STE included 10 repetitions in the anterior-posterior and lateral directions. The duration for each intervention was 5-10 min. STS was assessed before and after each intervention by using a motion analysis system. The sagittal angular movements of the trunk, hip, knee, and ankle, total STS task duration, maximum trunk forward tilt, and maximal ankle dorsiflexion angle were calculated.

Results There was a significant difference in the total duration of the STS movement before and after natural STE (2.40 ± 0.67 s vs. 2.24 ± 0.44 s) as well as Quick STE (2.28 ± 0.52 s vs. 2.06 ± 0.45 s). However, there was no significant change in angular movements with either of the interventions.

Conclusion This study demonstrated that trunk exercise in seated position resulted in immediate improvement in the temporal parameters of STS in children with spastic CP. However, to determine the beneficial effects on angular movement this trunk exercise emphasizing speed might be conducted intensively during a short period of time.

PP-197
Poster presentation
Poster session 2 - timeslot 4

Using a machine learning approach to predict the outcome of different intervention programs for children with unilateral Cerebral Palsy towards tailored intervention.
H.G. van den Boom1, C.M. Baas1, P.B.M. Aarts2, B. Steenbergen3, M.L.A. Jongsma1
1Behavioural Science Institute, NIJMEGEN, The Netherlands
2Sint Maartenskliniek, NIJMEGEN, The Netherlands
3Radboud University Medical Center, NIJMEGEN, The Netherlands

Introduction Unilateral cerebral palsy (uCP) is a disorder which is caused by an early brain lesion and mostly affects the hand capacity at the contralesional side. Rehabilitation programs are aimed at increasing the hand function of the affected hand. However, large interindividual differences in response to training exist. It has been proposed that differences in hemispheric dominance for controlling the affected hand (i.e. controlling the affected hand with either the contralateral or ipsilateral hemisphere) might contribute to these interindividual differences with respect to effect size of training.

Patients and methods We obtained EEG recordings in a group of 65 children with uCP (3-18 years old) that received either a Constraint Induced Movement Training (CIMT) or a Bimanual Training (BiT). Based on the EEG recordings we extracted several dependent variables describing the hemispheric dominance when using the affected hand. Hand assessment variables before and after training were compared to determine the effect size for each child. Next, several machine learning algorithms were optimized to predicting the expected effect of the treatment for each individual child.

Results Our preliminary results show that using machine learning reduces prediction error by at least 50-70% using cross validation. This implies that this approach can make accurate predictions for previously unseen data.

Conclusion This interdisciplinary approach shows promising results in predicting the outcome of intervention in individual children. In the future this method can be used as a screening tool in order to select the optimal intervention approach for each individual child with uCP.

PP-198
Poster presentation
**Children with Cerebral Palsy walking in the Lokomat: an evaluation of training parameters.**

K. van Kammen¹, H.A. Reinders-Messelink¹, A.M. Boonstra¹, L.H.V. van der Woude¹, A.R. den Otter²

¹Revalidatie Friesland, BEETSTERZWAAG, The Netherlands
²University of Groningen, University Medical Center Groningen, GRONINGEN, The Netherlands

**Introduction.**

Children with Cerebral Palsy often have impaired walking ability. The Lokomat (Hocoma AG, Volketswil, Switzerland) is an actuated exoskeleton that can be used for the (re-)learning of gait by providing robotic guidance during gait. For the design of training protocols it is crucial to understand how Lokomat training parameters affect gait and how children perceive Lokomat walking.

**Patients and methods.**

Ten children with Cerebral Palsy (age 6 – 16 years, GMFCS II-IV) and ten healthy (age and gender matched) controls walked on the treadmill and in the Lokomat (speeds 1.0 and 2.0 km/h, bodyweight support 0% and 50%, guidance forces 30% and 100%). Electromyography was recorded from Gluteus Medius (GM), Biceps Femoris (BF), Vastus Lateralis (VL), Gastrocnemius Medialis (MG), and Tibialis Anterior (TA), on the most affected side. Participants were asked to indicate how they perceived the walking condition by means of a five-points-scale (from extremely unhappy/uncomfortable (1) to extremely happy/comfortable (5)) and to explain their perception verbally.

**Results.**

Electromyography results will be presented at the conference, since at the time of writing only a single measurement has been completed. This participant (child with Cerebral Palsy, age 13, GMFCS II) did indicate that, overall, Lokomat walking was perceived as positive, although walking with 30% guidance and without bodyweight support was perceived as hard and exhausting.

**Conclusion.**

This study will give insight on the effects of training parameters on the neuromuscular control of gait and patients perspective. As such, the results can be used for recommendations for training protocols.

---

**Upsee, a potential tool for cognitive, social and physical development in young children with Down syndrome**

D. Issac, G.C. O’Carroll, U. Barrett

Institute of Technology, COUNTY KERRY, Ireland

**Introduction**

Young children with Down syndrome face developmental delay in walking compared to a typically developing child. This delay in upright exploration can in turn affect their skills such as cognition, social, self-help and emotional development. Acquisition of particular motor milestone is therefore vital. Upsee is a new mobility device designed to help children with movement delays to stand and move with the help of an adult. The ongoing research programme is designed to scientifically investigate the use of Upsee and to measure child’s progress covering areas such as cognitive, social and physical development. Moreover, active parental, siblings and peer group involvement during the Upsee programme will be evaluated.

**Subjects and methods**

Selection criteria included children with Down syndrome between 11 months and 5 years who are at the moment able to stand with some support. Twenty participants are equally divided into control group and intervention group. Conventional treatment is given to the control group and the intervention group receive the Upsee programme along with conventional treatment. Exercise is assigned for 40 minutes, 5 times a week, continued for 4 months. A pre and post-test evaluation is done using the ‘Bayley scale of infant motor development III’ to statistically measure mobility, ability and participation activities. The parents’ perspectives will be assessed using questionnaires.

**Conclusion**

The project will technically investigate the potential use of Upsee in children with Down syndrome who have motor impairment. It will also outline safety guidelines for the use of the UPSEE in this population.

---

**Friends4Sports - design of an innovative project**

M.A.M. Berger¹, J. Wolfram², A.J. de Kloet³

¹The Hague University of Applied Sciences, DEN HAAG, The Netherlands
²Sophia Rehabilitation Centre, The Hague University, DEN HAAG, The Netherlands
INTRODUCTION

Physical activities and sports have a positive effect on motor skills and health (O'Donovan, 2008, Blair, 2009, Lubans, 2010). However, research shows that children with motor impairments and/or chronic illness are less (physical) active, while this is even more important for them than for their healthy peers (Heiden 2013). Thresholds: facilities are hard to find, less attractive, not with own friends in own environment, transport and costs and last but not least physical activities cost more effort and energy with less pleasure and satisfaction. Therefore the aim of this project is to encourage young people with physical disabilities or chronic illness in The Hague region to perform and enjoy physical activities and sports.

PATIENTS and METHODS

Patients: children, adolescents (4-25 year) with physical disability or chronic disease.

METHODS:

a) A multidisciplinary sports counter: motivational interviewing addressing personal goals, psycho-education, advice and rehab technology.

b) Baseline measurements (training condition, strength) will be performed

c) Peer support by students ('Friend')

d) A social, sporting environment to try different sports.

e) Digital support by using an App to find sports, linked to 'Uniek Sporten'.

f) Monitoring 6 months, follow-up after 12 and 24 months.

RESULTS

A project plan has been submitted to sponsors (October 2016). Funding is realized (December 2016). Stakeholders involved (February 2017). Students recruited and trained (June 2017). Start (September 2017).

CONCLUSION

Friends4Sports will be a peer-supported intervention, combining examples of good practice in an integrated approach, encouraging young people with physical disabilities or chronic illness to more physical activities.

PP-201
Poster presentation
Poster session 2 - timeslot 4

Effect of a 5 day hybrid cimt program on the level of activity and participation in children with unilateral cerebral palsy in the age of 5-12 years

B. Snijders 1, E. Schreurs Mppt 2

1Revant Rehabilitation Centres, BREDA, The Netherlands
2Revant Revalidatiecentrum Breda, BREDA, The Netherlands

Introduction

Modified Constraint-Induced Movement Therapy (m-CIMT) supplemented with bimanual intensive therapy (BIT) - hybrid CIMT- have shown promising results in improving bimanual performance in children with unilateral cerebral palsy (CP). Children and parent(s) want improvement at the level of activity and participation (ICF-CY).

The aim of this study is to determine the effect of a short Hybrid CIMT program on activity and participation in children with unilateral CP.

Patients and methods

During the period 2013–2015, children with unilateral CP attended hybrid CIMT intervention during a day-camp (circus Revant) for five consecutive days. It consists of 3.6 hours m-CIMT (shaping and repetitive tasks (S&R) with a constrained unaffected arm) daily, followed by 4.85 hours BIT (goal directed training). Children received homework instructions between t1-t2.

Outcome measure for participation is GAS (Goal Attainment Scaling), activity is Abilhand-Kids. GAS is set by goals formulated by the parent(s) and child. Abilhand-Kids was completed by the parent.

Data collection occurred in three different moments, two weeks before the intervention (t0), the final day of the intervention (t1) and three months after (t2).

The Wilcoxon signed rank test was used to determine differences between t0 and t2.

Results

Twenty-one children (48% boys) with unilateral CP (aged from 4.11 to 11.10 years) participated in this study.

Results (GAS and Abilhand-Kids) showed a significant difference (p<0.05) between t0 and t2. In addition, the majority of the children showed a clinical important change on both outcome measures.

Conclusion

Based on data obtained it is concluded that this five day Hybrid CIMT program increases performance in activity and participation.

PP-202
Poster presentation
Poster session 2 - timeslot 1

Prismatic adaptation in children with Unilateral Spastic Cerebral Palsy (USCP): could it treat their visuospatial attention deficits?
Introduction: Though visuospatial attention deficits are reported in children with unilateral spastic cerebral palsy (USCP), no effective rehabilitation treatment has been described until now. In adults, prismatic adaptation (PA) - a rehabilitation technique with prismatic goggles shifting the visual field - is effective to treat visuospatial attention deficits. This study aimed at investigating the effectiveness of PA in children with USCP.

Patients and method: 31 children with USCP (left-sided n = 11, aged 6 to 16 yrs) were included. During a Hand Arm Bilateral Intensive Therapy Including Lower Extremities (HABIT-ILE, 90 hrs over 10 days), children received a bimanual task intervention for 2 sessions/day of 20 minutes wearing either sham or prismatic goggles (11° shift of the visual field towards the paretic side). Visuospatial attention assessments before and after intervention, were: Ogden figure copy, star cancellation, reading test, line bisection, proprioceptive pointing and visuo-proprioceptive pointing. A two-way ANOVA with between-subject factor GROUP and within-subject factor TIME was used for statistical analysis.

Results: Star cancellation improved significantly after HABIT-ILE, regardless of the type of visuospatial intervention (TIME: p=0.026). More specifically, there was a significant effect of TIME in children with left hemiparesis (star cancellation: total omitted stars, p=0.048; left omitted stars, p=0.024; line bisection, p=0.004). No significant effects of GROUP were observed.

Conclusion: An intensive bimanual motor therapy as HABIT-ILE is effective to improve visuospatial attention skills, particularly in children with left hemiparesis. At present, no significant effect of concomitant prismatic adaptation could be observed on visuospatial deficits in USCP children.

PP-203
Poster presentation
Poster session 2 - timeslot 2

Improvement of visuospatial deficits following unimanual or bimanual intensive motor interventions in children with unilateral spastic cerebral palsy. A randomized trial.

G. Ickx1, D. Ebner-Karestinos1, J. Paradis1, M.B. Brandao2, A.M. Gordon3, S.M. Hatem4, Y. Bleyenheuft1
1Université Catholique de Louvain, BRUXELLES, Belgium
2Universidade Federal de Minas Gerais, BELO HORIZONTE, Brazil
3Columbia University, NEW YORK, United States of America
4Vrije Universiteit Brussel, BRUSSELS, Belgium

Introduction: Although visuospatial attention deficits have been described in many children with unilateral spastic cerebral palsy (USCP), it is unknown whether intensive motor interventions requiring the constant use of the more-affected hand may result in visuospatial improvements. The exploration of the more-affected hemispace is likely different in constraint-induced movement therapy (CIMT) and Hand and Arm Bimanual Intensive Therapy (HABIT). This study investigates the effect of CIMT and HABIT on visuospatial deficits of children with USCP.

Patients and method: 46 children were randomized into a CIMT (22 children, 12 Left hemiparesis) or a HABIT group (24 children, 8 Left hemiparesis), both involving 90 hours of intervention (6 hours/day, 3 weeks). Four visuospatial tests (Ogden figure copy, star cancellation, line bisection, proprioceptive pointing) were performed before and after the interventions. A 2 (test session) x 2 (group) mixed model ANOVA was used first on the whole sample, and then separately in children with left and right hemiparesis.

Results: Children with a left hemiparesis improved their scores in the star cancellation and in the line bisection with HABIT, but not with CIMT (interactions: left omitted stars, p=0.015; line bisection: p=0.028). Children with a right hemiparesis improved their score in the line bisection with both interventions (p=0.023, no interaction). They also improved the Ogden score with CIMT but not with HABIT (interaction: p=0.024).

Conclusion: Intensive interventions result in an improvement of visuospatial abilities in children with USCP. Unimanual (CIMT) and bimanual (HABIT) therapies have differential effects depending on the side of the cortical lesion.

PP-204
Poster presentation
Poster session 2 - timeslot 3

Changes in tactile function during intensive bimanual training in children with unilateral spastic cerebral palsy

G. Saussze, M. van Laethem, Y. Bleyenheuft
Université Catholique de Louvain, BRUSSELS, Belgium

Introduction
Recently, intensive interventions have shown the ability to improve tactile function (stereognosis/tactile spatial discrimination) of children with unilateral spastic cerebral palsy (USCP) if an enriched environment is provided (objects with various textures & shapes). This effect has been observed both in conditions of full vision of these specific objects and during manipulation without vision, designed to enhance sensory abilities. Therefore it may be that increased manipulation time provided during intensive training (without enriched environment) is sufficient to improve sensory abilities. This study investigate whether regular intensive bimanual training is sufficient to improve tactile function in children with USCP.

Patients and methods
19 children with USCP received 90 hours of bimanual training over 2 weeks. Perception tests -Manual Form Perception Test (stereognosis) and Grating Orientation Task (GOT: tactile spatial discrimination)- and motor assessments —Box and Blocks test (BBT; gross motor manipulation) and the Jebsen-Taylor Test of Hand Function (JTTHF; dexterity)— were performed. Children were assessed pre-(T1), post-intervention (T2) and 4 months later (T3).

Results
For tactile function, only the stereognosis of the more-affected hand improved (p=0.006). Significant improvements were found in the more- and less-affected hands for the BBT and in the more-affected hand for the JTTHF.

Conclusion
Regular intensive bimanual training is sufficient to improve stereognosis on the more-affected hand probably because of the motor component of this test but not to improve tactile spatial discrimination. This suggests a specifically enriched material environment is needed to improve tactile function during intensive interventions.

PP-205
Poster presentation
Poster session 2 - timeslot 4

Does including a lower extremity component during Hand-Arm Bimanual Intensive Training affect improvements of the upper extremities?
G. Saussez1, M. Brandão2, A.M. Gordon3, Y. Bleyenheuft1
1Université Catholique de Louvain, BRUSSELS, Belgium
2Federal University of Minas Gerais, BELO HORIZONTE, Brazil
3Columbia University, NEW-YORK, United States of America

Introduction
Hand-arm bimanual intensive therapy (HABIT) promotes hand function using intensive practice of bimanual functional tasks. This intervention has shown to be efficacious to improve upper extremity (UE) function in children with unilateral spastic cerebral palsy (USCP). Recently, a new intervention has been introduced in which the lower extremity (LE) is simultaneously engaged during HABIT (Hand-arm bimanual intensive therapy including lower extremities; HABIT-ILE). It is unknown whether the addition of a LE component attenuates UE improvements. This study aims to compare the UE improvements in HABIT vs HABIT-ILE.

Patients and methods
This study consisted of retrospective analysis of 86 children with USCP who received 90h of either HABIT (n=42) or HABIT-ILE (n=44) as participants in previous studies. Primary outcomes were ABILHAND-Kids and the Assisting Hand Assessment. Secondary measures included the Jebsen-Taylor Test of Hand Function, Pediatric Evaluation of Disability Inventory (PEDI) and Canadian Occupational Performance Measure (COPM).

Results
Both groups showed similar significant improvements for all tests except the PEDI and COPM. Larger improvements on these tests were found for the HABIT-ILE group. These larger improvements may be explained as a consequence of the constant simultaneous UE-LE stimulation during HABIT-ILE intervention. LE and, more specifically, UE-LE coordination are often used during daily living activities included in the PEDI and potentially in the COPM.

Conclusion
UE improvements in children with USCP are not attenuated by a LE component. In addition, systematic LE stimulation during bimanual intensive intervention (HABIT-ILE) leads to larger functional improvements in activities of daily living involving the LE.

PP-206
Poster presentation
Poster session 2 - timeslot 1

A case of poor concentration, nystagmus and incoherent eye movement skills
S. Agarwal
Apollo Gleneagles Hospital, KOLKATA, India

Introduction: Cases of poor concentration and incoherent eye movement skills are usually referred to occupational therapists. Along with occupational therapy, vision therapy when introduced produces much better functional gains.
Patient and methods: A 7 year old male was referred to us with the parents complaining that he was unable to concentrate (ICF codes: b140, b1400, b1401), he had horizontal jerk nystagmus (ICF codes: b215, b2152), he had very poor social interactions and was always looking upwards. He was attracted by rotating objects like the ceiling fans. On examination he was found to have a lead of accommodation, poor saccadic skills and nystagmus. We suggested optometric vision therapy to relax his accommodation and also to work on his vergences and ocular movement skills. Results: After 20 sessions of optometric vision therapy, his amplitude and frequency of nystagmus had reduced, accommodation had normalized and had improved saccadic movements. He was advised further therapy to retain the positives achieved. Conclusion: Optometric vision therapy should be used as an adjunct with other therapies to complement them and also to attain better outcomes.

PP-207
Poster presentation
Poster session 2 - timeslot 2

Gesture imitation abilities in children with and without developmental coordination disorder: a pilot study
E. Bieber1, B.C.M. Smits-Engelsman2, G. Sgandurra3, F.H. Feys3, G. Cioni3, A. Guzzetta3, K. Klingels3
1KU Leuven, LEUVEN, Belgium
2University of Cape Town, CAPE TOWN, South Africa
3IRCCS Fondazione Stella Maris, University of Pisa, PISE, Italy

Introduction: Literature studies on gesture imitation abilities in children with Developmental Coordination Disorder (DCD) have consistently reported heterogeneity of deficits. Strong evidence has been reported for deficits in imitation of meaningful gestures. Imitation of meaningless novel gestures and sequence gestures, which can be related to the mirror neuron system hypothesis, has been far less investigated. This study proposes a new protocol to investigate deficits in meaningful and meaningless gestures in children with DCD.

Patients and methods: Seven children with DCD (mean age = 7y11m, SD = 1y6m) and seven age and sex matched TD children were enrolled. The protocol included eight simple (unilateral) and eight complex (bilateral) meaningless gestures, performed by finger or hand, and four sequence gestures with finger and hand, as well as 12 meaningful gestures based on the Gesture Test of Dewey et al., 1992. Children’s performances were video recorded and scored independently by two researchers according to a four point ordinal scale proposed by Watkins et al. (2002).

Results: Children with DCD scored significantly lower on the total score of simple and complex novel meaningless gestures (p = 0.03) and sequence gestures (p = 0.04). No significant difference was found for the meaningful gestures (p > 0.10).

Conclusion: To unravel the underlying mechanism deficits of gesture performance in children with DCD a larger sample is needed and validity results about the proposed protocol are warranted.

PP-208
Poster presentation
Poster session 2 - timeslot 3

Benefits of Intensive Therapy for Children with Quadriplegic Cerebral Palsy
D.A. Wallace, M.R. Trucks, S.C. Deluca
Virginia Tech Carilion Research Institute, ROANOKE, United States of America

Introduction
Intensive Therapies are widely utilized for children with hemiparetic CP, mainly Pediatric Constraint-Induced Movement Therapy and Hand Arm Bimanual Intensive Therapy. However, there is little evidence regarding the efficacy of intensive treatments for children with quadripareisis.

Patient and Methods
An intensive-therapy protocol was used on 6 children with quadripareisis. All were assigned to receive a 6-hr intensive protocol for 5 days a week for 4 weeks, although in one case the dosage was lowered to 4 hrs a day. The average age of these children was 76.2 months (s.d. = 61.0 months) with a range between 29-153 months of age. One child had a GMFCS level of II; another had a GMFCS level of III; two had a GMFCS level of IV; and two had a GMFCS level of V.

Results
The average number of new behaviors on the Emerging Behaviors Scales was 9.0 (s.d. = 5.01). A pre-post treatment paired samples t-test confirmed a significant change (t = 4.16, p = 0.01). Independent therapists’ reports on change were also significant on additional upper extremity measures of function for increased frequency of use (t = 8.13, p = 0.004) and improved quality of movement (t = 5.6, p = 0.01). fMRI findings from one child indicate increased bilateral hemispheric activation. Our fMRI analyses focused on inter-hemispheric communication showing...
Increased functional connectivity.

Conclusion
Children with quadriplegia can benefit from intensive therapies, and fMRI findings from one child is suggestive that better inter-hemispheric communication might be a response to intensive therapy.

PP-209
Poster presentation
Poster session 2 - timeslot 4

Does a sensory enhanced form of pediatric constraint induced movement therapy (PCIMT) enrich motor learning in children with hemiparesis during an intensive episode of treatment
M.R. Trucks, D.A. Wallace, S.C. Deluca
Virginia Tech Carilion Research Institute, ROANOKE, United States of America

Introduction
Approximately 77% of children with hemiparesis have sensory impairments and often cannot accurately report tactile stimuli (Auld et al., 2014), and disturbances in sensory abilities are believed to account for as much as 30% of their motor deficits (Auld et al., 2012a; Eliasson et al., 1995a). Treating children with motor impairment secondary to hemiparesis has been studied via many intensive therapy protocols (Ramey et al., 2013), but most protocols have focused only on the motor skill development. This case series provides data on sensory-enhanced Pediatric Constraint-Induced Movement Therapy (P-CIMT).

Patients and methods
Three children (7-8 years old) with hemiparesis were treated (2 right-side involved; 1 one left-sided involved). Sixty percent of the P-CIMT protocol was devoted to sensory enhancement which involved pairing unique functional items with sensory experiences. Sensory measures included Semmes Weinstein, Disc-Criminator, Stereognosis on both the impaired and the unimpaired upper extremities. Functional measures included the Shriners Hospital Upper Extremity Evaluation and Assisting Hand Assessment.

Results
Functional outcomes were consistent with other positive P-CIMT findings. Changes in static two-point discrimination on the impaired side was seen. Stereognosis demonstrated positive changes in 1 child. Sensory function on the unimpaired side remained constant. Qualitative analyses of sensory descriptors given by children indicate awareness of sensory abilities between the impaired and the unimpaired side and will be presented.

Conclusion
The inclusion of sensory activities during therapy might promote increased function during intensive therapies. Novel treatment items that promote function and sensation, simultaneously, will be presented.

PP-210
Poster presentation
Poster session 2 - timeslot 1

MELLE-project: Developmental trajectories of motor skills, executive functions, and language in preschoolers with and without risk for motor coordination problems
G.J. van der Veer
University of Groningen, GRONINGEN, The Netherlands

Introduction
There is a growing body of literature relating motor performance to executive functioning (EF) and language. However, little is known about these relationships in preschoolers and their developmental trajectories. The MELLE-project aims to investigate the relationships between developing motor skills, executive functions, and language in preschoolers with and without risk for motor coordination problems.

Patients and methods
The study has a lagged sequential design, providing both cross-sectional and longitudinal data. The study sample consists of 3- to 5-year-old children at risk for motor coordination problems and typically developing children. Every six months, children are examined with tests regarding motor performance, EF, and language. Caregivers complete questionnaires on demographics, motor performance, EF, home environment, physical activity, temperament, and behavioral problems.

Results
During phase 1 (April to July 2016) 97 children were tested (51 boys and 46 girls; M age = 49.16 months (SD = 9.91)). The Movement Assessment Battery for Children-2 total score (M = 49.03, SD = 29.46) suggest that our sample includes children from a whole spectrum of motor skills. In phase 2, starting in October 2016, the children of phase 1 are re-assessed and new children are recruited.

Conclusion
Understanding relationships between developmental trajectories of (problems in) motor skills, EF, and language critical to the development of causal models of developmental disorders and enables to understand how co-occurrence of problems affect children’s developmental and learning outcomes. An improved understanding of developmental trajectories will improve targeting of interventions and streamlining of services to children at developmental risk.
Testing first the dominant hand in the Jebsen Taylor Test of Hand Function (JTTHF): proposition of a modified protocol and normative values

J. Paradis¹, J. Andris¹, C. Luyckx¹, C. Arnould², Y. Bleyenheuft¹
¹Université Catholique de Louvain, BRUXELLES, Belgium
²Haute Ecole Louvain en Hainaut, MONTIGNIES-SUR-SAMBRE, Belgium

Introduction: The JTTHF is frequently used to assess dexterity of children with unilateral cerebral palsy (UCP). The original protocol, developed with healthy subjects, recommends testing first the non-dominant (NDOM) and then the dominant hand (DOM). In children with UCP, due to the lack of motor experience on the more-affected hand (NDOM) this procedure may underestimate their performance. This study aimed to investigate in typically developing children (TD): 1) the trial effect of beginning each JTTHF subtest with the dominant hand, 2) normative values using this procedure.

Methods: 169 TD children aged 3-16 years participated. The JTTHF original protocol was followed, but the dominant-hand was used first (DOM1), followed by the non-dominant hand (NDOM) and then by the dominant-hand again (DOM2).

Results: A learning effect of DOM2 outperforming DOM1 was found for most subtests and for the total score (all p < 0.045). The time to complete subtests decreased with age as expected (all p < 0.001). No significant gender or handedness (right or left-handed) effect was observed (all p > 0.083).

Conclusion: This study showed a learning effect that could be beneficial in children with UCP when beginning the test with the less-affected hand (DOM). Moreover, using DOM hand first could be more representative of the child’s performance when compared to TD children (in the original protocol TD children may benefit of the NDOM trial). Conversely, we propose for children with UCP a modified JTTHF protocol (beginning with DOM hand and then NDOM hand) and the comparison with normative values provided in this study.

The effect of a combined aerobic and strength training program focusing on quality of performance in youth with spastic cerebral palsy.

V.V. van Tittelboom, P. Calders, W.D. de Wilde, C. van den Broeck
University of Ghent, GENT, Belgium

Introduction

Strengthening programs and programs to promote cardiorespiratory function were avoided in children with cerebral palsy (Verschuren et al 2009). Current research showed that neither resistance training nor endurance training do worsen spasticity or abnormal movements but result in improvements of strength, aerobic capacity and function.

Nevertheless none of these programs focused on quality of performance.

Patients and methods

Twenty children with cerebral palsy (GMFCS levels I-III) were included in this study, aged 12-21 years. A control group and an experimental group were matched. In addition to their usual care the experimental group received a combined aerobic and strength training programs consisting of 2 sessions of 1 hour a week during 9 weeks. Quality of performance was emphasized. The control group continued usual care. Maximal strength and strength endurance were assessed with analytical and functional strength tests of the M. Quadriceps, Hamstrings and M. Glutei. The aerobic capacity was evaluated with the 10-MWT and functionality was assessed using the GMFM-66 (dimension D and E).

Results

Strength endurance of the M. Glutei and lumbopelvic stability enhanced. Improvements on the distance completed during the 10-MWT and at the GMFM-66 (dimension E and D+E) have also been reported.

Conclusion

A combined aerobic and strength training program focusing on quality of performance significantly result in improvement of strength, aerobic condition and gross motor capacities in youth with bilateral spastic cerebral palsy.

Reliability and validity of functional bimanual and unimanual strength in children with Cerebral Palsy

M.M.E. Geijen¹, M. Schnackers², Y.J.M. Janssen-Potten³, R. Smeets³, E.A.A. Rameckers⁴
¹Adelante, HOENSBROEK, The Netherlands
²Radboud University Medical Center, NIJMEGEN, The Netherlands

PP-211
Poster presentation
Poster session 2 - timeslot 2

PP-212
Poster presentation
Poster session 2 - timeslot 3

PP-213
Poster presentation
Poster session 2 - timeslot 4
and fat nutritional status, knowledge of body composition is essential. Body composition refers to the proportion of body fat and free mass (muscle, bone, connective tissue, water). Gold standards for measurements of body composition.

Introduction
Grip strength is commonly measured during therapy to determine effects of intervention. The clinical relevant information about the use of strength during a daily life activity is lacking. Therefore, a task-oriented strength test was developed, the task-oriented arm-hand capacity (TAAC) meter. Both functional bimanual (lifting a crate) and unimanual tasks (lifting a pitcher) can be measured with the affected hand (AH) and non-affected hand (NAH). This study will focus on the clinimetric properties of the TAAC meter compared to grip strength of both hands.

Patients and methods
The data of 45 children diagnosed with unilateral CP (5-17 years) was used. Test-retest reliability and construct validity of the TAAC meter of both hands was determined.

Results
The results showed a good test-retest reliability of the crate task of the TAAC (ICC = 0.84), and a low correlation with the grip strength of the AH (r=0.32) and with the grip strength of the NAH (r= 0.31). The results of the pitcher task showed a good test-retest reliability for the AH (ICC= 0.84) and NAH (ICC=0.88), a low correlation with the grip strength of the AH (r=0.34) and a moderate correlation with the grip strength of the NAH (r =0.52).

Conclusion
These results suggest that the TAAC meter is a good measurement method, and a good addition to the existing methods. The results also suggest that not only strength is needed to pull up a crate, but also other aspects such as muscle coordination and endurance.

PP-214
Poster presentation
Poster session 2 - timeslot 1

The relationship of childhood physical fitness to executive functions - A systematic review.

T. Mariën
University of Ghent, GHENT, Belgium

Mariën T.1, Prof. Calders P.1, Prof. Baeyens D.2, Prof. Van Waelvelde H.1
1 Department of Physical Therapy and Motor Rehabilitation, Ghent University, Ghent, Belgium
2 Faculty of psychology and educational sciences, KULeuven, Leuven, Belgium

Introduction: The objective was to systematically review the scientific literature addressing the relation of childhood physical fitness to different domains of executive functions. Patients and methods: A systematic research was conducted on the electronic databases PubMed, Web of Science, and SPORTDiscus. Only full text clinical trials which examined the relation of physical fitness to executive functioning of typically developing children (0-18 years) were eligible. Outcome parameters were selected for each executive function task and reported the following three core executive functions: inhibition, working memory and cognitive flexibility. Results: Findings suggest a positive relationship between physical fitness and specific domains of executive functioning. The included studies reported increased inhibition, shifting and visuo-spatial working memory in children with higher aerobic fitness levels. Tasks requiring a higher level of inhibitory control appear to be more sensitive to changes related to physical fitness levels. Response accuracy seems to be more influenced by aerobic fitness than response time in inhibitory control and switch tasks. Conclusion: A growing body of research suggests a beneficial relationship between physical fitness and executive functioning in children. However, good quality randomized-controlled trials are necessary to establish a causal link between these constructs.

PP-215
Poster presentation
Poster session 2 - timeslot 2

Validity of bioelectrical impedance analysis to determine body composition in children with cerebral palsy: a review

D.A.C. Snik1, K. van Hulst1, P.H. Jongerius1, O. Verschuren2, M. Ketelaar3, C. Erasmus1, N. de Roos4, A.C.H. Geurts1
1 Radboud University Medical Center, Nijmegen, The Netherlands
2 University Medical Centre Utrecht and Rehabilitation, UTRECHT, The Netherlands
3 De Hoogstraat Rehabilitation, UTRECHT, The Netherlands
4 Wageningen University & Research, WAGENINGEN, The Netherlands

Introduction
A strong correlation exists between nutritional status and well-being in children with cerebral palsy (CP). To assess nutritional status, knowledge of body composition is essential. Body composition refers to the proportion of body fat and fat-free mass (muscle, bone, connective tissue, water). "Gold standards" for measurements of body composition...
are isotope techniques and Dual-energy X-ray Absorptiometry (DXA), which are costly and time-consuming. Bioelectrical impedance analysis (BIA) measures tissue resistance, which is imputed into (disease-specific) equations to calculate volumes of body compartments. However, BIA estimations are subject to uncertainty; there is no consensus about their use in children with CP.

**Patients and methods**

In a systematic review, we identified studies using: MEDLINE, Cochrane Library and Embase. To be eligible for inclusion, a study had to report on a statistical comparison between BIA and DXA/isotope techniques to determine body composition in children with CP. Bias and applicability were evaluated using QUADAS-2.

**Results** Five studies met the inclusion criteria. In total, 265 children were studied who had different characteristics (e.g. mean age, severity, type of CP). In addition, different equations were used. Three studies had high risk of bias and all studies showed high applicability concerns. Two studies showed conflicting results when using the same equation. The largest study (n=128) found that BIA accurately determined body composition using non-CP-specific equation.

**Conclusion** No clear conclusions can be drawn from the available literature on BIA in children with CP, as there is too much heterogeneity among studies with regard to patient selection and BIA estimations.

---

**PP-216**

**Poster presentation**

**Poster session 2 - timeslot 3**

**Motor performance of Surinamese preterm and dysmature children and children with birth asphyxia at age 5**


1. Academic Hospital Paramaribo, PARAMARIBO, Surinam
2. Radboud University Medical Center, NIJMEGEN, The Netherlands

**Introduction** Preterm and dysmature infants, and infants with birth-asphyxia have an increased risk for neurological and developmental disabilities. Formerly in Suriname only children with severe motor retardation were referred to a pediatric physiotherapist. In 2012 a long-term follow-up program was introduced to enable early intervention in these children. In this study we investigate the prevalence of motor delay in 5 year old Surinamese children with the above mentioned risk factors. All children were born in 2010 well before the follow-up program started.

**Patients and methods** Two groups of children were included: group 1 were children born very preterm (<32 weeks) and/or dysmature (<1500 gram) and group 2 children born with birth-asphyxia (Apgar-score < 6 at 5 minutes postpartum). At age 5 years and 3 months the children were tested with the Movement Assessment Battery for Children-2-NL. Preliminary data were analyzed.

**Results** Group 1 consisted of 37 children (15 boys, mean age 5.3 years; range 5.1-5.4); group 2 of 14 children (12 boys, mean age 5.3 years (range 5.2-5.4). Four (11.1%) children of group 1 scored “at risk” and 4 (11.1%) scored delayed. One (7.1%) child of group 2 scored “at risk” and 5 (42.9%) scored delayed.

**Conclusion** The prevalence of motor delay in group 1 (22.2%) did not differ from the reference-group (16%). Half of the children in group 2 showed a delay. These results call for comparison with children followed-up in prospective studies and for studies on the effect of the early intervention program.

---

**PP-217**

**Poster presentation**

**Poster session 2 - timeslot 4**

**The effect of hippotherapy on trunk control in children with cerebral palsy: a pilot study**

L. Heyrman, E. Monbaliu, L. van Vaeck, E. Kritsotalaki, E. Lavent, H. Feys

1. KU Leuven, HEVERLEE, Belgium
2. KU Leuven, University of Leuven, HEVERLEE, Belgium
3. Dominiek Savio Institute, GITS, Belgium

**Introduction** The last decades an emerging trend has been observed towards studies on hippotherapy and its effect on posture or postural control in children with cerebral palsy (CP). However, the impact of hippotherapy on trunk control was not yet addressed.

This study investigated the effects of hippotherapy on static and dynamic aspects of trunk control.

**Patients and methods.** Eleven children (average age 11y 4m, SD 3y, range 8y – 15 y9m) with spastic CP, (9 bilateral CP, 2 unilateral CP; GMFCS I-IV) received 30 min of hippotherapy twice a week during six weeks. A standardized hippotherapy protocol was designed with exercises focusing on the trunk. The Trunk Control Measurement scale was administered at baseline, before intervention, after the intervention period and at six weeks follow-up. The secondary outcome measure was a subjective questionnaire based on a Likert Scale, which assessed the perceived improvements by the parents and the children.

**Results.** Highly significant improvements in the total TCMS score (p=.0001) and subscales selective movement control (p=.0003) and dynamic reaching (p=.0003) were found after intervention. However, the benefits were not retained at follow-up. Younger children and children with a lower level of GMFCS tended to benefit more from the intervention. The majority of children and parents partially perceived the observed improvements on daily activities.
after the intervention.  

**Conclusion.** The standardized hippotherapy protocol lead to an improvement of trunk control, in particular the dynamic aspects, in children with spastic CP. Further research is needed to confirm these results in a larger sample.

**PP-218**  
Poster presentation  
Poster session 2 - timeslot 1  

**Movement Assessment Battery for Children-2 (MABC-2): which reference values are suitable for Surinamese children at 5 years of age?**  

M. Fleurkens-Peeters¹, A.J.W.M. Janssen², M.W.G. Nijhuis-van der Sanden², C.W.R. Zijlmans¹  
¹Academic Hospital Paramaribo, PARAMARIBO, Surinam  
²Radboud University Medical Center, NIJMEGEN, The Netherlands

**Introduction**  
The Movement Assessment Battery for Children, second edition (MABC-2) is used worldwide for the identification of motor performance problems. Studies on cross-cultural validation of the UK reference values of the MABC-2 are performed in several countries. In Suriname the Dutch reference values are used. The aim of this study is to compare the Dutch (NL) and United Kingdom (UK) reference values of the MABC-2 for children between 5.0 years and 5.5 years in Suriname.

**Patients and methods**  
A cross-sectional design was used to compare the outcome of typically developing children in Suriname with the NL and UK reference values. Children visiting nursery classes of 7 schools in Paramaribo and surrounding rural areas were assessed using the MABC-2. Raw data was converted to UK and NL Standard Scores. Data were analyzed using SPSS 21.

**Results**  
Hundred five children (63 boys, 60%) were assessed. Mean age was 5.3 years (range 5.0-5.5). Using the UK and the NL references we found a mean Total Test Score of 9.95 and 9.83 respectively, also the Component Scores for Manual Dexterity, Balls Skills and Balance did not differ. However, compared to the NL reference values only 2 item scores differed significantly (p< 0.05) while compared to UK references this was the case for 4 items.

**Conclusion**  
The NL reference values proved to be more suitable for Surinamese children between 5.0-5.5 years than the UK reference values indicating that these NL references may be continued to be used both in clinical settings as for research purposes.

**PP-219**  
Poster presentation  
Poster session 2 - timeslot 2  

**Do children with motor disability practice sport enough? A survey on sports habits in children with motor disabilities attended in the service of child rehabilitation at Hospital Virgen Macarena.**  

V. Cruz Guisado¹, M.D. Romero Torres¹, V. Vidal Vargas², B. Romero Romero¹, J.A. Conejero Casares¹, M. Rodriguez-Piñero Durán²  
¹University Hospital Virgen Macarena, SEVILLE, Spain  
²Hospital Virgen Macarena, SEVILLE, Spain

**Introduction**  
The benefits of physical activity and sport are universally accepted for all children, including those with disabilities, but their participation in fitness and activity programs, whether for leisure, recreation, or competition, are limited. The aim of this study is to analyze sport habits of children with physical disabilities reviewed at Child Rehabilitation Unit (Hospital Virgen Macarena)

**Patients and methods**  
A survey is designed from two models that serve as a guide and comparison. In order to focus on caregivers of children with disabilities some questions are adapted.

**Results**  
66.67% of respondents perform some type of organized sport compared to 63% in normally-developing children (NDC). The most common activities are swimming and horse riding in girls (dance and swimming in normally-developing girls) and boys swimming and football (soccer and swimming in boys with normal development). Only 35% of respondents make spontaneous sport compared with 72% of children with normal development.

66% of children with GMFCS 5 perform some organized activity but no spontaneous sport. 71.3% of children with GMFCS 1 practice organized sport and 85.71% practice in non-organized way.

According to the topography organized sport is practiced by 58% of quadriplegics and 75% of hemiplegic; and spontaneously 6.67% of quadriplegics and 75% of hemiplegic.

**Conclusion**  
Participation in organized sport is similar in children with cerebral palsy and NDC, being less in spontaneous way but with the same preferences. The reason for those who do not play sports is because of the degree of disability and not having facilities nearby.
PP-220
Poster presentation
Poster session 2 - timeslot 3

Neuro-sensory Motor Developmental Assessment (NSMDA) at 18-24 months Predicts Quality of Life at 3½ to 5 years
Ann & Robert H. Lurie Children's Hospital of Chicago, CHICAGO, United States of America

Introduction: The NSMDA is a standardized motor assessment in infants and toddlers that is predictive of later abilities, but the importance of early neurosensory and motor development to later quality of life has not been assessed. Our purpose was to determine if NSMDA scores at 18-24 months were predictive of parent-rated quality of life at 3.5-5 years of age using the PedsQL 4.0™. Patients and Methods: Fifty-two high-risk children (28 weeks gestation, n=18; brain injury, n=20, neonatal cardiac surgery, n=21) were assessed using the NSMDA at 18-24 months corrected age. NSMDA scores were categorized as normal performance to minimal impairments (scores 0-11, NL-MIN), mild-moderate impairments (scores 12-19, MILD-MOD) and severe-profound impairments (scores ≥20). At 3.5-5 years, parents completed the PedsQL 4.0™ to assess their child's physical health and emotional and social functioning.

Results: Parent-assessed physical health was lower for children with 18-24 month Severe-Profound NSMDA impairments (46.2 ± 25) than for those with MILD-MOD (68.3 ± 27) or NL-MIN impairments (87.6 ± 17 SD, p<.05 for all comparisons). Social functioning was lower for children with severe-profound NSMDA impairments (63.0 ± 12.6, p<.05) and trended to be lower for those with MILD-MOD impairments (71.4 ± 15.5) compared to NL-MIN (85.6 ± 19.3). Emotional functioning was similar across NSMDA categories.

Conclusion: 18-24 month NSMDA scores predicted physical health and social quality of life scores at 3.5-5 years. Further research is needed to mitigate the effects of early neurosensory and motor impairments on social participation and physical health even at very young ages.

PP-221
Poster presentation
Poster session 2 - timeslot 4

Children with spastic cerebral palsy do not have excess leg muscle activity during daily activities or at rest
J.S. Michelsen1, M.C. Lund1, T. Alkjær1, T. Finni2, J.B. Nielsen2
1University of Copenhagen, COPENHAGEN N, Denmark
2University of Jyväskylä, JYVÄSKYLÄ, Finland

Daily activity may be involved in the development of contractures in children with Cerebral Palsy (CP). The aim of this study was to measure if lower limb muscles of children with CP are more or less active compared to typically developing (TD) children during activities of daily living and rest. Methods: The study was a cross-sectional case-control study involving 7 children with spastic CP (age range 7-13 years, GMFCS I–III) and 11 TD children (age range 7-12 years). EMG was measured from four muscle groups of each leg (quadriceps, hamstrings, tibialis anterior and gastrocnemious) using special-designed pants with built-in EMG surface electrodes. Measurements were made while the children performed a specific activity program consisting of 10 movement tasks (e.g. walking, jumping, kicking) and five tasks at rest (lying down, sitting, standing with/without support and relaxing in a couch).

Results: No difference in the level of muscle activation was found between children with CP and their peers in any of the activities or at rest. However, children with CP showed reduced ability to activate their muscles during maximum voluntary contraction (MVC). Conclusion: Absence of increased muscle activity during motor activities and at rest in children with spastic CP indicates that spasticity does not cause excess muscle activity during movement or involuntary continuous muscle activity at rest in these children. Our findings further indicate that children with CP use a higher percentage of the maximal capacity of their muscles in order to accomplish activities of daily living.

PP-222
Poster presentation
Poster session 2 - timeslot 1

Prevalence of Overweight and Obesity in Children with Cerebral Palsy in the United States, the National Survey of Children's Health (NCHS)
P. Abeysekara, J. Slaughter, R. Turchi
Drexel University, PHILADELPHIA, United States of America

Introduction: Cerebral palsy (CP) is the most common cause of physical disability in children. Obesity is an emerging problem for children with special needs including children with CP. The US lacks a widespread
In Suriname, an upper-middle-income country, treatment for children with DMD is not always prescribed due to constraints in transport and financial possibilities. Therefore, the aim of this study is to examine the functional status of DMD children over a two-year period without treatment history in Suriname. Suriname, with a population of 520,000 people, has a limited number of patients with DMD, of which 9 were included in this study.

The prevalence of overweight/obesity was 26.8% in children with CP versus 31.3% in children without CP. Among children with CP, boys [AOR: 6.82 (95% CI: 2.18-21.35)] and those with health insurance [AOR: 9.12 (95% CI: 0.82-101.6)] were more likely to be overweight/obese compared to girls and those without health insurance, respectively. Children with CP who walked independently were more likely to be overweight/obese than children who walked with assistance or did not walk [AOR: 3.53 (95% CI: 0.87-14.26)].

Conclusion While our findings did not show a significant difference between children with and without CP and overweight/obesity status, our findings suggest that overweight/obesity should still be monitored in children with CP as more than one quarter of children with CP were overweight/obesity.

PP-225
Poster presentation
Poster session 2 - timeslot 4

Evaluation of Duchenne Muscular Dystrophy children with no treatment history
F. Walhain*, M. Declerck*, K. Bastenie*, M. Fleurkens-Peeters*
1Anton de Kom University of Suriname, PARAMARIBO, Surinam
2Academic Hospital Paramaribo, PARAMARIBO, Surinam

In well developing countries, therapeutic intervention are widely applied in children with Duchenne Muscular Dystrophy (DMD). In Suriname, an upper-middle-income country, treatment for children with DMD is not always prescribed due to constraints in transport and financial possibilities. Therefore, the aim of this study is to examine the functional status of DMD children over a two-year period without treatment history in Suriname. Suriname, with a population of 520,000 people, has a limited number of patients with DMD, of which 9 were included in this study.

Muscle strength, range of motion, motor- and pulmonary function, functional tasks and independency of activities of daily living (ADL) were evaluated three times with 12 months in between testing. The group of children that were evaluated can be described as a varied group of children, with the ages between 8 and 18 years old. Two of the children with DMD were able to walk independently. Non-ambulant children mostly had rigid contractures and were heavily dependent on others to perform ADL. Overall, every year a decrease in inspiratory pressure, functional performance, muscle strength and range of motion -especially through the joints of
the lower limbs was noticed among all patients, as well a loss of ADL independency. This report evaluates the physical status and disease progression of DMD children with no treatment history. This evaluation is of importance to improve the quality of screening to set up standardized treatment protocols and to improve quality of life and life expectancy of children with DMD in Suriname.

PP-226
Poster presentation
Poster session 2 - timeslot 1

Developing a novel more robust approach to assessing and reporting body composition and fitness to families of children with mobility impairments: a mixed methods study
T. O’Brien1, H. Kubis2, L. Spencer1, N. Bray1, M. Jackson1, R. Whitaker3, J. Noyes2
1Liverpool John Moores University, LIVERPOOL, United Kingdom
2Bangor University, BANGOR, United Kingdom
3Whitres, BANGOR, United Kingdom

Introduction
Children with mobility impairments are often overweight and unfit. Measuring weight is challenging and sometimes misleading, so alternative tests are required. We know little about children’s experiences of physiological testing, or preferences for feeding-back results. Our mixed-methods study aimed to develop a robust approach to assessing and reporting body composition and fitness for children with mobility impairments.

Patients and methods
22 children who use wheelchairs (age: 6-18yrs, 10♂, 14CP). Physiological tests: body fat% using bioelectrical impedance; resting metabolic rate and respiratory exchange ratio using spiroergometer; respiratory function as FEV1/FVC% and maximal nasal inspiratory pressure. Immediately after testing children were interviewed about their experiences, and views on test acceptability. We subsequently asked parents in focus group, and children individually, their preferences for reporting results to them.

Results
Physiological tests confirmed that these children were overweight and some had reduced fitness. All tests were effective and acceptable for most children, although some with more severe impairments or younger children were unable to follow instructions to perform respiratory function tests or remain still for assessing metabolic rate. Parents found ‘numbers’ confusing and wanted unambiguous explanations of what the results of tests meant. They identified that some results, particularly body fat, needed to be reported with sensitivity, but clarity and honesty were vital to motivate behaviour change. Children needed simple and short individually-tailored messages.

Conclusion
Accessible and acceptable physiological testing and better understanding of results may lead to greater motivation by children and parents to participate in keep fit interventions.

PP-227
Poster presentation
Poster session 2 - timeslot 2

Voices and choices for disabled children and young people about participation in recreational activities: Creating their future stories with collages.
D.M. Pickering, P. Gill, J.P. Davies, C. Reagon
Cardiff University, CARDIFF, United Kingdom

Introduction
Understanding about participation in recreational activities suggests not enough is known about the motivational drivers to promote participation and build resilience with disabled children and young people (C & YP) (Imms et al 2016). It is unknown what disabled C & YP think about the potential health and wellbeing effects (H & WB) of participation in recreational activities. The aims were:
Explore disabled YP’s perceived H & WB effects of participation in recreational activities.
Facilitate YP to explore their future participation.

Patients and Methods
A consultation event was held with a group of disabled young people using a focus group and collage activity exploring ‘Fun’ and ‘Fitness’ and their ‘Future’ aspirations for participation (Mannay, 2015). An interpretative phenomenological analysis approach was used, coding for conceptual, descriptive and linguistic components to identify common themes (Smith et al, 2013).

Results
Seven disabled young people took part, three males, four females aged 14-30 years. All spoke verbally, one YP had cerebral palsy limiting her own participation in the collage activity. Themes which emerged included access to hoisting equipment and transport. Those engaged in community activities spoke of enhanced motivation to try new opportunities, describing helpful attitudes. There were mixed views about perceived H & WB effects resulting from
participation in recreational activities with only three participants featuring this in their collages.

**Conclusion**
This data has informed the future direction of the PhD study where C & YP will be recruited to explore their views, experiences and choices of participation in recreational activities.

**PP-228**
Poster presentation
Poster session 2 - timeslot 3

**How people with developmental disabilities perceive their participation?**

M. Badía¹, M.B. Orgaz², I. Riquelme³, M. Gómez-Vela⁴, M.A. Verdugo⁵

¹University of Salamanca, SALAMANCA, Spain
²Institute on Community Integration(INICO), SALAMANCA, Spain
³IUNICS, BALEARIC ISLANDS, Spain
⁴Institute on Community Integration, SALAMANCA, Spain

**Introduction:** Currently, people with Developmental Disabilities (DD) live in the community they can perform roles and interactions in different areas of life, but they have less opportunities for full and effective participation. Promoting participation has become a goal of the support services for people with DD and a key outcome of intervention. The purpose of this study was to examine the importance and control over participation by adults with DD.

**Patients and methods:** One hundred-ten individuals with DD (M= 31.8, SD= 13.2, range 16-73) completed the Community Participation Indicators (CPI) in a face-to-face interview. The response distribution for each of the items of indicators importance and control of participation was calculated. To determine significant differences between both indicators a t-test for related samples was conducted.

**Results:** People with DD report that their full participation is respected and they perceive that they have opportunities to control the life activities in which they engage. Significant differences between importance and control of participation, showing that the scores in control were significantly higher than the scores in importance.

**Conclusion:** The findings reveal interesting participation patterns from the viewpoint of adults with DD. Participants stated that they are at a disadvantage to participate fully in the community, although in the life activities in which they participate, they perceive that they can make decisions and be the agents of their own lives.

**PP-229**
Poster presentation
Poster session 2 - timeslot 4

**Long-term participation following pediatric ABI**

A.J. de Kloet¹, S. Rosema¹, F. van Markus-Doornbosch², R. Yahoob-Burgers³, C. Sluij-Hagen³, S.A.M. Lambregts³, J.J.L. Meesters³, T.P.M. Vliet Vlieland⁴

¹Sophia Rehabilitation Centre, The Hague University, THE HAGUE, The Netherlands
²Sophia Rehabilitation Centre, THE HAGUE, The Netherlands
³Revant Rehabilitation Centre, BREDA, The Netherlands
⁴Leiden University Medical Centre, LEIDEN, The Netherlands

**INTRODUCTION**
Research in paediatric ABI has long been mainly focused on physical and cognitive functioning and their determinants. Many studies highlighted the reciprocal relationship between outcome of pediatric ABI and family functioning. Therefore the aim of this study is to prospectively describe the course of participation and impact on family after paediatric ABI.

**PATIENTS/METHOD**
Patients: 150 children, adolescents and young adults (4-25 year) with a diagnosis ABI, their families and a significant other person (like a friend or teacher). Exclusion criteria were physical, neurological or psychiatric consequences affecting study participation.

Design: multicenter, prospective, observational study.

Assessments: questionnaires tapping into demographic and injury information, as well as participation and family functioning. Administration of these questionnaires is standard procedure for the initial appointment at the rehabilitation center. After Informed Consent the same set of questionnaires was completed 12 and 24 months following their first appointment.

Primary outcomes are participation and family. Secondary outcomes are health care consumption, needs and satisfaction, quality of life of the child and family and fatigue.

Injury and rehabilitation treatment characteristics are collected from the patient files by the researcher.

**RESULTS**
A medical ethical committee granted an exemption of assessment. Fourteen rehabilitation agreed to participate. Inclusion started October 1st 2015. A database was set up to process the data.
CONCLUSION
A multi-centered study started to prospectively describe the course of participation and impact on family in a large cohort of children and adolescents who are referred for ABI at a rehabilitation center in the Netherlands.

PP-230
Poster presentation
Poster session 2 - timeslot 1

Bullying in Children and Adolescents with Cerebral Palsy and Other Physical Disabilities
B. Tanp, B.T. Frainey, D. Gaebler-Spira, S. Berger
1Rehabilitation Institute of Chicago, CHICAGO, United States of America
2Northwestern University, CHICAGO, United States of America
3Lurie Children's Hospital of Chicago, CHICAGO, United States of America

Introduction: The purpose of this study is to determine the prevalence of bullying in school-aged children with cerebral palsy (CP) and other physical disabilities (PD). We hypothesize children with PD are victimized by peers at higher rates than children without PD. Also, we believe children with higher Gross Motor Function Classification Scale (GMFCS) levels experience greater rates of bullying.

Patients & Methods: Cross-sectional, survey-based. A convenience sample of children, ages 10-18, with a diagnosis of either CP or PD were invited into this IRB approved study. Caregivers of eligible participants were also enrolled in the study. Surveys were completed by the participant and designated caregiver.

RESULTS: 51 participants met the inclusion criteria. 44 children had a primary diagnosis of CP and 7 had a PD due to another cause (stroke, muscular dystrophy, etc.). 20/31 (65%) subjects between GMFCS I-III reported some form of victimization. Conversely, victimization occurred in a minority of subjects with GMFCS IV-V: 4/13 (27%) indicated peer victimization and none indicated bully victimization. The 7 patients without a diagnosis of CP could not be assigned GMFCS levels.

CONCLUSION: Children with PD are likely at equal or greater risk for bullying than the typically developing peers. We found that children with mild to moderate gross motor impairment seem to be at greater risk for peer and bully victimization than more severely impaired children. Further work needs to be done to determine why this may be as well as to help create more opportunities for inclusion within schools.

PP-231
Poster presentation
Poster session 2 - timeslot 2

Participation in leisure activities in children and adolescents with cerebral palsy in Belgium
G. Dequeker, N. Bulckmans, E. Ortibus, D. Kos
1UZ Leuven, PELLENBERG, Belgium
2Artesis Plantijn Hogeschool Antwerpen, ANTWERPEN, Belgium
3KU Leuven, LEUVEN, Belgium

Introduction: The aim of this study is to describe the participation in leisure activities of children and adolescents with cerebral palsy (CP) in Belgium and to identify the factors affecting participation.

Patients and methods: Fifty participants aged between 10-21 years were included (27 boys, 23 girls; mean age 14, SD 3; Gross Motor Functional Classification Scale (GMFCS) I n=19, II n=17, III n=8, IV n=4, V n=2). Children and adolescents completed the Children’s Assessment of Participation and Enjoyment (CAPE).

Results: Participants engaged most frequently in social activities (diversity 8.4; intensity 2.7), whereas physical (3.6; 1) and skill based (2.8; 1.2) activities were least frequent. Unpaired t-tests revealed significant differences in intensity (p=0.002) and intensity (p=0.003) scores between girls and boys, with a higher diversity and intensity score for girls. For type of education there was a significant difference for enjoyment (more enjoyment in special education p=0.021). Adolescents (15-21y) had less pleasure (p=0.01) but more variety in persons (p<0.0001) and places (p=0.001) to perform leisure activities than children (10-14y). For GMFCS levels ANOVA statistics indicated significant differences for diversity and intensity, with better outcomes for ambulatory participants. On the other hand GMFCS IV and V had significant more pleasure on leisure activities than GMFCS I, II and III.

Conclusion: Gender, age and educational setting are important variables associated with diversity, intensity and enjoyment of participation in leisure activities in children with CP. This information assist therapists to support participants with CP in their search for meaningful and varied leisure activities.

PP-232
Poster presentation
Poster session 2 - timeslot 3

Cognitive function and participation in children and youth with mild traumatic brain injury two years after...
Abstract

Introduction: long-term cognitive outcome after mild traumatic brain injury (mTBI) in children and youth may interfere with several domains of functioning.

Objectives: to describe cognitive functioning and participation in children and youth two years after mTBI, and determine associated factors.

Patients and Methods: cross-sectional study among patients (N=73) aged 6-22 years, hospital diagnosed with mTBI. Linear regression modeling was used to investigate the effect of potential predictors on cognitive functioning, using a neuropsychological assessment. Extent of participation was assessed using the Child and Adolescent Scale of Participation and correlation analysis were conducted to examine its association with level of cognitive functioning.

Results: 7-15% participants had impaired cognitive function, especially with regard to processing speed, ability to inhibit prepotent responses and to adjust responses to received information, visuo-spatial constructional ability and visuo-spatial memory. Being non-native Dutch, lower level of education and pre-injury cognitive problems were particularly found as predictive factors for lower level of long-term cognitive functioning. Slower inhibition speed, less visuo-spatial and verbal working memory were associated with less participation in activities at home and community living.

Conclusions: in the majority of children and youth no impaired cognitive function was found. However, some children performed below norm. Level of participation was reported quite high by parents, resulting in relatively few associations between long-term cognitive functioning and participation.

Activities and participation of children and adolescents after mild traumatic brain injury and the effectiveness of an early Intervention: the Brains Ahead! Study Design

Introduction: Approximately 20% of children and adolescents who have suffered mild traumatic brain injury (mTBI) may experience long-term consequences, including cognitive problems, posttraumatic stress symptoms and reduced load-bearing capacity. This may lead to chronic and disruptive problems, such as participation problems in school and in social relationships. This study aims to examine the level of activities and participation of children and adolescents after mTBI and to identify possible outcome predictors. Furthermore, the effectiveness of an early psychoeducational intervention will be investigated and compared to usual care.

Patients and methods: A randomized controlled trial (RCT) nested within a multicentre longitudinal prospective cohort study. The eligible participants include children between 6 and 18 years with mTBI within the last two weeks. The cohort study will include 500 children with mTBI and their caregivers. A subset of 140 participants and their caregivers will be included in the RCT. The psychoeducational intervention involves one face-to-face contact and one phone contact with the interventionist, during which the consequences of mTBI and advice for coping with these consequences to prevent long-term problems will be discussed. Information will be provided both verbally and in a booklet.

Results: The primary outcome domain is activities and participation using the Child and Adolescent Scale of Participation. Participants are evaluated two weeks, three months, six months and eighteen months after mTBI.

Conclusion: The results of this study will provide insight into which children with mTBI are at risk for long-term participation problems and may benefit from an psychoeducational intervention.
Introduction: “Impact Of Childhood Neurological Disability Scale (ICNDS)” was developed in 1999 by Carol Camfield, containing 44 items. The assessment scored with the overall health, family, social environment, activity number of schools and the academic status of self-care situation, the question of family activities. At the end of assessment there is a visual scale to measure the quality of life that ask the verbal score between 1-6. Our aim in this study, ICNDS scale by translate the Turkish ensure the validity and reliability of our language, is used to make clinical trial in patients with temporal lobe epilepsy.

Patients and Methods: The scale was translated into Turkish by following the appropriate translation step. The demographic data of patients were recorded. Internal structure consistency and test-retest reliability for reliability analysis were measured. Cronbach’s alpha coefficients for all subscales for each item separately and the scale and item-total correlations were calculated. Test-retest reliability, including baseline and 2 week after the scale was applied twice by physiotherapist. Test-retest reliability was assessed statistically using Pearson correlation test for validity ‘with validity’ was investigated.

Results: 28 female (35%), 52 male (65%) 80 patients were included. Mean age was 6,94 ± 1,453 year, mean birth weight was 3049,42 ± 520,309 gr. In the 95% confidence interval assessors from 0,973-0,989 found that Cronbach’s alpha; Intraclass Correlation Coefficient (ICC) 0,983 (r = 0,966; p = 0,000), respectively.

Conclusion: The ICNDS is a valid and reliable measurement for assessing functions in children with temporal lobe epilepsy in Turkey.

How do children with Cerebral Palsy GMFCS IV-V perform in everyday activities on the Pediatric Evaluation of Disability Inventory-Computer Adaptive Test (PEDI-CAT)?

J. Knox
Bobath Centre, LONDON, United Kingdom

Introduction
A clear baseline of children’s everyday functioning capability and likely potential aids treatment planning and is important for families. Functional gains following therapy and other interventions for children with cerebral palsy classified as GMFCS IV and V are typically small and often not detected by existing outcome measures. This preliminary study aimed to explore what everyday activities are typically achieved by these children.

Patients and Methods
The PEDI-CAT is a parent report measure arranged in four domains: daily activities, mobility, social/cognitive and responsibility. It was administered to an initial convenience sample of 14 parents (children: GMFCS IV, n=6; V, n=8). Items were identified where any child achieved a higher score than ‘unable’, and common skills by identifying where >25% achieved this.

Results
Most common skills acquired were social/cognitive, e.g. using a few words/signs to indicate choices or ask questions and recognition of simple concepts such as the days of the week. Daily activity skills included simpler dressing tasks, finger and spoon feeding. Fewer skills were attained within mobility: early skills such as propping on prone, turning the head and using a walker indoors; and for responsibility skills, only daily management of bowels and bladder.

Conclusion
In this sample, children classified as GMFCS IV and V appeared to acquire more social/cognitive and daily activity skills, but fewer mobility or responsibility skills. This might be anticipated with their level of physical impairment. Further research is needed with a larger sample to establish if this represents typical patterns of skill acquisition.
individual's most consistent and accurate movements, allowing them to play to their strengths and participate in
electronic gaming to their maximum.

Methods
Using a Kinect™ sensor, we analyse how a user moves. We are creating a database of movements from typically
developing children and children with cerebral palsy. We identify movements which are the most efficacious for
game play. A manually-trained machine-learning algorithm is used to discriminate and identify movements from a de
ovo user. Prioritisation heuristics identify which movements will create the most successful game play. The user will
then be able to play a wide range of existing, downloadable PC games using a completely individualised set of body
movements.

Results
We expect to create a utility that will choose an individual's 'best' movements and map these to gaming control. We
expect that individuals with movement disabilities will perform better when playing computer games using these
movements in comparison to a set of pre-prescribed movements or standard keyboard control.

Conclusion
This project focuses on participation in computer gaming, but applications of this movement recognition technology
could be used in environmental controls, computer access for education and electronic assistive technology.

PP-237
Poster presentation
Poster session 2 - timeslot 4

The effects of gender on quality of life of children with Down syndrome
B. Kepenek-Varol, A. Kostanoglu
Bezmialem Vakif University, ISTANBUL, Turkey

Introduction: Down syndrome (DS) is most common genetic cause of moderate mental retardation. Developmental
delay is universal, cognitive impairment does not uniformly affect all areas of development and social development is
relatively spared. Some studies have shown cognitive and social development are different between girls and boys.
Quality of life of children with DS needs to evaluate between girls and boys. The aim of this study was to investigate
the effects of gender on quality of life of children with DS. Patients and method: Twenty-one girls (mean ages
6.9±1.87 years) and 24 boys (mean ages 6.5±2.33 years) with DS and 21 healthy girls (mean ages 6.9±1.69 years)
and 21 healthy boys (mean ages 7.05±2.09 years) were included in the study. Parent form of Pediatric Quality of
Life Inventory 4.0 (PedsQL) were used in this study. The forms of PedsQL were completed by mothers of children.
Student’s t test were used to comparison the results of PedsQL. Results: There were no statistically significant
differences on quality of life between girls and boys with DS (p=0.095). However, results showed statistically
significant differences between girls with DS and healthy girls and boys with DS and healthy boys (respectively
p=0.0001 and p=0.0001). Conclusion: In this study there was no effect of gender on quality of life of children with
DS. When compared with healthy children there is an increase in favor of healthy children in both genders. We think
that studies are needed with a high number of participants in future.

PP-238
Poster presentation
Poster session 2 - timeslot 1

Developmental Challenges Are Associated with Preschool Quality of Life in High-Risk Children
Ann & Robert H. Lurie Children's Hospital of Chicago, CHICAGO, United States of America

Introduction: Much research has focused on functional limitations of high-risk children but the interaction between
functional limitations and quality of life has not been as well assessed, particularly at younger ages. The purpose of
this study was to evaluate the interaction between quality of life and developmental challenges (DC) in high-risk
preschool children.

Patients and methods: Fifty-five children (<28 weeks gestation, n=20; brain injury, n=22; neonatal cardiac surgery,
n=21) were enrolled at hospital discharge and evaluated at 3.5-5 years with neuromotor examinations, cognitive
testing, and parent ratings of quality of life using the PedsQL 4.0™.

Results: Fourteen children (25%) had DC including cerebral palsy, autism and/or low general cognitive abilities
(score <70). Children with DC had lower PedsQL 4.0™ scores than children without DC for physical health (64.6 ±
29 vs 86.5 ± 18, p=0.002) and social functioning (67.7 ± 25 vs 86.6 ± 15, p=0.0016). Emotional functioning scores
were similar (71.6 ± 23.6 vs 76.3 ± 16.4). Among the children with DC, children with gross motor functional
classification scores (GMFCS) of 2-5 had lower scores for physical health than children with GMFCS 0-1 (41.8 ±
18.7 vs. 78.9 ± 26.0, p=0.019) but social functioning was similar in both groups (62.0 ± 11 vs. 71.2 ± 31.7, NS).

Conclusion: Parents of high-risk children with developmental challenges reported lower quality of life for physical
and social functioning by 3.5-5 years of age. Innovative activities to increase early social participation may improve
quality of life for preschool children with developmental challenges.
Environmental barriers and its correlation with diversity and intensity of participation in leisure activities in children and adolescents with cerebral palsy

E. Longo¹, M. Badia², B. Orgaz³
¹University Federal do Rio Grande do Norte, SANTA CRUZ, Brazil
²University of Salamanca, SALAMANCA, Spain

Introduction: Physical, social, and attitudinal environment may affect the participation in leisure activities of children and adolescents with cerebral palsy (CP). The objective of this study was to examine the association between leisure participation and environmental barriers in children and adolescents with cerebral palsy (CP). Patients and methods: participants in this study included 206 children and adolescents with CP (55.8% males) aged 8–18 years (M = 11.96, SD = 3) and their parents. Distribution according to the Gross Motor Function Classification System (GMFCS) was 24.3% level I, 18% level II, 18% level III, 12.6% level IV, and 27.2 level V. Environmental barriers were assessed with the Spanish version of the European Child Environment Questionnaire (ECEQ), and participation with Spanish version of the Children’s Assessment of Participation and Enjoyment (CAPE). Pearson correlation coefficients were calculated to examine the association between ECEQ and CAPE scores. Results: Environmental barriers in Products & Technology, in Supports and in Services, Systems & Policies were associated with diversity and intensity of participation in several leisure activities. Conclusion: There is an increasing amount of research evidence regarding the role of the environment in explaining participation in children with cerebral palsy. The findings of this study confirms it and highlight the importance of providing interventions to produce environmental changes that foster the participation in leisure activities.

Investigation of the effect of robotic walking training on the gait of ambulatory children with cerebral palsy: detailed pilot study

M. Yazici¹, Y.Y. Yakut², A. Linalioğlu¹
¹Hacettepe University, ANKARA, Turkey
²Hasan Kalyoncu University, School of Health Sciences, GAZIANTEP, Turkey

Introduction

This study aims to investigate the effects of Robotic Walking Training (RWT) on gait symmetry and the stance phase control of the paretic limb in ambulatory children with hemiparetic Cerebral Palsy.

Patients and Methods

20 hemiparetic children GMFCS level I were equally divided into study and control groups. The 12-week-long intervention for the study group (average age: 8.4 ± 2.3) included conventional physiotherapy (PT) 3 days/week, and RWT (innowalk pro) 3 days/week, 30 minutes each. The control group (average age: 9.1 ± 1.7) joined the conventional PT program 3 days/week for 12 weeks. Spatio-temporal characteristics of gait and properties of static upright position were compared between paretic-nonparetic extremities, pre and post intervention.

Results

In the study group, no difference was found in the stance phase values pre-post intervention (p>0.05). In the control group, durations of the stance phase on the extremities were found different pre intervention (p<0.05). Swing phase and stride durations were significantly different in both groups both pre and post intervention (p<0.05). In the study group, weight transfer on the hemiparetic limb during the stance phase increased after the intervention (p<0.05). In both groups, the duration of standing on one foot was different between the two limbs, pre and post intervention (p<0.05). However, the difference values were similar in both groups (p>0.05).

Conclusion

Further researches on walking optimality and developing new applications in addition to physiotherapy programs are important.

Playful rehabilitation - is there a future for virtual reality within cognitive rehabilitation for children? A review.

M.S. van den Heerik¹, L.A. Spreij¹, J.M.A. Visser-Meily¹, I.C.M. Rentinck², M. Verhoef², T.C.W. Nijboer¹
¹De Hoogstraat Rehabilitation/UMC Utrecht, UTRECHT, The Netherlands
Support needs profiles in children and adolescents with cerebral palsy

V. Aguiu, M. Bada, M.A. Verdugo, A.M. Amor
1University of Salamanca, SALAMANCA, Spain
2INICO, University of Salamanca, SALAMANCA, Spain

Introduction
Support needs are defined as the pattern and intensity of supports necessary for a person to participate in activities linked with normative human functioning. The aim of this study is to present the supports needs’ profiles of a sample of children with Cerebral Palsy (CP) considering their motor function, manual ability and functional communication.

Patients and methods
Seventy Spanish children and adolescents (58% males and 42% females) with CP (M = 9.5, SD= 3.6, range 5-16 years old). The professionals completed the Spanish version of the Supports Intensity Scale –Children’s Version (SIS-C), Classification Systems on Gross Motor Function (GMFCS-E&R), Manual Ability (MACS), and Communication Function (CFCS). Descriptive statistics and Pearson correlations were calculated between those characteristics and children’s support needs.

Results
Support needs evaluated in seven areas: Home Living, Community and Neighborhood, School participation, School learning, Health and Safety, Social activities, and Advocacy activities; were positively related with the motor function, manual ability and communication function, being the highest correlation between CFCS and SIS-C total score.

Conclusion
Supports need and motor function, manual ability and communication function are related. This study assesses support needs with the goals of guiding the support’s individualized plans and the organizations’ resources allocation to enhance participation. Besides using the SIS-C, the study addresses the specific motor and communication characteristics of these children. It implicates the use of the SIS-C in this group and paves the way for further studies.
Introduction: Few studies examine the relationship between cognition and brain microstructure in persons with dyskinetic cerebral palsy (CP). This study aims to identify brain regions where white matter (WM) microstructure is associated with intellectual quotient (IQ) in dyskinetic CP.

Patients&methods: Thirty-three participants with dyskinetic CP (mean±SD age: 24.4±12.6, 15 women) where divided in two groups according to IQ (n=14 IQ<85; n=19 IQ≥85) and were age and sex matched with 14 and 19 controls. Intelligence was measured using the Raven’s Coloured Progressive Matrices. Diffusion weighted images were acquired at 1.5T. Two voxel-based whole brain groupwise analyses were used to compare FA of both CP groups to the matched controls using a general lineal model. Statistical maps were threshold at p<0.05 corrected for multiple comparisons using threshold-free cluster enhancement.

Results: White matter FA was significantly different between both CP groups (IQ<85, IQ≥85) and their matched controls in regions associated with motor pathways (internal and external capsule and corona radiata) and cingulum, fornix and corpus callosum. In subjects with IQ≥85, differences were more extended in all cerebral lobes and along entire tracts close to cortex regions, and involved relevant associative fasciculi such as the superior longitudinal fasciculus.

Conclusion: Long association fibres are specifically impacted in persons with dyskinetic CP with borderline/low IQ while subjects with an average IQ present a normal FA in these regions. Subjects with both average and borderline/low IQ also have a reduced FA in motor-related fibres and regions that might play a role in other associated comorbidities.

PP-244
Poster presentation
Poster session 2 - timeslot 3
Relationship between upper extremity functional level and health related quality of life in patients with cerebral palsy
K. Unal, E. Safran, D. Tunçer, B. Naci, H.N. Gurses
Bezmialem Vakif University, Faculty of Health Sciences, ISTANBUL, Turkey

Introduction: Cerebral Palsy (CP) is a non-progressive neurological disorder characterized by long term disabilities that affect the quality of life of both patients and those caring for them. The aim of this study is to investigate the relationship between upper extremity functional level and health related quality of life in patients with CP.

Patients and Method: 8 ambulatory children with hemiparetic CP the ages between 6-18 were included in the study. We used Manuel Ability Classification System (MACS) and Pediatric Outcome Data Collection Instrument (PODCI) to evaluate functional upper extremity level. functional health and health related quality of life, respectively.

Results: There were a significant negative correlation of MACS to pain and global subscores because of the many associated comorbidities. Significant correlation was found between mobility and global subscores (p<0.05). Physical function and happiness were found to be correlated (p<0.05).

Conclusion: Having a small sample size is a limitation of our study. Children with a higher upper extremity level have a better quality of life score. We only found a correlation of MACS to pain and global subscores because of the many factors related to quality of life in children with CP. Further studies should be conducted with larger populations and control groups.

PP-245
Poster presentation
Poster session 2 - timeslot 4
Higher functioning cerebral visual impairment and academic skills in children with cerebral palsy
S. Micheletti1, V. Scaglioni1, M. Gnesi2, V. Avigo3, J. Galli2, L. Pansera2, E. Fazzi2
1ASST Spedali Civili di Brescia, BRESCIA, Italy
2University of Pavia, PAVIA, Italy
3ASST Spedali Civili, BRESCIA, Italy
4University of Brescia; ASST Civili Hospital of Brescia, BRESCIA, Italy
5University of Brescia, BRESCIA, Italy
6ASST Spedali Civili, University of Brescia, BRESCIA, Italy

Introduction: Children with spastic cerebral palsy (CP) are often affected by cerebral visual impairment and visuo-cognitive disorders, which involve learning processes. Up to now there have been a few studies analyzing the learning skills of CP children, most of them limited to the measurement of IQ.

The aim of our study is to investigate which neuropsychological and neurofunctional aspects most influence academic skills in school aged children with CP.

Patients and methods: From the children referred to our Unit from 2009 to 2015 we selected 30 children ( 16 females, mean age 12 years and 5 months, SD 2 years and 11 months; 22 with hemiplegia, 8 with diplegia), according to the following criteria: 8-16 years, pre-perinatal brain injury documented by MRI, verbal/performance IQ
Introduction: Angelman Syndrome (AS) is a rare neurogenetic imprinting disorder attributable to the reduced expression of the maternally inherited allele of UBE3A gene. The aim of the study was to provide a complete neurodevelopmental profile in AS, with particular regard to some aspects, not so frequently analyzed in the literature, such as neurovisuo, communicative and adaptive features.

Patients and methods: a total of 25 subjects aged from 3 to 16 years (9 M and 16 F) with molecular confirmed diagnosis of AS have been enrolled in our study. All of them underwent an assessment protocol including neuromotor (Gross Motor Function Measure Scale), neurovisual, cognitive (Griffiths Mental Development Scale and Uzgiris Hunt Scale) adaptive (Vineland Scales) and communicative (MacArthur Bates Communicative Development Inventory and video-recordings children’s verbal expression) aspects.

Results: All children presented motor function involvement and neurovisual impairment characterized by refractive errors, fundus oculi anomalies, visual attention disorder, strabismus and/or oculomotor dysfunction. A severe cognitive impairment was detected with different profiles according to the test applied. In all cases, communicative disability regarding phonemic inventory, word/gesture comprehension and production was revealed. The profile of adaptive functions was the most various, according to the type of genotypic mechanism.

Conclusion: Cognitive skills seem to reach a plateau in patients with UBE3A deletion. The analysis of adaptive functions provided the most interesting data about the variability of patients’ skills: moreover an early correction of visual disorders can ameliorate visual acuity for activities of daily living and can promote the development of cognitive functions.

PP-247
Poster presentation
Poster session 2 - timeslot 2

Reliability and feasibility of the Portuguese version of Eating and Drinking Ability Classification System (EDACS-PT) in children with Cerebral Palsy
A.F. Santos1, J.J.M. Alvarelhão1, E. Salazar1
1Associação do Porto de Paralisia Cerebral, PORTO, Portugal
2Aveiro University, AVEIRO, Portugal

Introduction
Eating and drinking are activities that children with Cerebral Palsy (CP) often present limitations in performance, due to motor difficulties, with consequences in their quality of life. A classification system for eating and drinking, comprising five levels, that identifies characteristics of safety and efficiency related to oral feeding abilities was recently developed in UK. The aim of this study was to assess the reliability and feasibility of the Portuguese version of Eating and Drinking Abilities Classification System (EDACS-PT).

Patients and methods
36 children, aged between 3 and 18 years old were assessed by two Speech and Language Therapists (SLT), one of those not familiar with the child, and by own parents. All therapists had more than five years of experience working with children with CP. Agreement between SLT’s and between SLT and parents was calculated and also correlations with other classifications (GMFCS, MACS, BFMF, VSS). Facility of use and comprehensibility of items
was assessed by an independent interviewer.

Results
The ICC between SLT’s was 0.96 (CI95%: 0.92-0.98) and between SLT1 and parents was 0.84 (CI95%: 0.71-0.91). Kendall’s tau for GMFCS (0.66, p<0.001), BFMF (0.74, p<0.001), MACS (0.79, p<0.001) and VSS (0.69, p<0.001) shows a strong association with EDACS-PT. Feasibility interviews showed that EDACS was easy to understand and to use.

Conclusion
This work shows that Portuguese version of EDACS is reliable and can be used in clinic practice and information could be gathered both from professionals or from close proxies.

PP-248
Poster presentation
Poster session 2 - timeslot 3

Adherence and impact of interagency guideline in the management of children with dysphagia and complex feeding needs

V. Chatzidaki1, L. Franklin1, A. Khan2, H. Collumbine2, A.K. Seal3
1NHS Leeds Community Healthcare, LEEDS, United Kingdom
2University of Leeds, LEEDS, United Kingdom
3Leeds Community Healthcare NHS Trust, LEEDS, United Kingdom

Introduction
Unsafe swallowing is common in children with complex disabilities and associated with risk of aspiration. Shared multi-agency guidelines and tailored ‘Feeding plans’ can reduce risk. This study evaluated the effectiveness and compliance with multiagency feeding plans by settings other than the primary residence in a cohort of children. Methods 40 children (1-19 years) were selected by convenient sampling in an observational, qualitative service evaluation using questionnaires and telephone contacts. Written questionnaires were sent to all settings each child attended except their primary residence. Settings which did not respond to the questionnaire were contacted over phone to explore adherence to existing guidelines and feeding plans. Results Questionnaires were sent to 39 eligible settings and 21 were returned. 85% of these had a regularly updated feeding plan and 100% of the involved staff had appropriate training. One reported adverse event was related to a child having an unthickened drink. 18 settings didn’t return the questionnaire and were phoned. All 18 settings showed a lack of awareness of guidelines or non-compliance with feeding plans. Common themes were staff shortages, staff unaware of guideline or who was responsible for feeding the child. Some claimed that guideline reminders weren’t needed as staff were aware of the correct feeding technique. Conclusion The compliance with inter-agency guidelines to improve feeding safety is variable and dependent on leadership in settings, staff awareness and attitude, adequate staff numbers and regular staff training. Where compliance was good, the commonest risk was accidental access by a child to unthickened fluids.

PP-249
Poster presentation
Poster session 2 - timeslot 4

Title: Outcomes of Physical Therapy used with children and youth with Cerebral Palsy: a Systematic Review

J.I. Gómez1, M. Badía2
1Gimbernat-Cantabria University, TORRELAVEGA, Spain
2NICO, University of Salamanca, SALAMANCA, Spain

Introduction: The frameworks of International Classification of the International Classification of Functioning for Children and Youth (ICF-CY, 2007) and the current definition of Cerebral Palsy (CP) were used to explore the outcomes evaluated in Physical Therapy Clinical Practice. Specifically, the aim of this review was to determine the relationship between the outcomes in Physical Therapy with children and youth with CP with the ICF-CY.

Patients and methods: A systematic search was conducted utilizing Medline, PEDro and CINAHL databases from October 2011 to September 2016. We have selected clinical trial studies which evaluated physical therapy interventions in children and youth with CP. A reproducible review of the scientific evidence was developed with the methodology of the American Academy of Cerebral Palsy and Developmental Medicine (AAPDPM). Forty randomized clinical trials were selected to identify their outcomes.

Results: Forty studies met the inclusion criteria. Twenty-four studies investigated structures and function, and sixteen activity or participation outcomes. The focus of the research outcomes is related to structures and functions, and more specifically in the regulation of the muscle tone. Most outcomes referring to activities are related to bimanual activity in patients with hemiplegic CP. Only four studies have related to participation outcomes.

Conclusion: The results indicated that further research is needed concerning application of the others components of ICF in Physical Therapy Practice.
Sensory integration patterns and occupational participation of children with autism spectrum disorder
M. Huri, S. Kars, H. Kayihan
Hacettepe University, ANKARA, Turkey

Introduction: Sensory processing differences in children with autism spectrum disorder (ASD) affect their occupational participation which can restrict the opportunities to develop skills such as gross/fine motor skills, social interaction, communication and behavior. The aim of the study was to investigate the effects of specific sensory processing patterns which can effect development and occupational participation.

Patients and methods: In a sample of school aged children with ASD (N=433) a retrospective review was used to collect clinical data. Data of sensory processing patterns were gathered by Sensory Profile and Sensory Integration and Praxis Test while occupational participation was evaluated by Short Child Occupational Profile.

Results: Results showed that somatosensory patterns related to habituation; visuopraxis pattern related to volition, communication and interaction skills, bilateral integration and sequencing patterns related to motor skills (p≤0.05).

Conclusion: Certain sensory processing patterns may help to predict children’s development of habituation, volition, communication and interaction skills and motor skills which may effect occupational participation of children with ASD. Rehabilitation professionals should consider sensory processing skills both supports and limits children’s occupational participation. Further research should be planned.

The evaluation of visual attention skills in children with cerebral palsy using a remote infrared eye-tracking system
L. Turetti 1, L. Falciati 2, J. Gali 3, S. Micheletti 1, C. Cobelli 4, C.B. Balconi 4, E. Fazzi 2, C. Maioli 2
1ASST Spedali Civili of Brescia, BRESCIA, Italy
2University of Brescia, BRESCIA, Italy
3University of Brescia, ASST Civili Hospital of Brescia, BRESCIA, Italy
4Catholic University of the Sacred Heart Milan, MILAN, Italy
5ASST Spedali Civili, University of Brescia, BRESCIA, Italy

Introduction: Children with cerebral palsy (CP) show limitations in oculomotor control that are often thought to be related to visual control skills. The aim of this study was to evaluate the attentional skills of CP children during the execution of lower-order cognitive tasks.

Methods: we recorded ocular movements from 10 CP children (5 females, mean age: 11 years and 4 months ± 2 years and 10 months) using a remote infrared eye-tracking system, during the execution of two consecutive experimental sessions: a simple visually guided saccade task (SVGS) and a spatial cueing paradigm (SCP). In the SCP, 150 ms before the onset of an eye target, one of four placeholder around a central fixation cross briefly flashed (cue). The target randomly occurred at the same location of the cue (valid condition) or at a different one (invalid condition). Latency and accuracy of saccades of CP subjects were compared with those of 13 children with typical development (TD, 7 females, mean age: 13 years and 1 month ± 2 years and 6 months).

Results: Both groups showed a similar mean saccadic latency during the SVGS task. In the SCP, CP children often executed gaze movements to the cue and during the fixation of the central cross. These intrusive saccades were mostly aimed to one of the placeholders displayed in the visual scene.

Conclusions: CP children present difficulties to suppress eye movements towards locations exogenously and endogenously activated by visuo-spatial attention.

Medium-term results of a multidisciplinary program in a cohort of children with Neonatal Brachial Palsy.
M. Martínez- Moreno, J. Fernández-Leroy, S. Espinosa-García, C. Briñez-Sabogal, F. Diaz-García
Hospital Universitario La Paz, MADRID, Spain

Introduction: The perinatal brachial plexus palsy (PNBP) affects 0.1 to 4 per 1000 live births and it is estimated, between 10 and 20% of children are left with sequelae, functional and / or aesthetic. Main treatment of PNBP is rehabilitation treatment, but in some cases botulinum toxin and surgical treatments can improve the result of isolated conservative treatment.

Patients and Methods: A retrospective review of the data from our Neonatal Brachial Palsy Clinic (NBPC) over the last 9 years was done. The Narakas classification was used to define the type of lesions. We also, described the
different treatment options used in our cohort of patients. We have evaluated the results of these children older than 2 years at the time of the study with the Gilbert scale.

Results: Of the 86 patients who constituted the sample, most of them had an affection of type I or IIa and b of the Narakas classification and 12% were complete plexus injuries. Most of our patients during follow-up had required only conservative treatment and in those in which surgery was necessary this was conducted in most of the cases to deal with the sequelae. Of the 62 patients who were followed up in our NBPC and had more than 2 years at the time of the study 72% had achieved a level of 4 or 5 on the Gilbert Scale, that is considered a good result.

Conclusion: A comprehensive approach is needed to deal with functional limitations due to a PNBP.

PP-253
Poster presentation
Poster session 2 - timeslot 4

Long term outcome in infants treated with hypothermia for hypoxic-ischemic encephalopathy (HIE)
N. Vens1, A. Casaer2, A. Oostra2, J. Deslee5, L. Cornette5, C. van den Broeck1
1University of Ghent, GENT, Belgium
2Az sint jan, BRUGGE, Belgium
3Uz Ghent, GHENT, Belgium

Introduction
Perinatal asphyxia is a leading cause of brain injury in term born infants. Asphyxia resulting in HIE is standardly treated with moderate whole body hypothermia. Current research showed improved neurocognitive outcomes in childhood. Nevertheless none of the programs focused on a long term motor follow up.

Patients and methods
In 2013, a study was started to compare the difference in motor development between an experimental group and a control group.
Three different tests were applied to evaluate the motor development. The General Movements assessment (GMs), the Alberta Infant Motor Scale (AIMS) and the motor component of the Bayley III Scale.

Results
Neonates with HIE treated with moderate hypothermia often evolved from abnormal to normal GMs between 0 and 3 months old.
The most obvious difference between the experimental and the control group was found in the GM at the age of 0 months.
The results from both groups were not significantly different on other tests at a later age.

Conclusion
This study shows the largest differences in motor quality between the two studied groups of infants at 0 months of age, but indicates that differences decrease when children reach the age of 3 months.
Conclusions cannot yet be made for the age groups of 24-30 months, because most studied infants did not yet reach this age.
Aside from completing the current follow-up, it would provide more insights if the follow-up could be extended until primary school age where more precise assessment of specific complex motor skills is possible.

PP-254
Poster presentation
Poster session 2 - timeslot 1

The influence of mobility on bone mineral density in patients with cerebral palsy
A. Mikov1, Z. Kablar1, M. Mikov1, S. Golocorbin-Kon1, L. Dimitrjevic4, I. Turkalj1
1Medical Faculty, University of Nis, NIS, Serbia
2Medical Faculty, University of Novi Sad, NOVI SAD, Serbia

Introduction: Patients with cerebral palsy (CP) have increased risk for low bone mineral density (BMD). The aim of this research was to explore the difference in bone mineral density between ambulatory and non-ambulatory patients with CP.

Patients and methods: Research included 22 patients with diagnosed of cerebral palsy. BMD was measured at the lumbar spine and the femur neck using dual X-ray absorptiometry. Severity of motor function disorder was assessed using GMFCS (level I-III defined as “walkers”, level IV and V defined as “non-walkers”).

Results: The study group included girls (55%) and boys (45%), mean age 11.62. Femoral neck: mean Z score was -0.725 vs -2.991 SD (walkers vs non-walkers). It was statistically significant difference (p=0.002) in BMD between these two groups. 59.09% of patients had hip/spine deformities. Group with hip deformities had mean Z score -2.737, without hip deformities had mean Z score was -2.112 SD. The difference between BMD values in these two groups was not statistically significant. Lumbar spine: mean Z score was -0.075 vs -2.253 SD (walkers vs non-walkers). It was statistically significant difference (p=0.031) in BMD. Z score for group of patients with kyphosis was -2.45 SD, scoliosis -2.437 SD, and group with both deformities -2.10SD. Group of patients without spine deformities
had mean Z score -1.12±SD. The difference between BMD values in these groups was not statistically significant. **Conclusion:** Non-walkers have had lower mean Z-scores than walkers both at femoral neck and lumbar spine. Connection between BMD and hip/spine deformities was not found.

**PP-255**
**Poster presentation**
**Poster session 2 - timeslot 2**

**Brace treatment in children with cerebral palsy**
K. Pettersson  
Lund University, LUND, Sweden

**Introduction:**
Spinal braces can be used by children with cerebral palsy to prevent trunk deformities or to improve functional outcomes such as sitting ability and head control. The implications for treatment vary and the effectiveness is unclear. This cross-sectional study describes current brace treatment in children with cerebral palsy in Sweden, what the indications are and if the treatment was successful.

**Patients and Methods:**
All 2800 children born 2000 to 2014 reported into the Swedish cerebral palsy registry CPUP during 2013-2014. Registry data was extracted from the latest physiotherapy report for each child and analyzed relative to their age, sex, GMFCS level and scoliosis. Indications for brace treatment was reported as prevent deformity or the following functional outcomes: improve stability, arm-hand function or head control.

**Results:**
In total 251 of the 2800 children with cerebral palsy used a spinal brace, mean age 8.26 years (SD 3.25).The use of spinal brace increased significantly with age and were used by children at GMFCS level III-V. There was no difference between boys and girls. Slightly more than half (59%) of the children wearing a brace were also reported to have a scoliosis. The most common indication for treatment was to improve stability/posture. Goal attainment was 78-87% for the functional outcomes and 57% for prevention of deformity.

**Conclusion:**
Spinal braces are only used by 9% of all children with cerebral palsy. Goal attainment for all functional outcomes is high and more than half seem to attain their goal in preventing deformity.

**PP-256**
**Poster presentation**
**Poster session 2 - timeslot 3**

**Constraint-Induced Movement Therapy (CiMT): Effects of Multiple Treatment Episodes**
M.R. Trucks, D.A. Wallace, S.C. Deluca  
Virginia Tech Carilion Research Institute, ROANOKE, United States of America

**Introduction**
Constraint-Induced Movement Therapy (CiMT) is designated as one of the most efficacious treatments for children with Cerebral Palsy (CP; Novak et al, 2013). This study provides evidence supporting the efficacy of multiple CiMT sessions.

**Patient and Methods**
Forty children with asymmetric CP, ages 11 months to 10 years (mean=31 months) were treated with multiple CiMT sessions (2 to 6 times). This clinical sample range in severity level; 25% had a Manual Abilities Classification of II, 54% level III, 18% level IV, and 1 level V. All families voluntarily sought multiple CiMT sessions. Therapy was delivered for 6 hrs/day, 5 days/week, for 4 weeks with full-time constraint for 17 days followed by 3 no-constraint days. Assessments included Emerging Behaviors Scale (EBS), the Pediatric Motor Activity Log, the Directed Play, and the Assisting Hand Assessment. Content analyses of daily therapy logs were completed.

**Results**
The first treatment resulted in significant gains for all children on all measures (e.g. the EBS resulted in a range of 3-19 new skills; mean=13) for treatment episode one. Small loss of gains occurred during the inter-treatment intervals for many children on almost all measures without returning to baseline. Subsequent treatments were able to regain losses and build increased function and skill. Content analyses showed that activities during treatment session 1 were very play-based, and subsequent treatments had increased focus on activities of daily life and bilateral skill activities.

**Conclusion**
This evidence supports the use of multiple CiMT treatments for children with hemiparetic CP.

**PP-257**
**Poster presentation**
The results of the tests of basic motor skills and gross motor function measure in a case with down syndrome

E. Durgut¹, H. Denizoglu Kulli¹, A. Zengin Alpozgen², H.N. Gurses¹
¹Bezmialem Vakif University, Faculty of Health Sciences, ISTANBUL, Turkey
²Istanbul University, ISTANBUL, Turkey

Introduction: Test of Basic Motor Skills (BMS) and Gross Motor Function Measure (GMFM) are clinical tests that evaluate motor functions in children. This study was planned to represent the changes in the motor functions by using BMS and GMFM in a case with down syndrome. Patients and methods: The case with corrected age of 5 months was applied physiotherapy and rehabilitation programme that was appropriate for his motor development. Before and after the program, BMS and GMFM evaluations were done. The physiotherapy and rehabilitation program including the neurodevelopment treatment methods was applied twice a week during 6 months. Results: While BMS score was 7 and total GMFM score was 0.12 before the treatment; BMS score was 22 and total GMFM score was 0.29 after the treatment. Both of the test scores were improved. Conclusion: As it was expected, improvement in motor development was seen with physiotherapy and rehabilitation programme in the case with down syndrome. The changes in motor development were shown objectively with both of the tests of BMS and GMFM. We thought that using the test of BMS could be more advantageous, because it was done with video analysing and so motor functions could be seen more detailed. In conclusion, the test of BMS could be used in clinics as an alternative to GMFM.

Can Selective Motor Control in children with spasticity predict improvement in Gross Motor Function after Selective Dorsal Rhizotomy?

L.R. Grootveld, P.E.M. van Schie, E.A.M. Bolster, A.I. Buizer
VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands

Introduction

Although good selective motor control (SMC) is a selection criterion for Selective Dorsal Rhizotomy (SDR), we hypothesize that there is variation in SMC, and that SMC is a predictor for Gross Motor Function Measure score (GMFM-66) after SDR.

Patients and methods

We included 15 walking children (n=10 male) with baseline Gross Motor Function Classification System (GMFCS) levels I (n=7), II (n=7), III (n=1) who underwent SDR and 5 years follow up. Files were retrospectively analyzed. We accumulated baseline left and right SMC scores according to modified 'Trost' scale of hip, knee and ankle (maximum total SMC score=12). Since SMC scores of 3 patients were incomplete, we also calculated mean SMC per joint for each patient.

Results

Mean ‘age in months at SDR’ was 99.8 (68.6-141.4). Mean ‘total SMC score’ was 9 (4.0-12.0) and mean ‘SMC per joint’ 1.5 (0.7-2.0). Five years after SDR, six patients had improved 10 points or more on GMFM-66. There were no significant correlations between change in GMFM-66 with 1) total SMC score (Spearman’s r= -0.05, p=0.58), 2) mean SMC per joint (Spearman’s r= -0.18, p=0.85).

Conclusions

Children selected for SDR in general have good SMC, but there is variation in SMC among the group. Within the group 40% improved 10 points or more on GMFM-66. We found no evidence of SMC being a predictor for outcome in GMFM-66 after SDR. Further research is recommended in a larger group to determine predictive factors of outcome of SDR, including improvement on the gross motor curve.

Fitness trends in children and adolescents with cerebral palsy: fatter but fitter?

M. Zwinkels¹, T. Takken², T. Ruyten¹, J.M.A. Visser-Meily², O. Verschuren¹
¹De Hoogstraat Rehabilitation, UTRECHT, The Netherlands
²University Medical Center, UTRECHT, The Netherlands

Introduction

Fitness has become an important goal in clinical practice in children and adolescents with cerebral palsy (CP). This study compared (1) body composition, (2) performance-related fitness, and (3) cardiorespiratory fitness in children with CP measured in 2014 with a convenience sample from 2004.
Patients and methods Data collected in 2014 and 2004 were matched according to gender, height and Gross Motor Function Classification System (GMFCS) level. In total, data of 50 participants with CP (26 boys; mean age 13 y 8 mo, SD 2 y 9 mo; range 8-18 years; 30 classified at GMFCS level I) were compared for (1) body weight and body mass index (BMI), (2) Muscle Power Sprint Test (MPST), 10x5 meter sprint test, and achieved level on the 10-meter shuttle run test (SRT). Data of 30 participants with CP (20 boys; mean age 12 y 8 mo, SD 2 y 8 mo; range 7-18 years; 16 classified at GMFCS-level I) were available for analyses on (3) VO2peak.

Results Body weight and BMI increased significantly between 2004-2014 (p=.010; p=.004). Performance-related fitness improved significantly on the MPST (p=.004), 10x5 meter sprint test (p=.001), and achieved level on the SRT (p=.000). However, no differences were found for VO2peak (ml/kg/min) (p=.339).

Conclusion The present study shows positive performance-related fitness trends over a 10 year period in children and adolescents with CP. However, the lacking response of cardiorespiratory fitness needs further investigation. Furthermore, the substantial increase in body weight and BMI is alarming and require serious attention in healthcare.

PP-260
Poster presentation
Poster session 2 - timeslot 3

Language development and brain magnetic resonance imaging findings in preschool children with cerebral palsy
E.S. Park1, J.Y. Choi1, S. Jung2
1Severance Hospital, Yonsei University College of Medicine, SEOUL, South-Korea
2Dongtan Sacred Heart Hospital, Hallym University College of Medicine, HWASEONG, South-Korea

Introduction: Communication difficulty is common problem in children with cerebral palsy (CP). The aim of this study is to investigate characteristics of language development in relation to brain magnetic resonance imaging (MRI) findings and the affecting factors on language development in children with CP.

Patients and methods: The study included 172 children with CP who underwent brain MRI and language assessments between 3 and 7 years of age. The MRI findings were categorized as: normal, malformation, periventricular white matter lesion (PVWL), deep gray matter lesion, focal infarct, cortical/subcortical lesion, and others.

Results: Expressive language development quotients (DQs), but not receptive language DQs were significantly different in the brain MRI findings. Both receptive and expressive language DQs were significantly related with PVWL or deep gray matter lesion severity. In multivariable analysis, only cognitive level was significantly related with receptive language development, while ambulatory status and cognitive level were significantly associated with expressive language development. Over one-third of the children had a language developmental discrepancy between receptive and expressive DQs. Children with cortical/subcortical lesion were at high risk for this discrepancy.

Conclusion: Cognitive function is a key factor for both receptive and expressive language development. In children with PVWL or deep gray matter lesion, lesion severity seems to be useful to predict language development.

PP-261
Poster presentation
Poster session 2 - timeslot 4

Clinical research on tcm meridian application method to improve children spastic cerebral palsy lower limb motor function
H. Wang
Xi’an TCM hospital of encephalopathy, XIAN, China

(Abstract)Objective: To research the herbal penetration therapy along meridians to improve the clinical curative effect of infantile spasm type cerebral palsy movement function. Methods: 120 cases of children with spastic type cerebral palsy were randomly divided into observation group and control group, each group had 60 cases. Observation group with the herbal penetration therapy along meridians and neurophysiological therapy (Bobath treatment), while the control group with the treatment of the neurophysiological therapy. It takes 30 days as 1 course of treatment, and observe the curative effect after 3 courses of treatment. Results: After treatment, the gross motor scale score of the observation group was 32.38±5.72 and the gross motor scale score of the control group was 32.38±5.72. By the statistical test, p=0.0001< 0.05, there were statistical differences; After treatment, the observation group markedly effective in 39 cases, effective in 15 cases, ineffective in 6 cases, the total effective rate was 90%, while in the control group, 25 cases were markedly effective, 24 cases were effective, 11 cases were ineffective, the total effective rate was 81.67%. By the statistical test, p=0.037< 0.05, there were statistical differences. Conclusion: herbal penetration therapy along the meridian can improve the motor function of lower limbs in children with spastic type cerebral palsy, and can be applied in clinic.
**Interdisciplinarity in the use of assistive technology by children with quadriplegic cerebral palsy**

J. Braga Class de Souza  
Sarah Network Rehabilitation Hospital, BRASÍLIA, Brazil

**Introduction**  
Assistive technology promotes accessibility and inclusion for individuals with cerebral palsy, however, in order for these technologies to be effective, appropriate assessment and training are required. This process demands interaction between rehabilitation, education, and technology, in addition to the child’s own motivation and family involvement. The aim is to describe how an interdisciplinary approach can contribute to the successful use of assistive technology systems for augmentative and alternative communication (AAC), and computer access for children with quadriplegia associated with cerebral palsy.

**Patients and Methods**  
The work presented here is carried out at the Children's Rehabilitation sector of Sarah Network of Rehabilitation Hospitals in Brasilia, Brazil. It is an intervention group consisting of school aged children with cerebral palsy. The professionals responsible for planning activities are: a speech pathologist, a teacher, and an art education teacher. Also involved are physical therapists, psychologists, a physical education teacher, a social worker, and an engineer.

**Results**  
All participating children began to use an assistive technology system for AAC or computer access in their daily lives. After participating in the activities proposed by the intervention group, there was a decrease in the time needed between the assessment and the establishment of suitable technology, as well as increased adherence, functional use, and expansion into other contexts.

**Conclusion**  
Acting as an interdisciplinary team, while taking into account the cognitive, motor, social, academic, and child communication skills, allows for a better approach, and for greater chances of success and adherence.

---

**Understanding Frames: Implementation of standing frames as part of postural management for children with cerebral palsy in the classroom.**

J. Goodwin¹, J. Lecouturier², S. Crombie³, J. Smith², J. Cadwgan²  
¹University of Newcastle, NEWCASTLE UPON TYNE, United Kingdom  
²Newcastle University, NEWCASTLE UPON TYNE, United Kingdom  
³Sussex Community NHS Foundation Trust, SUSSEX, United Kingdom

**Introduction**  
Standing frames are regularly used at school as postural management for children with cerebral palsy. The aim of this study was to provide insight into educational professionals’ experiences of standing frames in school including perceived benefits and challenges of standing frame use.

**Methods**  
Educational professionals from a special school for children with physical and learning disabilities in the UK participated in a semi-structured focus group. Topics of discussion included challenges and benefits of standing frame use at school, and perceptions of children’s performance in the classroom whilst using a standing frame. The Framework method is guiding data analysis, with themes currently emerging.

**Results**  
Five support assistants and four teachers with experience using standing frames in the classroom participated in the focus group. Preliminary analysis reveals the competing pressures on this group of participants, as they juggle the child’s needs and wants with their own work demands. Educational professionals strive to find the right balance between academic learning, social development, therapy, and health issues for each child. They also face challenges such as time, lack of formal training, and limited access to standing frames despite scheduled sessions.

**Conclusion**  
The results from this study highlight the need for an interdisciplinary integrated approach to therapy and education when considering standing frame use in school settings. It will inform the next stage of the Understanding Frames project (https://research.ncl.ac.uk/understandingframes/), that is, the development of trials to evaluate the efficacy of standing frames.
Understanding Frames: Young people’s experiences of using standing frames as postural management in cerebral palsy.
J. Goodwin, J. Lecouturier, S. Crombie, J. Smith, J. Cadwgan
University of Newcastle, NEWCASTLE UPON TYNE, United Kingdom
Newcastle University, NEWCASTLE UPON TYNE, United Kingdom
Sussex Community NHS Foundation Trust, SUSSEX, United Kingdom

Introduction
Standing frames are widely used as part of postural management for young people with cerebral palsy (CP), yet there has been no previous published research about their experiences of standing frame use. The aim of this study was to explore young people’s experience of standing frame use; regarding benefits and challenges of standing frames. Method In-depth, semi-structured interviews with young people with CP who have used a standing frame. The focus of the interviews is the young people’s individual experience of using standing frames, including what they like and dislike about using standing frames. Interviews are transcribed verbatim and analysed using the Framework method. This will allow for robust interpretation of the young people’s experiences through theme development. Results To date three males (aged 8, 13, 14) and three females (aged 13, 14, 15) have been interviewed. Preliminary analysis reveals they believe standing frames are beneficial in terms of body structure (e.g., contracture management) but can be painful. The young person’s choice was a salient issue, some participants report little control over when and how they use their standing frame. Further interviews will continue until interviews stop identifying new themes (saturation). We anticipate this will be 12-15 interviews. Conclusion The results will provide insight into young people’s experience of standing frame use; and identify benefits and challenges of standing frames. It will inform the next stage of the Understanding Frames project (https://research.ncl.ac.uk/understandingframes/), that is, the development of trials to evaluate the efficacy of standing frames.

PP-265
Poster presentation
Poster session 2 - timeslot 4

Exploring early social responsiveness and shared attention skills of children with cerebral palsy
K. Price, M.T. Clarke, J. Swettenham
University College London, LONDON, United Kingdom

Introduction
Social responsiveness and shared attention underpin language and communication development. Children with cerebral palsy (CP) may be vulnerable to disruption in the development of these foundation skills [1]. However, there are few guidelines for assessment of these skills in this group of children [2]. This study aimed to trial tasks to describe the social responsiveness/joint attention profiles of children with CP and to compare these profiles with those seen in children with autism and with children with Down Syndrome (DS).

Patients and methods
57 children were included, in these three groups, matched for age, language and non-verbal abilities. The children with CP (n=32) were screened for their ability to use looking behaviours to give responses [3]. A measure of social responsiveness/shared attention accessible by all three groups was derived from established assessments [4].

Results
Children with CP gave reliable responses to the tasks offered, and a range of skills was seen. A number of children showed social responsiveness and shared attention skills at a level of development significantly below their language age/non-verbal age. The performance on the target measure was significantly different across the three groups F (2,54) = 8.302, p =0.001. Post hoc analysis revealed some overlap in scores across the CP and DS groups.

Conclusion
Given the range of abilities shown in the group of children with CP, it seems important to work towards the development of assessment tools to identify deficits, and hence be ready to explore intervention for these early language and interaction skills.

PP-266
Poster presentation
Poster session 2 - timeslot 1

Funvis: rapid assessment of functional near vision in children with severe cerebral palsy for non-vision specialists
University College London, LONDON, United Kingdom
Great Ormond Street Hospital for Children NHS Foundation Trust, LONDON, United Kingdom
Introduction
Children with severe cerebral palsy (CP) who have little or no functional speech are commonly reliant on their 'looking skills' to engage with the world, and to communicate with others. It is recognised however, that this group of children are particularly vulnerable to problems with various aspects of the visual system. This vulnerability may manifest in impairments in visual functions (e.g. low visual acuity, visual field defects), and difficulties with functional vision (using looking skills effectively). Our experience indicates that sub-optimal visual behaviours are often present in this group without drawing professional comment. This presentation will describe a new procedure designed for non-vision specialists to examine the presence or absence of behaviours that are indicative of normal functional vision in children with severe CP. The visual skills, assessed via parent questionnaire and direct observation, are: (i) gaze fixation, (ii) gaze shifting, (iii) tracking moving objects.

Patients and methods
The procedure is being tested on 200 children with CP developmentally aged 9 months to 6 years. Forty children passing and 40 children failing the test receive a full assessment of vision, language and cognition. The robustness of the procedure is being tested via analysis of inter-rater and test-retest reliability and its sensitivity and specificity.

Results
Early analysis indicates that the procedure shows excellent levels of reliability and discriminates very effectively between children with and without functional vision problems.

Conclusion
This simple procedure has excellent potential to aid non-vision specialists in identifying children at risk of functional vision difficulties.

PP-267
Poster presentation
Poster session 2 - timeslot 2

Neurodevelopment of children with hearing loss
A.B. Palchik1, D.S. Yurieva2
1Post-Graduate Faculty, ST.PETERSBURG, Russian Federation
2Paediatric Medical University, ST. PETERSBURG, Russian Federation

Hearing deprivation is an important cause of malneurodevelopment.

We examined 95 babies (34 female, 61 male) under 3 years old with confirmed degree or type of hearing loss. Children underwent routine somatoneurological examination, otoacoustic emissions, auditory brainstem evoked response audiometry. Neurodevelopment dynamics – with Alberta Infant Motor Scale (AIMS), Denver Developmental Screening Test (DDST), Griffiths Mental Development Scales (GMDS). The examined children were classified as follows: 35 babies had hypoxic-ischemic encephalopathy (HIE); 18 – stable hyperbilirubinaemia; 50 babies were connexin-positive. Auditory neuropathy was diagnosed in 14 cases; sensoneural hearing loss (SNHL) – in 81. AIMS assessment showed motor delay in 15 infants. Speech delay was found in 48 babies, performance disorder – in 15, fine motor coordination lack – in 9, motor delay – in 11 (by means of DDST). GMDS demonstrated locomotor development lag in 4 cases, speech delay – in 43, eye–hand coordination disorder – in 8, practical reasoning – in 1, performance – in 15. Total developmental retardation by sum of all subscales was detected in 19 cases.

Children with hearing deprivation had more frequently speech delay than other disorders detected by means of DDST and GMDS (p < 0.0001).

Spearman’s analysis showed mild positive correlation of connexin-positive appearance and neurodevelopment, mild negative correlation of HIE stages, hyperbilirubinaemia level and motor, cognitive and speech development.

Infants with hearing deprivation have various, mainly speech, neurodevelopmental deviations. Causes of locomotor delay are unclear, may be explained by primary brain damage or motor learning deficit due to sensory deprivation.

PP-268
Poster presentation
Poster session 2 - timeslot 3

Sleep-related difficulties are common in children with neurodisability at both Primary- and Secondary-school ages.
J.R. Turnbull1, V. Impy1, H. Abul-Eis2, A. Sharma1, B. Lahoti1
1Guy's & St Thomas' NHS Foundation Trust, LONDON, United Kingdom
2Royal Alexandra Children’s Hospital, BRIGHTON, United Kingdom

Introduction:
Sleep-related difficulties are common in children with neurodisability, and affect physical health, cognitive performance, behavior, and parental health and wellbeing. In neuro-typical children, sleep-related problems can be expected to improve with age. We describe sleep-related difficulties in Primary and Secondary age children attending Special Needs Schools within London; comparing prevalence, type, and consequences of sleep-related difficulties in these two broad age groups.
Patients and methods:

Parent/carer survey by two-part questionnaire: Children’s Sleep Habits Questionnaire and Supplementary Questionnaire on child’s diagnosis; sleeping environment; investigations, advice, and treatments; perceived consequences for child and family.

Results:

52 parents/carers were surveyed [32 primary-school children (median age 7.5 years); 20 secondary-school children (median age 15 years)]. All children had severe learning disability (48% Autism Spectrum Disorder; 29% motor disorder). Difficulties were common in both groups at similar rates; “sleep difficulties” in child, 59% versus 61% respectively; delayed sleep-onset 34% versus 45%; waking in the night 75% in both groups; tiredness in daytime 53% versus 50%. Burden on carer, and carer-anxiety in relation to child’s sleep pattern were also similar (great burden to carer in 38% versus 40%; at least some degree of anxiety in 66% versus 70%). Reported sleep difficulties in siblings were not common in either group (17% and 11%)

Conclusion:

Sleep related difficulties in children with neurodisability are common at both primary and secondary school age. This raises the need for services providing adequate long-term support for sleep-related problems in children with neurodisability. Parent/carer sleep-workshops held at school have been welcomed by families.

PP-269
Poster presentation
Poster session 2 - timeslot 4

Visual neglect: does it exist in children and adolescents with congenital and acquired unilateral brain lesions?

F. Tinelli1, G. Purpura1, G. Cioni2
1Stella Maris Foundation, CALAMBRONE, Italy
2IRCCS Fondazione Stella Maris, University of Pisa, PISA, Italy

Introduction: Adult brain-damaged patients with lesion involving the parietal cortex may show unilateral spatial neglect consisting in a bias of spatial representation and attention ipsilateral to of extrapersonal, personal (ie, the body) space, or both, toward the side of the hemispheric lesion (Vallar, 2007). Even if the phenomenon of neglect is well known in adult patients, less is known about what happens in children with parietal congenital or acquired lesions.

Patients and Methods: The aim of this study was that to adapt a battery of tests used in adult subjects to investigate visual neglect to children and adolescents. 113 boys and girls (6-14 years old) were enrolled in the Italian school to collect normative data. At the same time we administered the same battery in all children and adolescents with congenital or acquired unilateral brain lesion admitted to the Fondazione Stella Maris Hospital starting from March 2016 (18 subjects).

Results: Preliminary results show that typical children are able to do well all the tasks we administered since 6 years of age with an interesting improvement with age in time trials. Children with congenital unilateral brain lesions don’t have visual neglect while some subjects with acquired lesion showed the presence of visual neglect. Correlation with the timing and the extension of the lesion will be done.

Conclusions: In conclusion, our results can give a contribute to the debated argument of the presence of visual neglect in developing age excluding the presence of neglect in subject with congenital lesion.

PP-270
Poster presentation
Poster session 2 - timeslot 1

Local Audit of the Diagnosis of Fetal Alcohol Syndrome (FAS)

W. Aung
RSUH, WOLVERHAMPTON, United Kingdom

The use of alcohol during pregnancy has a range of long term effects on neurodevelopment and behaviour. Appropriate diagnosis can lead to early intervention which helps improve outcomes. There is no national pathway for the diagnosis and management of children with FAS in the UK. A recent report by the BMA (Preventing and managing Fetal Alcohol Spectrum Disorders, Feb 2016, ISBN 978-0-9575831-4-6) recommended that we should be using the Canadian 2005 Diagnostic Criteria and Terminology which includes FAS, Partial Fetal Alcohol Syndrome (PFAS) and Alcohol Related Neurodevelopmental Disorder (ARND). The term Fetal Alcohol Spectrum Disorder (FASD) whilst in current use is not a diagnostic term in the UK.

We reviewed the notes of all local children on our current Community Paediatric Database with the diagnosis of FAS/FASD/PFAS/ARND using the 2005 Canadian diagnostic criteria (diagnosed from 2004-2016). Our aim was 100% appropriate diagnosis. There were 25 children in total, ranging from 7 months to 16 years old. 60% (15/25) were Looked After Children (LAC); 13 currently in foster care with 2 adopted. 32% (n=8) had the correct diagnosis according to the 2005 criteria.

Due to the impact of the diagnosis in long term care and support for these children, we have developed a local
pathway which can be used in our Community Paediatric and LAC service to help improve diagnosis and therefore start early intervention to best support children with this disorder. Nationally a joint pathway with Obstetrics, Community Surveillance, Community Paediatrics and Genetics is currently under development.

**PP-271**
Poster presentation
Poster session 2 - timeslot 2

**The effects of neuropsychological group intervention on children's executive functions**
K. Nivala¹, E. Vierikko¹, K. Rantanen¹
¹University of Tampere, TAMPERE, Finland
²Tampere University Hospital, TAMPERE, Finland

Introduction
Neuropsychological group intervention EXAT was developed for children with deficits in executive functions (EF) and attention. The aim of this study is to evaluate the effects of the EXAT on children’s behavioral aspects of executive functions compared to children in mainstream schools.

Patients and methods
Thirty-four 7-13 year-old children (mean 9.2) attending the EXAT at the Psychology Clinic, University of Tampere, during 2013-2016 participated in the study. The study group was compared to age and gender matched control children (n=32). EF were assessed using the Behavior Rating Inventory of Executive Function (BRIEF, Parent and Teacher Forms). The BRIEF includes subscales for behavioral regulation and metacognition. Nonparametric tests were used.

Results
The children attending to the EXAT had higher scores in the BRIEF subscales, and more clinically (T >65) significant EF deficits were reported compared to control children. After the intervention, parents reported significant increase in behavioral regulation (i.e. inhibition and emotional control, p<.05), and metacognition (i.e. working memory, p<.01, planning and monitoring, p<.05) compared to controls. Especially, younger children (6-8 years) benefited more of the intervention than older children (9-13 years). Teachers reported more persistent EF problems, and despite positive trend, no significant changes after the EXAT were found.

Conclusion
The results demonstrated that the EXAT has effects on behavioral aspects of executive functions. In addition to behavioral regulation, also metacognitive skills can be targeted in neuropsychological group interventions for children. Regular cooperation with teachers is needed to ensure better generalization of learned skills to school environment.

**PP-272**
Poster presentation
Poster session 2 - timeslot 3

**Family-centred care: Differences in what parents of children with cerebral palsy rate important**
M. Terwiel¹, M.W. Alsem², R.C. Siebes¹, K. Bieleman², M. Verhoef³, M. Ketelaar³
¹De Hoogstraat Rehabilitation, UMC Utrecht, UTRECHT, The Netherlands
²De Hoogstraat Rehabilitation, UTRECHT, The Netherlands
³Wilhelmina Children's Hospital, UTRECHT, The Netherlands

Introduction
A family-centred approach to services of children with disabilities is widely accepted as the foundational approach to service delivery in pediatric health care. The 56-item questionnaire Measure of Processes of Care (MPOC-56) reflects the elements of family-centred care. In this study we investigated which items from the elements of family-centred care are rated important by parents of children with cerebral palsy (CP) by adding a question on importance for each item of the MPOC-56 (MPOC-56-I).

Patients and methods
175 parents of children with CP completed the MPOC-56-I. For each MPOC-item parents were asked to rate the importance on a 5-point scale ranging from 0 (= not important at all) up to and including 4 (= very important).

Results
Parents' importance ratings of all MPOC-56 items differed. The differences in percentages of parents rating an item important varied between 43.8% and 96.8%. Six items were rated important by almost all (> 95%) parents. These items concern specific information about the child, coordinated and comprehensive care, and enabling and partnership. Items that were found to have most variation between parents (< 65% of the parents rating it important) were 5 items with respect to the provision of general information.

Conclusion
Parents differ in what elements of family-centred services they consider important. These findings endorse that family-centred services should recognize the uniqueness of families and should be tailored to what parents find important.
"It was some big step from the buggy to the wheelchair": Lived experience of caregivers in Switzerland when providing the first wheelchair to their child with severe cerebral palsy. Rückriem, B.

E.M. Rückriem1, A. Kottorp2, B.E. Gantschnig3
1Children’s Hospital Zürich, Rehabilitation Centre for children & adolescents, AFFOLTERN AM ALBIS, Switzerland
2University of Illinois at Chicago, CHICAGO, United States of America
3ZHAW University of Applied Sciences Winterthur School of Health, WINTERTHUR, Switzerland

Introduction
In Switzerland the provision of the first wheelchair to a child with severe cerebral palsy (Gross Motor Function Classification System /GMFCS IV/V) is considered by therapists in the neuro-pediatric field a logical step in the growing up of the child because of medical reasons and size. Experiences from practice led to the assumption that this seems to entail far more difficulties for caregivers. The aim of the study therefore was to examine how parents of a child with severe cerebral palsy experience the provision of the first wheelchair to their child.

Patients and methods
The approach of the Interpretative Phenomenological Analysis was chosen to gain insight into the lived experience of 5 mothers regarding the provision of the first wheelchair to their child (GMFCS IV/V). Data was collected through one-to-one, in-depth semi-structured interviews.

Results
The findings entailed three superordinate themes describing the caregiver’s inner struggle to accept their child’s diagnosis before being able to agree to the provision of the wheelchair (1), the impact the wheelchair had on child and caregiver differing between GMFCS level IV & V (2) and caregiver’s dissatisfaction with the service and collaboration with the health professionals (3).

Conclusions
This study can help to understand caregiver’s perspectives when confronted with the provision of the first wheelchair, recognise the need for close collaboration with parents and the lack of assessments and distinguish clearly between the needs of the caregivers and children with GMFCS level IV/V. Further studies in the field are needed to improve the service.

Parent led review - Do therapists do what families ask them to do?
C.D. Forbes, J.J. Carroll
Bobath Children’s Therapy Centre Wales, CARDIFF, United Kingdom

Introduction
Parents of children with cerebral palsy (CP) have demonstrated that they have specific, realistic and appropriate concerns in relation to what might be possible for their child to achieve1. Measures/audit are needed to establish whether paediatric therapy services are identifying parents concerns as a starting point in collaborative goal setting which are then used as a basis for therapy.

Participants and methods
Retrospective analysis of data of children with cerebral palsy, born prematurely who attended a specialist centre for cerebral palsy and received intervention during 2013-2015. Grouped according to GMFCS2 levels. Family concerns and goals were categorised into ICF3 domains and compared. Results 145 families of pre term children identified 275 concerns. 295 goals were set.209 goals addressed parental concerns (71%) 78% of goals and 77% of family concerns were in Activity domain21% of goals and 32% of family concerns were in Body Function and Structure domain 0.6% of goals and 0.3% of family concerns were in Participation domain Conclusion Majority of goals correlated with concerns and were in the Activity domain of the ICF. Participation concerns were the least for both family and therapist. Parents concerns should take precedence when striving for partnership in a family centred service. Children and families are active participants in setting therapy goals at this centre, leading to empowerment and autonomy of children and their families.

Empowerment of families that have children with developmental disabilities
S. Golubovic, J. Kralj
University of Novi Sad, NOVI SAD, Serbia

Empowerment of families that have children with developmental disabilities
S. Golubovic, J. Kralj
University of Novi Sad, NOVI SAD, Serbia
Introduction
Family empowerment is recognized as an important factor for inclusive development. It is the way to improve services for families with children with disabilities. Empowerment can be discussed as states which may change over time in response to experiences or as a processes/causative conditions. The main goal of this study was to analyze the exact level of family empowerment and the way it is expressed.

Patients and methods
Sample consisted of 83 parents or guardians whose children have developmental disabilities and attend state institutions. Parents completed 34 items in Family empowerment scale (FES) which is composed of two parts: the level of empowerment and the way it is expressed. One dimension reflects empowerment with respect to the family, service system, and larger community and political environment; the other dimension reflects the expression of empowerment as attitudes, knowledge and behaviors.

Results
The internal consistency of FES was Cronbach Alpha 0.94. For the three-sub scores (Family, Service System, and Community/Political coefficients ranged from 0.84 to 0.89. When it comes to the level of empowerment the lowest score was on Community/political subscale compared to the other two subscales while the highest score was on Family subscale. The lowest score on the way how it is expressed showed on subscale Knowledge and the highest score on Attitudes.

Conclusion
Parents expressed the need for better understanding of their rights, as well as having more opportunities to express their opinion, in order to obtain appropriate services for their children.

PP-276
Poster presentation
Poster session 2 - timeslot 3

Predictors of needs for community and financial resources for families of pre-school children with cerebral palsy
D. Bertule, A. Vetra
Children's Clinical University Hospital, RIGA, Latvia

Introduction. An understanding of predictors of family needs for the families of preschool children with cerebral palsy (CP) is important so as to provide efficient and cost-effective services. The aim of this study was to identify the characteristics of children, families and services that are risk factors to meeting family needs for community and financial resources.

Patients and Methods. 234 parents of pre-school children with CP completed a modified version of the Family Needs Survey (FNS), the Measure of Processes of Care (MPOC-20), and a demographic questionnaire. The gross motor function level and communication function level of children were classified on the basis of the Gross Motor Function Classification System (GMFCS) and the Communication Function Classification System (CFCS) respectively. Two hierarchical multiple regression models were generated to determine the predictors of unmet family needs.

Results. The socialisation and communication skills of children, as well as caregiver employment and family income levels were significant predictors of family needs for community resources (adjusted $R^2=0.44$).

Significant risk factors in terms of family needs for financial resources included the child's gross motor limitations, caregiver employment, low levels of family income and no ability to receive services on the basis of enabling and partnership principles (adjusted $R^2=0.51$).

Conclusion. A child's limitations in terms of communication, gross motor functions and socialisation, as well as the socioeconomic status of the child's family, must be taken into account when planning services for families with preschool children with CP.

PP-277
Poster presentation
Poster session 2 - timeslot 4

Parents instructions brochure about home-exercises in infant oropharyngeal dysphagia
P. Diaz Borrego¹, M. Lopez Ruiz¹, B. Romero Romero², J.A. Conejero Casares², M. Montes Catedra¹, M. Rodriguez-Piñero Duran¹
¹Servicio Andaluz de Salud, SEVILLE, Spain
²University Hospital Virgen Macarena, SEVILLE, Spain

INTRODUCTION
The ability to suck or swallow successfully requires the infant to coordinate several actions: suck-swallow-breathe. Eating and drinking are essential components to achieve an adequate nutrition and hydration. Besides, difficulties in children deglutition ability could impact on their family and develop high stress levels. Our aim was to design a brochure with information about oropharyngeal dysphagia and exercises instructions to support parents/caregivers of dysphagic infants in their execution at home.
MATERIAL AND METHOD
Delphi method: Skilled professionals from three hospitals were included (speech-language therapists, physiotherapists, occupational therapists and phsiatists). Brochure structure: oropharyngeal dysphagia definition, factors related, clinical presentation and 10 exercises described with pictures to stimulate oral motor function, oral sensory response and deglutition. It was printed and checked by a parents/caregivers group.

RESULTS
12 parents were asked to check the document. Check-list data: parents promoted to extend general information, to include more exercises and better quality pictures. 2 Diptych brochure in a easy-to-understand language was developed with contents initially designed. One of them incluyed oropharyngeal dysphagia definition, factors related, clinical presentation, and feeding advice. Second one described 15 exercises performance: oral massage, oral motor exercises, chewing training and feeding technique.

CONCLUSION
There is a relationship between feeding/swallowing disorders impact and family stress. Brochures help you to communicate more clearly with patients and families about deglutition and its treatment. Besides, interventions are more successful when the history of the child’s feeding progression is understood. So printed information helps parents/caregivers to be involved in their children therapy and evolution.

PP-278
Poster presentation
Poster session 2 - timeslot 1

Evaluation of cerebral palsy caregivers’ mental health and its relation with caregivers’ burden syndrome.
V. Cruz Guisado1, M.D. Romero Torres1, P. Diaz Borrego2, V. Vidal Vargas2, J.A. Conejero Casares1, B. Romero Romero1
1University Hospital Virgen Macarena, SEVILLE, Spain
2Hospital Virgen Macarena, SEVILLE, Spain

Introduction
It is well-known that taking care of a child with disabilities such as cerebral palsy affects the psychosocial health of their family caregivers. The objective of this study is to evaluate the caregiver burden syndrome and the associated factors with the aim of analyzing disability as a family status.

Patients and methods
Cross-sectional descriptive study. The study assesses the burden of caregivers of children with cerebral palsy in a semistructured interview, integrated Goldberg’s General Health scale (GHQ 18) and Zarit scale. These information was related to clinical data (age, gender, cerebral palsy type, and GMFCS) using an statistical frequency analysis and averages or applying Pearson lineal correlation for quantitative variables.

Result
21 caregivers were included in the study. 84% of those had chronic problems that affected mental health (CGHQ) and 31% had acute character problems. 43% of caregivers presented overburden (Zarit scale) of those 78% presented symptoms of mental health issues. Nevertheless, amongst the caregivers without overburden 70% have symptoms of chronic mental health issues. We could not find a relation between patient’s functional state with health (p=0.059) and the caregivers’ overcharge (p=0.24).

Conclusion
It is known that caregivers’ mental health is influenced by the patients’ functional level; even if other factors that intervene in the family unit. We have found that most caregivers’ are not adapted to the chronical situation. However this only evolves caregivers’ overburden with an acute worsening in their emotional condition.

PP-279
Poster presentation
Poster session 2 - timeslot 2

Rare neurological diseases - survey on Slovenian children
V. Prevc1, K. Zrnec1, D. Neubauer1, M. Jekovec Vrhovšek2
1University of Ljubljana, LJUBLJANA, Slovenia
2University Medical Centre Ljubljana, Children’s Hospital Ljubljana, LJUBLJANA, Slovenia

Introduction
In Europe a rare disease (RD) occurs in 1/2000 people or less. Rare neurological diseases (RND) are important research in Child Neurology, diagnoses are complex and evaluation is expensive. Children with RND, have more psychosocial problems which influence the quality of life (QoL). Home health care is a solution to diminish the burden of the family with a child with RND.

Aim is to find the frequency of RND in Slovenian children and evaluate the burden of RND in respect to QoL.

Patients and methods
100 children with RND at University Children’s Hospital in Ljubljana were included and evaluated for their level of health condition by 5-level scale. Strength and Difficulties Questionnaire (SDQ) was used for evaluation of QoL.
Parents were asked whether they preferred home care to hospital care.

Results
The prevalence of RND in Slovenia is similar to that in Europe. The average level of disability in children with RND is 2.08. Children who suffer from neurometabolic diseases have the highest level of disability (p < 0.010) compared to those with other RND. We have not confirmed that QoL of children with RND is low. Parents prefer home care in 66.7%.

Conclusions
We got the first epidemiological data of some of the RND in Slovenia that are comparable to European data. Neurometabolic diseases cause the highest level of disability, but the higher level of disability does not mean the lower quality of life. Parents wish for less in-patient hospital care and more home care.

**PP-280**
Poster presentation
Poster session 2 - timeslot 3

**School and family focused intervention on gait in a child with Rubinstein-Taybi Syndrome: a case study.**
V. Robles-García 1, P. Galán Jaspe 1, A. Alvarez García 1, L. Torreiro Diéguez 1, N. Tain García 1, C. Lillo-Navarro 2, L. Macías Merlo 3
1Universidade da Coruña, A CORUÑA, Spain
2Miguel Hernández University, ELCHE, ALICANTE, Spain
3Universitat Internacional de Catalunya, BARCELONA, Spain

**Introduction:** Rubinstein-Taybi syndrome (SRT) is a rare genetic disease with an incidence of one person per 125,000 births. In relation to mobility, children with SRT have motor delay, ligamentous laxity and other musculoskeletal disorders which may elicit balance and gait impairments. The scientific literature describing the syndrome and possible lines of physiotherapy interventions is scarce. The aim of this work was to study the effect of a school and family focused intervention on a child with SRT. **Patients and methods:** This report describes an 13-year-old boy with SRT, who has been prescribed for a supramalleolar orthosis (SMOs). The child participated in an individualized physiotherapy program at school twice a week for 8 weeks. Family intervention was also carried out based on interests and adjusted to routines. Gait was evaluated by 10 meter walk test (10MWT). Balance was also studied by Pediatric Berg Balance Scale (PBBS). Evaluations were performed before and after starting the intervention (1,3 and 5 months later). **Results:** The boy has improved his balance showing an increase of 4 points in PBBS. No effect between evaluations of 10MWT was obtained. However, self-paced and fast velocities improved when using the SMOs (10.24m/s and 8.03m/s, respectively) compared without it (13.31m/s and 8.75m/s).

**Conclusion:** Preliminary results advance that an individualized physiotherapy program including a SMOs is useful to improve balance and gait. Forthcoming data will help children with this or other syndromes which involve ligamentous laxity and delay on postural stability.

**PP-281**
Poster presentation
Poster session 2 - timeslot 4

**Family-centred practice and child participation: comparing the experiences of professionals and primary caregivers**
J.T.M. Eijkelkamp, S. Vanassche
Artevelde University College, GHENT, Belgium

**Introduction** For participation of children with multiple disabilities and their families it is necessary that family-centred practice (FCP) becomes best practice. However, research reveals that parents and professionals perceive FCP differently what impedes an effectual application. To solve these problems, the input from both parties is needed. This study examines FCP as experienced by occupational therapists and primary caregivers.

**Patients and methods** The data are collected in two stages, and will be triangulated in a third. In a first, phenomenological study (completed), ten occupational therapists, working with children aged 2-12 with mild to severe multiple disabilities and their families were individually interviewed about their experiences with FCP. In a second grounded theory study (ongoing), approximately twelve parents or other primary caregivers of the defined children will be interviewed about the experiences with the child’s rehabilitation and the cooperation with the professionals. Finally, the findings from both perspectives will be integrated for a better understanding of FCP.

**Results** Four themes characterise the occupational therapists’ perception of FCP: 1) enabling a dialogue with parents, 2) realising the impact of the family context, 3) letting children flourish, and 4) a matter of good timing. The results from the caregivers perspective will be described by May 2017.

**Conclusion** Occupational therapists intend to work in a family-centred way, but are insufficiently familiar with the principles and key behaviours of FCP. The conclusions integrating the families’ perspectives will be known by May 2017. The insights will be transferred into factsheets with guidelines for families and professionals.
Pain in children, psychological view and treatment
R. Huhta-Hirvonen
Tampere University Hospital, TAMPERE, Finland

Introduction
Pain is still under diagnosed among children although pain symptoms have been increasing during last years. Family is intensive part of recognizing, treating and coping children’s pain. Efficacy of psychological pain treatment is better in children than in adults. Risk of chronic pain is higher in children due to greater plasticity of the nervous system. Multi professional approach is important when treating chronic pain in children.

Nowadays, prevention of the chronic pain symptoms and treatment of long lasting pain in children concerns all the pediatrics populations. Pain in children and adolescents is multidimensional phenomenon including variety of symptoms such as fear of pain, procedural fear and pain, feelings of anxiety and panic etc.

Patients and methods
Clinical group of children (n= 45) with a variety of neurological and somatic conditions, aged 5-16 years, will be presented in this descriptive study carried out in the Department of the Pediatrics of the Tampere University Hospital.

Results
Results of the series of psychological interventions for lessening the experiences of pain, learning to cope with it and helping the family with psychoeducational guidance will be presented.

Conclusions
There is a growing need for taking into account issues of chronic pain among the pediatric patient groups. The patient groups who benefited psychological interventions during the follow-up time were neurological, musculo-skeletal and gastroenterological patients.

The Key to Empowering Families
C.D. Forbes, C.D. Forbes, J.J. Carroll
Bobath Children's Therapy Centre Wales, CARDIFF, United Kingdom

Introduction:
It is well established that managing children with chronic health or developmental problems can affect parental wellbeing, with higher family stress levels$^1$-$^6$ and worse physical and psychological health$^7$. The function and wellbeing of parents is crucial to children with cerebral palsy and to parents themselves$^8$. Family centred practice acknowledges that the family is the child’s primary source of strength and support. What key aspects of practice in a family focused service helps parents feel empowered to support their child? How do we measure it?

Participants/Methods
March 2011- April 2016 families completed:
The Measure of Process of Care$^9$ (MPOC) (n=104)
Feedback and Satisfaction questionnaire$^{10}$ (n=560)
Family Empowerment Scale$^{11}$ (FES) (n=44)
Patient Stories$^{12}$ (n=5)
Interviews and focus group discussion.

Results:
Key aspects identified by families:
the variety of communication practices used (verbal, kinaesthetic and visual)
time taken for information exchangepractice and adjustment of activities (coaching) which were personalised
above enabled further dissemination of knowledge to the wider family
High scores in all domains of the MPOC correlated with positive trend in FES scores (family p=0.001, service system p=0.0007, community: p=0.0001) and patient stories and questionnaires. Questionnaires revealed families more effectively able to deal with their concerns (91.6%) and understand their child’s condition (76.8%). significant changes in their child observed by 70%.

Conclusion: Quantitative and qualitative data, in particular key aspects identified by families, provides services with richer information and can be used to inform practice centred on the needs of service users and families.
Family centered early intervention in children with Cerebral Palsy
H.M. Hüche Larsen, S. Ejlersen, P. de Lipthay Behrend, J.J. Skafte Jensen
Elsass Institute, CHARLOTTENLUND, Denmark

**Background** Encircle the family – Target the child is a cross sectorial and interdisciplinary project. The project aims to increase quality in habilitation of children with CP, focusing on early family centered intervention, enhancing knowledge and interdisciplinary collaboration. 415 professionals and 63 families with children with CP participated in the project. This presentation is data from the intervention with the families. The purpose was to increase the families: control over own life, empowerment, knowledge and active decision making regarding the developmental challenges of the child.

**Methods** The evaluation of the project contained a quantitative questionnaire and semi-structured interviews and was performed by an outside institute for regional government research. The families attended a 4 day stay at the Elsass Institute. This was a combination of observation, testing and goal orientated activities focusing on participation based on the values of the families. Additionally, the parents attended lectures and networking sèances facilitated by a psychologist. Afterwards the families were invited to participate in facilitated social media groups to ensure continually networking. Prior and subsequent the families attended seminars containing knowledge on CP.

**Results** Regarding the parents: 81% agree/strongly agree to having increased knowledge, 70% agree/strongly agree to having changed their approach to training, 70% agree/strongly agree to having changed their daily activities and 47.5% agree/strongly agree that their child’s level of function has improved.

**Conclusion** Interdisciplinary, biopsychosocial early intervention is effective to empower and educate parents and make them feel able to influence the daily activity and function of their child.

PP-286
Poster presentation
Poster session 2 - timeslot 1

HEJ! The Dutch Pediatric Brain Injury Network, an Example of Good Practice
P. de Koning
Heliomare Rehabilitation, WIJK AAN ZEE, The Netherlands

**INTRODUCTION** In the Netherlands, a nationwide network (HEJ) for children with acquired brain injury was set up five years ago. HEJ is an acronym for Hersenletsel En Jeugd or in English, Brain Injury and Youth. HEJ brings together parents, professionals (in the field of neurology, psychiatry, rehabilitation, education, long term care) and researchers.

**METHODS** HEJ’s national steering committee has 6 taskforces with experts covering the fields of acute care, rehabilitation, education, long term care, family support and research & development.

**RESULTS** HEJ has produced and implemented several pediatric ABI guidelines. The exchange of knowledge as well as various collaborations has so far resulted in three joint research projects. Every year HEJ organizes a symposium to share new insights and create a meeting place for professionals and for parents. HEJ coordinated the publication of a “standard of care” for children with TBI. Another result is that HEJ has nurtured an enthusiasm within the whole chain of care for children with ABI and their families to join forces and work together.

**CONCLUSION** The HEJ network enables mutual understanding and trust, an exchange of knowledge and collaboration opportunities. This has resulted in an efficient joint effort to optimize awareness, treatment, care, research and education for children with ABI and their families. Critical success factors are: commitment of organizations; representative taskforces; a dedicated and independent chair of the steering committee; international contacts and support by the Netherlands Brain Foundation. Setting up the national HEJ network has paid off- with both tangible and non-tangible results.

PP-287
Poster presentation
Poster session 2 - timeslot 2

Enhancing trainee doctors’ learning in the Child Development Clinic
N. Mc Farlane1, R.L. Conn2, J.E. Bothwell3
1Northern Health and Social Care Trust, ANTRIM, United Kingdom
2Centre for Medical Education, Queen’s University Belfast, BELFAST, United Kingdom
3Carlisle Health, Wellbeing Centre, BELFAST, United Kingdom

**Introduction** The multidisciplinary Child Development Clinic (CDC) is the gold standard in assessment of children with developmental delay. Moreover, the multidisciplinary format and diverse caseload provide unique educational opportunities for doctors in training (residents). However, CDC is primarily organised to deliver patient care; there can be tension between clinical objectives and doctors’ learning. Also, while CDCs share standardised principles,
variation in practice also impacts educational experiences. This quality improvement project aimed to analyse
trainee doctors’ views of working within the CDC, allowing development of an educationally-focused clinic model.

**Patients and methods** Setting The project was completed in the Belfast Health and Social Care Trust, Northern
Ireland. Five consultant-led CDCs take place across three sites, staffed by a multidisciplinary team and five doctors
undertaking specialty training in paediatrics. Methods We conducted a focus group involving four trainee doctors,
using De Bono’s Six Thinking Hats methodology, to encourage thinking about the problem from different
perspectives. This was audio recorded and transcribed verbatim. We categorised the transcript data and established
key educational themes, from which a new clinic model was developed. Results Key themes contributing to positive
educational experiences were: working in the multi-disciplinary team; having sufficient time to work; supportive
consultant supervision; and being facilitated to prepare in advance. We developed a new clinic model addressing
these demands, without need for additional resources or change to clinical care. Conclusions This quality
improvement project illustrates how incorporating trainee doctors’ views can enhance educational experiences within
a clinical service without using extra resources.

**PP-288**

Poster presentation
Poster session 2 - timeslot 3

**Does Epilepsy Training for teachers improve confidence levels in managing students with seizures in schools?**

M.U.J. Taylor1, J.E. Bothwell2, M. Shields1, C. Mcneice2

1Royal Belfast Hospital for Sick Children, BELFAST, United Kingdom
2Carlisle Health, Wellbeing Centre, BELFAST, United Kingdom

Introduction

Epilepsy training for schools is offered by a variety of sources including local health services. To enable quality
improvement evaluation of training effectiveness is required.

Methods

All school principals in Belfast were contacted via email by the Education Authority. A link to an electronic
questionnaire was given. The questionnaire was completed by the Special Educational Needs Co-ordinator
(SENCO) in each school.

Results

Emails were sent to 149 schools with 88 (59.1%) schools returning questionnaires. Forty-two (47.8%) schools were
not aware of training offered vs. 41 (46.5%) which were. Five schools did not answer (5.7%).

There were multiple modalities for training offered, we considered groups as those who had not received training, 47
(53.4%), training from Belfast Health and Social Care Trust (BHSCT) staff, 37 (42.0%), and training from external
organisations, 4(4.5 %). Schools were asked to rank confidence along a linear scale from 1 to 5, representing. Only
those scoring confidence levels of 4 or 5 were deemed as being confident.

Analysis of variance was performed and the Prob (F) was 0.0006 indicating that there were differences within these
groups. Tukey-Kramer testing indicated that there was a significant different in the level of confidence between those
with BHSCT training and no training (p-value 0.0004). Testing between the no training and external training groups
yielded a p-value of 0.8536 (non-significant); it is felt this reflects low numbers in the external training group.

Conclusions

Training delivered by BHSCT staff significantly increased confidence levels reported by teachers in the management
of epilepsy.

**PP-289**

Poster presentation
Poster session 2 - timeslot 4

**‘Together for Health’ - Service reorganisation for family centredness.**

J.J. Carroll1, C.D. Forbes1, A. Moses2, V. Stevenson1

1Bobath Children’s Therapy Centre Wales, CARDIFF, United Kingdom
2Hywel Dda University Health Board, CARMARTHEN, United Kingdom

Introduction

Children with cerebral palsy (CP) can have complex needs, often with high medical requirements and support
required from specialist clinics/services. Travel to clinics/services can be challenging and potentially stressful for the
child and the family, leading to reduced accessibility to specialist support, often for the families needing it most.

Families need to be empowered in their child’s management with services being family centred and everyone
working in partnership’. An interdisciplinary therapy team at a specialist centre for cerebral palsy worked collaboratively with families, community paediatric therapy services and a regional health board adapting their traditional model of delivery and integrating care in order to meet the needs of the families and the community therapy teams. A new collaborative model was developed and jointly delivered.
Patients and methods
New model was evaluated using Goal Attainment Scaling (GAS), and Satisfaction Questionnaires. 88 children (April 2009 - March 2016). All levels of the GMFCS.

Results
GAS - 74% achieved/exceeded, 16% some improvement, 9% no change.
Family questionnaire: 95% felt they could deal more effectively with their concerns
68% perceived improvement in understanding of their child.
95% were very satisfied with the service
Professional's questionnaire: 94% reported sessions had been useful for child/family
88% reported sessions had changed their knowledge/understanding

Conclusion
A collaborative local approach to delivering a specialist service for CP showed positive results, comparable to results at the specialist centre, enabling families with children with more complex presentations to continue therapy. Partnership between all parties maximised knowledge transfer.

PP-290
Poster presentation
Poster session 2 - timeslot 1

Examining the importance of Experienced Therapy Aide (experience > 5years) in ICF CP corsets validation study for integrated care delivery to the Children suffering from Cerebral Palsy
J. Chakraborty, A. Bhattacharya, R. Sahu, A. Nandi
Apollo Gleneagles Hospital, KOLKATA, India

Introduction: Therapy aides (TA) provide support to multidisciplinary professionals catering for children with special needs. In the globally pioneering cultural validation study of ICF core set (CP) in South East Asian subcontinent, one experienced (>5 years) TA was used. The TA demonstrated presumably deeper understanding of the ICF items validated. If this is generally true, there is potential of improved utilization of this group of human resources in service.

Aim of the study was to examine whether experienced (>5 years) TA are really an important factor for integrated care delivery to the CP children compared with other professional in this WHO region (India) for ICF CP core sets.

Methods: Ten TA with > 5 years of experience were selected at one Indian Resourced Center for this study. They have been briefly explained about the ICF. The five components of the Vancouver validated ICF CP core sets [Comprehensive Core Set; Brief Common Core Set; Brief (0-6 years); (6-14 years) and (14-18 years)] were used to generate data by three stage Delphi method. A comparative analysis was done with the already validated items found in the earlier Validation study.

Results: Overall, 121 out of 135 categories of the comprehensive ICF Core Set for CP met the validation criteria as compare to other participants (91 validated items). The majority of the categories in the BF, A&P and Environmental factors components were validated.

Conclusion: TA (experienced>5 years) is no less important for integrated care delivery using ICF to the Children with CP.

PP-291
Poster presentation
Poster session 2 - timeslot 2

Integration of education in welfare: a three year experience in an inclusive nursery in Flanders
K. Ballon1, M. de Strooper2
1VZW Villa Clementina, ZEMST, Belgium
2Villa Clementina, ZEMST, Belgium

Introduction
The inclusive nursery Villa Clementina daily takes care of 25 children (0-6 years) , 8 of whom with special needs. From the start they believed in the added value of having a teacher on the multidisciplinary team. As in Flanders there is no legislation for education in a welfare setting, they had to prove the benefits to convince the government.

Patients and Methods
From January 2013 to September 2016 100 children were taken care of in Villa Clementina of which 25 children with disabilities.
24 Children with special needs (2y6m-6 y) were enrolled in the educational program in collaboration with a specialized school, a primary school and the pupil guidance center (CLB). Their trajectory was aligned and a survey done of parents and caregivers.

Results
12 children receive ongoing education.
12 completed both their educational project and the nursery. The mean age of typically developing children leaving
was 2y6 m. of special needs children 4y7m. 
All typically developing and 5 special needs children started at a regular school, 4 special needs children in 
specialized schools and 2 in a day care center. 
This outcome was other than expected in 4 children. 
All parents and caregivers are convinced of the added value of the goal directed approach of education. 
Conclusion 
It is feasible to integrate education in the welfare sector and education is an added value in the multidisciplinary 
approach of special needs children. The educational project was officially approved as a pilot project by the 
government in June 2016.

PP-292 
Poster presentation 
Poster session 2 - timeslot 3

The efficacy of a low-cost multi-disciplinary team-led experiential workshop for Public Health Midwives on 
dysphagia issues in children with cerebral palsy. 
S. Hettiarachchi1, G. Kitnasamy2, D. Gopi3, R. Poobalan2, R. Mahendran2, P. Kumara2, Y. Yogaraj2, F. Shamra2, B. 
Bandara1, P. Gowritharan3 
1University of Kelaniya, RAGAMA, Sri Lanka 
2Cerebral Palsy Lanka Fundation, COLOMBO, Sri Lanka 
3Freelance SLT, JAFFNA, NORTHERN PROVINCE, Sri Lanka

Introduction: In the past decade, there has been a growing focus on offering appropriate training for nursing staff, 
other healthcare professionals, and caregivers to support safe feeding practices in children. There is 
anecdotal evidence of a high incidence of serious complications resulting from possible aspiration-pneumonia in 
children with cerebral palsy in Sri Lanka. This necessitates the formulation and delivery of low-cost multi-disciplinary 
team-led dysphagia awareness workshops for caregivers and healthcare professionals. 

Patients and methods: Thirty Public Health Midwives in the Northern Province were offered an experiential workshop 
by a multi-disciplinary team (MDT). A self-administered questionnaire and a video-based client-scenario test were 
administered pre- and post-workshop to determine changes in knowledge. The data was analyzed statistically using 
within-participant t-tests. 

Results: Overall, there was a significant increase in the level of knowledge post-workshop. This included positive 
changes in the level of understanding in the knowledge related to dysphagia and cerebral palsy and its influence on 
feeding difficulties and dysphagia and potential signs of aspiration at a p=0.05 level of significance. While there was 
an increase in the knowledge on general guidelines during mealtimes, this did not reach statistical significance. 

Conclusion: The low-cost MDT-led experiential workshop was effective in increasing knowledge of feeding and 
dysphagia issues in cerebral palsy among a group of PHMs. This workshop could serve as a model for training 
PHMs and Community-Health Workers in order to reach the Sustainable Development Goal of 'good health and 
well-being'.

PP-293 
Poster presentation 
Poster session 2 - timeslot 4

Clinician Led Brain Injury Clinic: An alternative service delivery model 
J.A. Hancock, A. Morrow, H. Chew, S. Coombes, M. Simons-Coghill, T. Murphy, T. Brandtman, S. Drevensek, T. 
Freguson 
The Childrens' Hospital at Westmead, WESTMEAD, Australia

Introduction The Brain Injury Service (BIS) had insufficient clinic appointments to allow all clients to be reviewed 
within clinically appropriate timeframes. Alternative service delivery models were considered; a clinic led by senior 
allied health clinicians was identified as an option. 
This project aimed to assess whether a Clinician Led Brain Injury Clinic (CLBIC) was a clinically appropriate, 
effective method to deliver a brain injury clinic. 

Patients and methods Four allied health clinicians were selected and provided with specific training. Clinics were 
conducted in accordance with developed procedures and clinician leads received direct supervision of an Attending 
Medical Officer (AMO). Introduction letters were sent to families and families were able to decline involvement. 

Results Twenty clients were seen in the CLBIC over 6 months. Clients were matched to the clinician based on their 
needs and the clinician's discipline and expertise. 
All parents indicated good or excellent experience with CLBIC; expectations met and clinic rating the same/ better 
than previous clinics. All AMOs and staff indicated satisfaction with CLBIC; staff rating CLBIC as good /very good 
(87%). All staff rated the clinic as the same or better than previous clinics. Clinician leads identified they had 
adequate training and resources to lead the clinics (93%). 

Conclusion It was demonstrated that senior clinicians can lead effective, safe, high quality brain injury clinics. The 
CLBIC provides an alternative service delivery model to ensure clients are seen within clinically appropriate time-
frames. This model is directly transferable to other clinical settings in the management of disability.

PP-294
Poster presentation
Poster session 2 - timeslot 1

Change of the incidence of cerebral palsy in Korea
S.W. Kim, H.R. Jeon, J.Y. Kim
National Health Insurance Service Ilsan Hospital, GOYANG-SI GYEONGGI-DO, South-Korea

Introduction
Cerebral palsy (CP) is one of childhood neurodevelopmental disorders and causes severe disabilities. In recent days, high-risk birth rate is increased but the incidence of CP is uncertain in Korea. We analyze trend of incidence of CP, prematurity and low birth weight infants over time in the last 9 years.

Patients and methods
Based on medical claims data submitted to the National Health Insurance Service, patients with history of diagnosis classification codes such as prematurity (gestational age<37 weeks), low birth weight (LBW) (birth weight<2,500 gram), and CP were investigated by year.

Results
For overall CP incidence from 2003 to 2011, 0.43% of total newborn babies were diagnosed with CP in 2003 whereas only 0.25% was diagnosed with CP in 2011, the incidence was remarkably decreased over 10 years. When evaluating prematurity and LBW born from 2003 to 2011, 0.82% of newborn babies were diagnosed with prematurity in 2003 and greatly increased to 2.8% in 2011. In case of LBW, 0.49% of newborn babies were diagnosed with LBW in 2003 and 2.09% in 2011. When analyzed the history of prematurity or LBW in patients with CP, the percentage of having the history of prematurity was increased from 18.0% in 2003 to 37.7% in 2011. Similarly, the percentage of having the history of LBW showed increasing trend from 11.5% in 2003 to 31.7% in 2011.

Conclusion
The present study revealed the CP incidence has been reduced despite of steep increment of high risk delivery in recent years in Korea.

PP-295
Poster presentation
Poster session 2 - timeslot 2

The association between childhood attention-deficit/hyperactivity disorder symptoms and adolescent academic outcome - a register-based study
K. Holmberg, E. Appelgren
Karolinska institutet, STOCKHOLM, Sweden

Introduction
Attention-deficit/hyperactivity disorder (ADHD) is associated with cognitive difficulties. Children with ADHD symptoms are at risk of underachieving at school. The objective of this study was to explore the association between childhood ADHD symptoms and adolescent academic outcome, focusing on the impact of symptom severity and type of symptoms.

Patients and methods
A population-based longitudinal cohort study was conducted. Data on ADHD symptoms and possible confounders were collected from parental questionnaires at 12 years of age on 1,626 children through the Swedish Twin Register linked to the Medical Birth Register. School results at age 16 years were retrieved from the Swedish National School Register. Regression analyses were performed in order to evaluate the association between symptoms of ADHD and academic achievement.

Results
Symptoms of ADHD in childhood were associated with lower grade point average (GPA 175 vs 213, p<0.001) and an increased risk of not being accepted to upper secondary school (OR 2.58; 95% CI 1.60-4.16) in adolescence. Symptoms of inattentiveness were associated with an increased risk of not being accepted to upper secondary school (OR 3.87; 95% CI 2.04-7.34) compared to symptoms of hyperactivity/impulsivity (OR 1.55; 95% CI 0.49-4.87). Severe symptom load did not increase the risk of academic difficulties.

Conclusion
ADHD symptoms in childhood, especially inattentiveness, are associated with academic difficulties in adolescence. Both children with limited and severe ADHD symptom load may be in need of educational support, with specific attention paid to inattentiveness. Appropriate interventions to prevent academic failure in ADHD need to be further explored.

PP-296
Poster presentation
Poster session 2 - timeslot 3

A decade later: developmental trajectories of social participation and associated factors in individuals with
cerebral palsy into adulthood
S.S. Tan1, M. van Gorp1, L. van Wely2, D.W. Smits3, W.M.A. van der Slot1, M. Ketelaar4, A.J. Dallmeijer2, M.E. Roebroek1
1Erasmus University Medical Center, ROTTERDAM, The Netherlands
2VU University Medical Center Amsterdam, AMSTERDAM, The Netherlands
3De Hoogstraat Rehabilitation, UMC Utrecht, UTRECHT, The Netherlands
4De Hoogstraat Rehabilitation, UTRECHT, The Netherlands

INTRODUCTION: The prospective PERRIN study earlier established developmental trajectories of social participation in individuals with cerebral palsy (CP) aged 1-24 years. The trajectories were associated with intellectual impairment and GMFCS-level. To test the hypothesis that participation levels continue to be stable during their twenties, the current study aimed to prolong the trajectories up to the age of 34 years. Furthermore, we explored additional factors associated with these trajectories.

PATIENTS AND METHODS: Among the 424 participants of the PERRIN study (26% with intellectual impairment; GMFCS-levels I-V), 122 participants had a 13-year follow-up assessment at age 21-34 years. Using multilevel modelling, we assessed developmental trajectories of social participation (socialization domain of Vineland Adaptive Behaviour Scale, VABS), and its associations with sociodemographic factors, clinical characteristics and impairments.

RESULTS: For individuals without intellectual impairment, the inclining trajectories of social participation continued to be stable in their late twenties and early thirties, at scores of 122/132 for GMFCS-levels I-IV and 96/132 for level V. The trajectories for individuals with intellectual impairment also remained stable, but at lower levels of 98/132 for GMFCS-levels I-IV and 72/132 for level V. In addition to intellectual impairment and GMFCS-level, epilepsy, speech impairment and attending special education were each negatively associated with the development of social participation.

CONCLUSION: The development of social participation of individuals with CP continue to be stable in their late twenties and early thirties. Individuals with CP and with epilepsy, speech impairment and/or attending special education are at increased risk for suboptimal social participation.

PP-297
Poster presentation
Poster session 2 - timeslot 4

Multi-morbidity in Middle-Aged Adults with Cerebral Palsy
E.A. Hurvitz, N. Cremer, M.D. Peterson
University of Michigan, ANN ARBOR, United States of America

Introduction: Individuals with cerebral palsy (CP) have significant risk factors for age-related multi-morbidity, such as high adiposity and lower fitness and physical activity participation. The objective of this study was to examine the prevalence of chronic conditions and multi-morbidity in middle-aged adults with CP. Patients and Methods: A health system-based sample of 435 adults (40-60 years old) with CP was examined using Electronic Medical Records Search Engine (EMERSE) software. Prevalence of several common chronic conditions were evaluated. Multivariate logistic models were used to estimate adjusted multi-morbidity (i.e., ≥2 conditions), adjusting for age, sex, smoking status, obesity, and Gross Motor Function Classification System (GMFCS). Results: Multi-morbidity was found in 252 patients (57.8%). The most prevalent combinations were: (a) Prehypertension/hypertension (HTN) and osteopenia/osteoporosis (n = 84); (b) osteoarthritis and osteopenia/osteoporosis (n = 73); and (c) HTN and osteoarthritis (n = 54). There was higher prevalence among obese individuals for both GMFCS I-III (75.8% vs. 53.6%) and GMFCS IV-V (79.0% vs 64.2%), and in non-obese individuals with GMFCS IV-V (64.2%) versus GMFCS I-III (53.6%). In the fully-adjusted models, both obesity status (OR: 2.20; 95% CI 1.32-2.79) and the GMFCS IV-V (OR: 1.81; 95% CI 1.32-3.68) were significantly associated with multimorbidity. Conclusion: Middle-aged adults with CP have high estimates of multimorbidity. Both obesity and GMFCS level IV-V are independently associated with greater risk. Future surveillance efforts are required to characterize the etiology and temporal sequence of secondary conditions in CP, and to inform early intervention strategies to lessen the burden of chronic conditions.

PP-298
Poster presentation
Poster session 2 - timeslot 1

Congenital central nervous system malformations as a cause of unilateral spastic cerebral palsy
F. Hadzagic Catibusic1, E.A. Avdagic1, S. Zubcevic1, S. Uzicanin1
1Pediatric Hospital, University Clinical Center Sarajevo, SARAJEVO, Bosnia-Herzegovina
2Radiology Institute, University Clinical Center Sarajevo, SARAJEVO, Bosnia-Herzegovina

Introduction: Unilateral spastic cerebral palsy (US CP) is the second most common type of cerebral palsy. The aim of the study was to identify brain malformations as etiological factor of unilateral spastic cerebral palsy in children.
Patients and methods: The study was hospital based, which has included 106 patients with US CP (boys 72/girls 34,82 term /24 preterm). Neuroimaging findings were classified into 5 groups: 1. Brain maldevelopments 2. Predominant white matter injury 3. Predominant grey matter injury. 4. Non specific finding 5. Normal neuroimaging findings
Results: Brain malformations were identified in 8/106 children (7.5%), and all of them were term born. The spectrum of central nervous system malformations were: corpus callosum agenesis (2 cases), pachygiria (3 cases), pachygiria plus Dandy Walker malformation (1 case), hemimegalencephaly (1 case) and schizencephaly (1 case) Predominant white matter lesions where the most frequent (50/106, 47.2%; term 37/preterm 13). Predominant grey matter lesions had 32/106 children, 30.2%;(term 25/preterm 7).
Other finding had 2/106 children, 1.9%, both of them were term born. Normal neuroimaging findings were present in 14/106 patients (13.2%).
Conclusion: Brain maldevelopments play important role in the etiology of unilateral spastic cerebral palsy.

PP-299
Poster presentation
Poster session 2 - timeslot 2

Neurological Recovery after Childhood Stroke
T. Aprasidze, N. Tatishvili, T. Shatirishvili
M. Iashvili Children’s Central Hospital, TBILISI, Georgia

Aim: To study sensorimotor outcome of childhood stroke.
Methods: 74 patients were investigated. Diagnosis of stroke was confirmed by CT/MRI/MRA scan. Follow-up assessment was done with Pediatric Stroke Outcome Measure (PSOM) and IPSS Stroke Recovery and Recurrence Questionnaire (RRQ) at discharge and after 2-5 years from discharge.
Results: Arterial ischemic stroke (AIS) was reported in 39 patients, hemorrhagic stroke - in 28 and cerebral sinovenous thrombosis (CVST) in 7 patients. Focal signs occurred in all cases of AIS, in 11 of hemorrhagic stroke and 6 of CVST. Seizures were presenting symptom in 30 patients. Risk factors were identified in 42 patients.
Outcome:
Death occurred in 10 patients: 1-AVM, 5-leukemia, 1-trombocitopenic purpura, 1-Factor VIII deficiency
Neurologic deficit at discharge – hemiparesis, was found in 39 patients, 32 with AIS and 7 with hemorrhage stroke
Stroke recurrence occurred in 3 patients, all in patients with cardiac disease
From 39 patients with neurological deficit at discharge, follow-up assessment revealed full recovery in 19 patients, mild deficit in 8 patients, moderate - in 7 and severe deficit-in 5 patients.
The following risk-factors were identified in patients with long-term disability after stroke: Cardiac disease, Arterial Hypertension, Moya-moya syndrome. Other risk-factors were identified as follows: Cerebral aneurysm, Dissection, Encephalitis, Vasculitis Post Varicela-zoster virus FCA, Hemolytic anemia, Hypochromic microcytic anemia, Thrombocytopenic purpura, Hypocoagulation (K-vit), Sturge-weber syndrome.
Conclusions: The reported outcome after childhood stroke is variable with long-term neurological deficits or disability in more than half of childhood stroke survivors. Etiology was one of the determinants for the mortality, recurrence and neurological recovery after stroke.

PP-300
Poster presentation
Poster session 2 - timeslot 3

Experiences of women with cerebral palsy accessing women’s healthcare services
R. Byrne1, D. Gaeble2, E. Fowler3, S. Gray3, T. Pickar3, D.P. Roye5
1Cerebral Palsy Lanka Foundation, NEW YORK, United States of America
2Rehabilitation Institute of Chicago, CHICAGO, United States of America
3Center for Cerebral Palsy at UCLA, LOS ANGELES, United States of America
4Boston Children’s Hospital, BOSTON, United States of America
5Weinberg Family Cerebral Palsy Center at Columbia University Medical Center, NEW YORK, United States of America

Introduction: To describe and define the experiences of women with cerebral palsy (CP) in women’s health care
Methods: 30 women with CP were recruited to participate in individual and group interviews (2-5 women per group). Semi-structured focus group interviews were conducted to explore four key content domains: appointment planning, accessibility, experience with providers and recommendations for improving services. A comprehensive description of care as well as a description of their obstetric/gynecological experience, benefits identified, barriers encountered and strategies for improvement were discussed. All sessions were audio-recorded then transcribed. At least 2 researchers attended each session and took notes on nonverbal behavior, group dynamics and emergent themes.
Results: Five major themes emerged 1) transition to adult care (45%) 2) lack of accommodations (58%) 3) knowledge limitations of patients and providers (85%) 4) attitudinal barriers (61%) and 5) exit from the healthcare system due to previous negative experiences (25%). Participants identified an absence of continuity of care, lack of
CP related services and accommodations as barriers to care. Patients felt disempowerment about provider’s lack of CP specific knowledge in sexual health, especially pregnancy and family planning and expressed major concerns about the perception of asexuality and the assumption of cognitive deficits. Recommendations given include creating checklists for providers and patients, specialized equipment and education for providers to improve communication with patients.

Conclusions: Challenges in women’s health care were identified by all participants including physical barriers and knowledge gaps that are essential in developing a research agenda to address deficiencies and barriers to care.

PP-301
Poster presentation
Poster session 2 - timeslot 4

Attitudes toward prenatal genetic testing and therapeutic termination of pregnancy among parents of offspring with Prader-Willi Syndrome
Shaare Zedek Medical Center, JERUSALEM, Israel

Introduction: Prenatal diagnosis (PND) raises ethical dilemmas such as the option of termination of pregnancy (TOP) in cases with severe outcome. Prader-Willi Syndrome (PWS), is a complex neurogenetic syndrome, due to loss of function of specific genes on chromosome 15, with high morbidity and mortality throughout life. Recently, a unique prenatal phenotype was reported and TOP becomes a possibility. We undertook to explore factors influencing the attitudes of parents of PWS children toward PND and TOP concerning a hypothetical scenario.

Patients and methods: 85 parents of individuals with PWS, who visited the Israeli PWS National Multidisciplinary Clinic, were interviewed regarding their attitudes towards PND and TOP using semi-structured questionnaire.

Results: Fifty-seven parents were supportive of invasive PND and 28 of non-invasive tests only; none opposed PND. Thirty eight favored TOP, additional 31 supported TOP under certain conditions such as spiritual advice, 15 were categorically against TOP. Attitudes correlated with religiosity (p<0.025), mother’s education (p <0.001), mother’s work status (p<0.001), current age of the child with PWS (p <0.008). Couples had similar attitudes regarding PND and TOP. No correlation was found with gender, genetic subtype and parental age.

Conclusions: Most parents of individuals with PWS support PND, however less than half support TOP. Religiosity was the most influential factor. Familial worldview should be taken into account during prenatal counseling.