Poster Presentations

Poster presentation 1
Healthy Parent Carers Programme: testing feasibility of a novel group-based intervention to improve the health and wellbeing of parents of disabled children

A BOREK, B MCDONALD, M FREDLUND, S LOGAN, C MORRIS
University of Exeter, Exeter, UK

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 method: 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 Wellbeing 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.

Poster presentation 2
Participatory design in the development of an early therapy intervention for perinatal stroke

AP BASU, JE PEARSE, J BAGGALEY, RM WATSON, T RAPLEY
Newcastle University, Newcastle Upon Tyne, UK

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 method: 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).
Conclusions: 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.

Poster presentation 3
Language development and brain magnetic resonance imaging findings in preschool children with cerebral palsy

ES PARK[1], JY CHOI[1], S JUNG[2]
[1]Severance Hospital, Yonsei University College of Medicine, Seoul, South-Korea; [2]Dongtan 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 method: 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 grey 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 grey matter lesion severity. In multivariable analysis, only cognitive level was significantly related with receptive language development,

DOI: 10.1111/dmcn.13456

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.
Conclusions: Cognitive function is a key factor for both receptive and expressive language development. In children with PVWL or deep grey matter lesion, lesion severity seems to be predictive of language development.

Poster presentation 4
Can GMFCS be directly used in its original form in underdeveloped countries? An observation in Nepal

R THAPA
Self-help Group for Cerebral Palsy, Nepal, 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 GMFCS and soon changed GMFCS levels.
Patients and method: 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 centre 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 did not show any change in their GMFCS. Deprived children from lower socio economic background showed more improvements.
Conclusion: In an underdeveloped country like Nepal due to lack of treatment, potential of children with CP remains unexplored. Determining a GMFCS level might be misleading, which influences counselling 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 suggest to use a range (e.g. GMFCS level II–III).

Poster presentation 5
The experience of play for 6- to 12-year old children with high levels of physical disability due to cerebral palsy: an interpretative phenomenological analysis

NE GRAHAM, A MANDY, C CLARKE
University of Brighton, Eastbourne, UK

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 method: Six children functioning at GMFCS level IV/V, MACS III/IV/V, and CFCS I–II 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 recognised and promoted.

Poster presentation 6
Safeguarding children with disability

E ABBAS
Wrightington, Wigan & Leigh NHS Foundation Trust, Wigan, UK

Introduction: 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 is accentuated by the additional needs, lack of ability to communicate and other factors This studied aimed to ascertain the scale of the problem in Wigan and improve the service, and to raise the awareness of risk of abuse.
Patients and method: List of children with concern of non-accidental injury (NAI), seen in our department over a year period (January–December 2014)
Results: 212 cases identified, with 37% female, 63% male, 81 (38%) referred because of bruises, 20 (9%) with burns, 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 behavioural problems, and 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=0.07) while 29% of disabled found their injuries to be accidental vs 49% of nondisabled, with relative risk 0.51 (p=0.06). 32% of disabled assessment was inconclusive vs 10%, with relative risk of 3.1 and (p=0.001).
Conclusion: Although the small sample size was small, children with disabilities were more likely to have 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.

Poster presentation 7
Natural evolution of gait in children with hereditary spastic paraplegia

A VAN CAMPENHOUT[1], E PAPAGEORGIOU[2], P NEUT[2], K DESLOOVERE[2]
[1]*University Hospital Leuven, Pellenberg, Belgium;* [2]*KU Leuven, Leuven, 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 method: 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 (average age 7.8y) GPS was 8.96 (SD 3.9) with the MAPs mostly elevated for all levels in the sagittal plane and for hip and foot in the transverse plane. At 5.3 years (range 4–9y) follow-up, GPS increased significantly to 13.34 (SD 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.
Conclusions: 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.

Poster presentation 8
Effect of Botulinum toxin injections on gait of children with hereditary spastic paraplegia

A VAN CAMPENHOUT[1], E PAPAGEORGIOU[2], P NEUT[2], K DESLOOVERE[2]
[1]*University Hospital Leuven, Pellenberg, Belgium;* [2]*KU Leuven, Leuven, 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 method: 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.

Poster presentation 9
Verification of reliability and validity of feeding and swallowing scale for infants born preterm (FSSPI)

CW MOON, HG JUNG, HJ CHEON, SM OH, YO KI, JY KWON
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 method: 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 (SD 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

Poster presentation 10
Change of the incidence of cerebral palsy in Korea

SW KIM, HR JEON, JY 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 method: Based on medical claims data submitted to the National Health Insurance Service, patients with history of diagnosis classification codes such as prematurity (gestational age <37wks), low birth weight (LBW) (birth weight <2500g), 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 suggests that the incidence of CP has decreased despite increase in high-risk delivery in recent years in Korea.

Poster presentation 11
Computerized executive function training in very preterm born children aged 8–12 years

CSH AARNOUDSE-MOENS[1], ES TWILHAAR[2], J OOSTERLAAN[2], AHLC VAN KAAM[1], PJ PRINS[3], AG VAN WASSENAER-LEEMHUIS[1]
[1]*Academic Medical Centre Amsterdam, Amsterdam, The Netherlands;* [2]*VU University, Amsterdam, The Netherlands;* [3]*University 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 behavioural 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 9–11 years.
Patients and method: 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.

Poster presentation 12
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 method: 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 1626 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 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 need educational support, with specific attention

paid to inattentiveness. Appropriate interventions to prevent academic failure in ADHD need to be further explored.

Poster presentation 13
HEJ! The Dutch Pediatric Brain Injury Network, an example of good practice

P DE KONING
Heliomare Revalidatiecentrum, 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 (Brain Injury and Youth). HEJ brings together parents, professionals (in the field of neurology, psychiatry, rehabilitation, education, long term care) and researchers.
Patients and method: 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 as follows: 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.

Poster presentation 14
Parenting stress and psychological well-being among parents of children with functional disabilities at early school age

E DOMELLÖF[1], B FALCK[2], M TERNERT[3]
[1]*Umeå University, Umeå, Sweden;* [2]*Västerbotten County Council, Skellefteå, Sweden;* [3]*Stockholm 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 method: 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 – particularly autism – 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.

Poster presentation 15
Functional electrical stimulation to improve upper limb function in a child with an acquired brain injury: a single case experimental design study

G KELLY[1], J SHANLEY[2]
[1]*The Children's Trust, Tadworth, UK;* [2]*Coventry University, Coventry, UK*

Introduction: 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.
Patients and 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.

Conclusions: 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.

Poster presentation 16
How do people with developmental disabilities perceive their participation?

M BADIA[1], MB ORGAZ[2], I RIQUELME[3], M GÓMEZ-VELA[4], MA VERDUGO[2]
[1]*University of Salamanca, Salamanca, Spain;* [2]*Institute on Community Integration (INICO), Salamanca, Spain;* [3]*IUNICS, Balearic Islands, Spain;* [4]*Institue 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 method: One hundred-ten individuals with DD (mean 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.
Conclusions: 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.

Poster presentation 17
Surveying the childhood disability research landscape: bumps in the road separate researchers from patients

MJ PURSER, PL ROSENBAUM
McMaster Children's Hospital, Cambridge, ON, 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 method: 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.
Conclusions: 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.

Poster presentation 18
Sleep-related difficulties are common in children with neurodisability at both primary- and secondary-school ages

JR TURNBULL[1], V IMPEY[1], H ABUL-EIS[2], A SHARMA[1], B LAHOTI[1]
[1]*Guy's and St Thomas' NHS Foundation Trust, London, UK;* [2]*Royal Alexandra Children's Hospital, Brighton, UK*

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 method: 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 7.5y]; 20 secondary-school children [median age 15y]). 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% vs 61% respectively; delayed sleep-onset 34% vs 45%; waking in the night 75% in both groups; tiredness in daytime 53% vs 50%. Burden on carer, and carer-anxiety in relation to child's sleep pattern were also similar

(great burden to carer in 38% vs 40%; at least some degree of anxiety in 66% vs 70%). Reported sleep-difficulties in siblings were not common in either group (17% and 11%)
Conclusions: Sleep related difficulties in children with neurodisability were 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.

Poster presentation 19
Family-centred care: differences in what parents of children with cerebral palsy rate important

M TERWIEL[1], MW ALSEM[1], RC SIEBES[1], K BIELEMAN[2], M VERHOEF[3], M KETELAAR[1]
[1]*De Hoogstraat Rehabilitation and UMC Utrecht, Utrecht, The Netherlands;* [2]*De Hoogstraat Rehabilitation, Utrecht, The Netherlands;* [3]*Wilhelmina 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 method: 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 differed in what elements of family-centred services they consider important. These findings suggest that family-centred services should recognize the uniqueness of families and should be tailored to what parents find important.

Poster presentation 20
Implementation of PEDI-CAT in the Netherlands: an inventory of support, barriers, and facilitators

MF ENGEL, M KETELAAR, PEDI-CAT RESEARCH GROUP
De Hoogstraat Rehabilitation and UMC Utrecht, 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 method: 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.
Conclusions: Dutch pediatric rehabilitation physicians are positive on the usefulness of the PEDI-CAT. However, different barriers to its implementation are foreseen.

Poster presentation 21
Participation in leisure activities in children and adolescents with cerebral palsy in Belgium

G DEQUEKER[1], N BULCKMANS[2], E ORTIBUS[1], D KOS[3]
[1]*UZ Leuven, Pellenberg, Belgium;* [2]*Artesis Plantijn Hogeschool Antwerpen, Antwerpen, Belgium;* [3]*KU 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 method: Fifty participants aged between 10–21 years were included (27 boys, 23 girls; mean age 14, SD 3; Gross Motor Functional Classification Scale [GMFCS] level 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 diversity (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 then 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 levels IV and V had significant more pleasure on leisure activities than GMFCS levels I, II and III.
Conclusions: Gender, age and educational setting were important variables associated with diversity, intensity and enjoyment of participation in leisure activities in children with CP. This information should assist therapists to support participants with CP in their search for meaningful and varied leisure activities.

Poster presentation 22
Five-year motor outcomes of children following arterial ischaemic stroke

AN 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 method: 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) 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]) and 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-II]) were completed.
Results: Where population norms were available for comparison, the stroke group performed more poorly than test norms on most assessment measures ($p<0.05$). 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.
Conclusions: Stroke had a persisting impact on many different areas of a child's life including motor function, participation and QOL.

Poster presentation 23
Understanding frames: implementation of standing frames as part of postural management for children with cerebral palsy in the classroom

J GOODWIN[1], J LECOUTURIER[1], S CROMBIE[2], J SMITH[1], J CADWGAN[1]
[1]Newcastle University, Newcastle Upon Tyne, UK; [2]Sussex Community NHS Foundation Trust, Sussex, UK

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.
Patients and method: 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.

Poster presentation 24
Understanding frames: preliminary results of young people's experiences of using standing frames as postural management in cerebral palsy

J GOODWIN[1], J LECOUTURIER[1], S CROMBIE[2], J SMITH[1], J CADWGAN[1]
[1]Newcastle University, Newcastle Upon Tyne, UK; [2]Sussex Community NHS Foundation Trust, Sussex, UK

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.
Patients and 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, aiming to evaluate the efficacy of standing frames.

Poster presentation 25
Understanding frames: A UK survey of parents and professionals regarding the use of standing frames for children with cerebral palsy

J CADWGAN[1], J GOODWIN[1], A COLVER[1], AP BASU[1], S CROMBIE[2], D HOWEL[1], J PARR[1], E MCCOLL[1], N KOLEHMAINEN[1], A ROBERTS[3]
[1]*Newcastle University, Newcastle Upon Tyne, UK;* [2]*Sussex Community NHS Foundation Trust, Sussex, UK;* [3]*Robert Jones and Agnes Hunt Orthopaedic and District Hospital, Oswestry, UK*

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 method: 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.

Poster presentation 26
Cognitive function and participation in children and youth with mild traumatic brain injury two years after injury

SAM LAMBREGTS[1], JEM SMETSERS[2], AJ DE KLOET[3], IMAJ VERHOEVEN[4], IGL VAN DE PORT[1], GM RIBBERS[5], CE CATSMAN-BERREVOETS[6]
[1]*Revant Rehabilitation Centre, Breda, The Netherlands;* [2]*University Utrecht, Utrecht, The Netherlands;* [3]*Sophia Rehabilitation Centre, The Hague, The Netherlands;* [4]*The Hague University (of Applied Sciences), The Hague, The Netherlands;* [5]*Rijndam rehabilitation institute, Rotterdam, The Netherlands;* [6]*Erasmus MC University Medical Centre, Rotterdam, The Netherlands*

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 method: Cross-sectional study among patients (n=73) aged 6–22 years, hospital diagnosed with mTBI. Linear regression modelling 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.

Poster presentation 27
Correlation between hand function and activities of daily living in children with cerebral palsy

E KAVLAK[1], F TEKIN[1], A ÜNAL[1], HA KAVLAK[2]
[1]*Pamukkale University, Denizli, Turkey;* [2]*Yagmur 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 method: 15 children with bilateral or unilateral cerebral palsy in GMFCS level I, II or III were included the study. The subjects were being treated according to the 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 (SD 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 (SD 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.
Conclusions: 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.

Poster presentation 28
Empowerment of families that have children with developmental disabilities

S GOLUBOVIC, J KRALJ
University of Novi Sad Faculty of Medicine, 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 method: 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 behaviours.
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, to obtain appropriate services for their children.

Poster presentation 29
Friends4Sports: design of a project to encourage young disabled people to perform sports activities

MAM BERGER, J WOLFGRAM, AJ DE KLOET
The Hague University of Applied Sciences, 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 method: Patients: children, adolescents (4–25y) with physical disability or chronic disease. Methods: (1) A multidisciplinary sports counter: motivational interviewing addressing personal goals, psycho-education, advice and rehab technology. (2) Baseline measurements (training condition, strength) will be performed. (3) Peer support by students ('Friend'). (4) A social, sporting environment to try different sports. (5) Digital support by using an App to find sports, linked to 'Uniek Sporten'. (6) 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.

Poster presentation 30
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 method: 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 dichotomized EDACS levels and the PPDS.
Results: Interrater reliability of the PPDS was excellent (ICC=0.897). Analyses show a significant positive correlation between the PPDS and the dichotomized EDACS levels (Spearman's Rho=0.58, $p<0.05$).
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 with a larger sample is needed.

Poster presentation 31
Medium-term results of a multidisciplinary program in a cohort of children with Neonatal Brachial Palsy

MM 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 method: 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 affectation 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, which is considered a good result.
Conclusions: A comprehensive approach is needed to deal with functional limitations due to a PNBP.

Poster presentation 32
Validity of bioelectrical impedance analysis to determine body composition in children with cerebral palsy: a review

DAC SNIK[1], K VAN HULST[1], PH JONGERIUS[1], O VERSCHUREN[2], M KETELAAR[2], CE ERASMUS[1], N DE ROOS[3], ACH GEURTS[1]
[1]Radboud University Medical Center, Nijmegen, The Netherlands; [2]University Medical Center Utrecht, Utrecht, The Netherlands; [3]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). Criterion 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 method: 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.

Poster presentation 33
Course of employment in adults with cerebral palsy over a 14-year period

JL BENNER[1], SR HILBERINK[1], T VEENIS[2], WMA VAN DER SLOT[3], ME ROEBROECK[1]
[1]Erasmus University Medical Center, Rotterdam, The Netherlands; [2]Sophia Rehabilitation Institute, The Hague, The Netherlands; [3]Rijndam Rehabilitation Center, 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 method: Sixty-five adults with CP (male 51%; baseline age 21–31y; 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). Like the Dutch general population, males worked mostly full-time 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.

Poster presentation 34
Parent-led review: do therapists do what families ask them to do?

CD FORBES, J CARROLL
Bobath Children's Therapy Centre Wales, Cardiff, UK

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 achieve. 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.
Patients and method: 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 GMFCS levels. Family concerns and goals were categorised into ICF domains and compared.
Results: 145 families of preterm 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.

Poster presentation 35
How do children with cerebral palsy (GMFCS level IV-V) perform in everyday activities on the Pediatric Evaluation of Disability Inventory-Computer Adaptive Test (PEDI-CAT)?

J KNOX
Bobath Centre, London, UK

Introduction: A clear baseline of children's everyday functioning capability and likely potential aids treatment planning and is important knowledge 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 method: 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 level 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.

Poster presentation 36
Detection vision development in a national cohort of young children with severe to profound visual impairment: OPTIMUM cohort

AT SALT[1], M O'REILLY[1], E SAKKALOU[1], C SPRINGALL[2], NJ DALE[1]
[1]UCL Great Ormond Street Institute of Child Health, London, UK; [2]Great Ormond Street Hospital for Children, London, UK

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 method: 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.

Poster presentation 37
Early cognitive development in spina bifida

R ELLIOTT, TA WILLIAMS, A BOTMAN
The Children's Hospital Westmead, Westmead, NSW, 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 method: 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.
Conclusions: 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 multidisciplinary intervention that focuses on the child's cognitive development in addition to their physical challenges.

Poster presentation 38
Affected connectivity organization in dyskinetic cerebral palsy: a connectome-based study

J BALLESTER-PLANÉ[1], R SCHMIDT[2], O LAPORTA-HOYOS[1], E VÁZQUEZ[3], I DELGADO[3], L ZUBIAURRE-ELORZA[4], A MACAYA[5], P PÓO[6], E TORO[3], MA DE REUS[2], R PUEYO[1], MP VAN DEN HEUVEL[2]
[1]University of Barcelona, Barcelona, Spain; [2]Brain Center Rudolf Magnus, University Medical Center Utrecht, Utrecht, The Netherlands; [3]Hospital Universitari Vall d'Hebron, Barcelona, Spain; [4]Facultad de Psicología y Educación, Universidad de Deusto, Bilbo-Bizkaia, Spain; [5]Vall d'Hebron Institut de Recerca, Universitat Autònoma de Barcelona, Barcelona, Spain; [6]Hospital Universitari Sant Joan de Déu, Barcelona, Spain

Introduction: Dyskinetic cerebral palsy (CP) has long been associated with basal ganglia and thalamus lesions but recent evidence points at white matter damage to have been underestimated. Our aim was to elucidate the state of white matter in dyskinetic CP using a whole-brain connectivity approach.
Patients and method: Twenty-five dyskinetic CP patients (11–42 years) and 24 healthy controls matched by age underwent a high-resolution T1-weighted and diffusion-weighted MRI scan. Individual connectome maps were obtained combining a structural parcellation scheme of 83 cortical and subcortical brain regions with whole-brain deterministic tractography. Graph metrics (density, node degree and node FA strength) were analysed using the Brain Connectivity Toolbox for MATLAB, together with permutation testing (10 000 permutations, $p<0.05$, FDR). All analyses were corrected for age.
Results: Subjects with CP showed a significant reduction of 5.5% in network density (total number of links) compared to controls ($p=0.045$) and a lower degree (number of links per node) mainly in the bilateral parietal cortex (postcentral and superior gyrus, $p\leq0.004$) and occipital areas (lingual, pericalcarine and cuneus, $p\leq0.009$). Bilateral supramarginal gyrus, however, showed a significantly higher degree ($p\leq0.003$). Finally, regional strength data revealed reduced fractional anisotropy (FA) mainly in the bilateral sensorimotor cortex ($p\leq0.001$), superior parietal ($p\leq0.002$) and middle temporal gyrus ($p\leq0.009$).
Conclusions: Subjects with dyskinetic CP showed an abnormal pattern of white matter connectivity mainly characterized by a reduction in number and integrity of the sensorimotor and posterior connections, highlighting the involvement of sensory areas. Compensatory mechanisms could explain the increased degree in the supramarginal area.

Poster presentation 39
Relating shoulder muscle atrophy to strength loss in obstetrical brachial plexus palsy

C PONS[1], F SHEEHAN[2], HS IM[2], K ALTER[2], S BROCHARD[1]
[1]University hospital of Brest, Brest, France; [2]National Institute of Health, Bethesda, MD, USA

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 method: Twelve children (age 12.1, SD 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.
Conclusions: This study documents variable muscle atrophy across all the main shoulder muscles of the glenohumeral joint, associated with three-dimensional muscle volume imbalances. The PM, which was 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.

Poster presentation 40
Assessing corticospinal tract (re)organization in unilateral cerebral palsy based on mirror movement characteristics and diffusion measures

E JASPERS[1], K KLINGELS[2], C SIMON-MARTINEZ[2], H FEYS[2], N WENDEROTH[1]
[1]ETH Zurich, Zurich, Switzerland; [2]KU Leuven, Leuven, Belgium

Introduction: Structural reorganization of the corticospinal tract (CST) forms a primary source of variability amongst children with unilateral cerebral palsy (CP). 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 method: We assessed MM, CST-wiring and structural integrity in 26 children with unilateral CP (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: This study provides 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.

Poster presentation 41
Movement analysis software for improving participation in gaming: a study project

RH EAST[1], CR BOOKER[2], RCT MILES[1], K PATEL[1], E CHRUSCIKOWSKI[1], AL GORDON[3], AP SHORTLAND[1]
[1]Guy's and St Thomas' NHS Foundation Trust, London, UK; [2]King's College Hospital, London, UK; [3]Evelina Children's Hospital, London, UK

Introduction: Children and young adults with physical disabilities enjoy playing electronic games as much as their peers but may have barriers to their participation if they have movement difficulties. The Kinect™ is a simple motion detector, originally designed to be used in Xbox™ gaming. Our project aims to create a software utility that finds an 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 novo 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.
Conclusions: 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.

Poster presentation 42

A decade later: developmental trajectories of social participation and associated factors in individuals with cerebral palsy into adulthood

SS TAN[1], M VAN GORP[1], L VAN WELY[2], DW SMITS[3], WM VAN DER SLOT[1], M KETELAAR[3], AJ DALLMEIJER[2], ME ROEBROECK[1]

[1]Erasmus MC University Medical Center, Rotterdam, The Netherlands; [2]VU University Medical Center, Department of Rehabilitation Medicine, Amsterdam, The Netherlands; [3]Brain Center Rudolf Magnus and Center of Excellence for Rehabilitation Medicine, 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 method: 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.

Conclusions: The development of social participation of individuals with CP continued 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.

Poster presentation 43

Advanced technologies complementing occupational therapy in children with neuromotor disorders undergoing rehabilitation

A HERZOG, J LIEBER, B RÜCKRIEM, HJA VAN HEDEL

University Children's Hospital Zurich, Affoltern Am Albis, Switzerland

Introduction: During recent years, advanced technologies are more and more applied 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 method: In this preliminary retrospective analysis, we included data from 30 children (7 girls; 20 children with cerebral palsy, 10 other diagnoses; age 12 [SD 6.1] years) who received conventional occupational therapy and advanced technologies with systems such as Armeo Spring, YouGrabber, or ChARMin. 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 (SD 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.

Poster presentation 44

The relationship between swallow frequency, dysphagia and saliva control in children with cerebral palsy

G GELIN[1], E ORTIBUS[1], N ROMMEL[2]

[1]University Hospitals Leuven, Leuven, Belgium; [2]KU 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 method: SSF of 15 children with CP (mean age10.8 [SD 3.6] y) was compared to 22 healthy children (mean age 1.5 [SD 1.4] y). SSF was recorded for 15 minutes (rest and activity) by a microphone taped to the cricoid and connected to a digital recorder (Crary et al. 2012). Drooling Quotient was scored during the middle 5 minutes. Dysphagia was evaluated using the Dysphagia Management Staging Scale. Audiofiles were analysed (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=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: In this study, 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.

Poster presentation 45
An investigation of visual perceptual abnormalities in children with suspected or diagnosed congenital cerebral visual impairment

HEA SAKKI[1], R BOWMAN[2], R KUKADIA[2], J SARGENT[2], NJ DALE[2]
[1]University College London, London, UK; [2]Great Ormond Street Hospital for Children NHS Foundation Trust, London, UK

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 method: 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.

Poster presentation 46
The effect of child, family and environmental factors on the participation of young children with disabilities

D ANABY[1], L SALVO[2], E DI MARINO[1], M KHETANI[3], S TREMBLAY[1]
[1]McGill University, Montreal, QC, Canada; [2]Jewish Rehabilitation Hospital, Laval, QC, Canada; [3]University of Illinois, Chicago, IL, USA

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, day-care/preschool and community.
Patients and method: Parents (*n*=90) of children, ages 1.4–6 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.

Poster presentation 47
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 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 method: 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 based on 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 considered when planning services for families with preschool children with CP.

Poster presentation 48
Outcomes of clinical exercise tests are related to fatigue in youth with walking problems

EAM BOLSTER, ACJ BALEMANS, V DE GROOT, AI BUIZER, AJ DALLMEIJER
VU University Medical Center, 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 method: Fifty-eight participants with physical disabilities were included in this study (mean age 12y 11mo, range 5y 10mo–22y 1mo). 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 (R^2=0.20) and maximal aerobic work rate (R^2=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 (R^2 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 (R^2=0.28).
Conclusions: In youth with walking problems an increased net energy cost and a decreased aerobic capacity were associated with fatigue during walking. This suggests that 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.

Poster presentation 49
Adults with cerebral palsy in Slovenia

M JEKOVEC VRHOVSEK[1], H DAMJAN[2], K SCHARA[1], M ZEN JURANCIC[2], D BRATEC[3]
[1]University Medical Centre, Ljubljana, Slovenia; [2]University Rehabilitational Institute Soca, Ljubljana, Slovenia; [3]Soncek Cerebral Palsy Association of Slovenia, Ljubljana, Slovenia

Introduction: The level of care for adults with cerebral palsy seems to be less than desired compared to that in childhood and adolescence. A pilot study was carried out to highlight their health problems and to propose guidelines for more optimal care.
Patients and method: 16 patients (8 male, 8 female), aged 23–54 years 6 months (mean age 36y 5mo) were invited to participate in interview and clinical examination.
Results: Cerebral palsy was classified as bilateral spastic (11 participants), unilateral spastic (3 participants), dystonic/dyskinetic (1 participant), mixed (1 participant). GMFCS was level V (10 participants), level IV (3 participants) and level II (2 participants). Eight participants were cognitively impaired. Among additional disorders cardiovascular diseases were found in 9 participants, eating and swallowing disorders were established in 2 participants. There was psychiatric comorbidity in two participants, epilepsy in three participants and chronic headache in one participant. Twelve participants needed orthopaedic devices, adapted home environment, spasticity treatment and gait therapy. Further orthopaedic diagnostic procedures and surgical treatment (scoliosis, hip luxation) were necessary in eight participants. No female participant was regularly followed by a gynaecologist. Despite non-optimal ambulatory status, nobody had bone mineral density measured.
Conclusions: In all participants, less than desired level of specialist health care was identified. Therefore, they were referred to additional specialist care: orthopaedics, rehabilitation medicine, neurology, internal medicine, gynaecology, psychiatry, psychological support and to participate in social skill groups. The majority of participants considered the study as very useful.

Poster presentation 50
Motor performance of Surinamese preterm and dysmature children and children with birth asphyxia at age 5

MJAJ FLEURKENS-PEETERS[1], AJWM JANSSEN[2], MWG NIJHUIS-VAN DER SANDEN[2], CWR ZIJLMANS[1]
[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 method: Two groups of children were included: group 1 were children born very preterm (<32wks) and/or dysmature (<1500g) and group 2 children born with birth-asphyxia (Apgar-score <6 at 5 min 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 5.3y; range 5.1–5.4), group 2 of 14 children (12 boys, mean age 5.3y (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.

Poster presentation 51
Movement Assessment Battery for Children-2 (MABC-2): which reference values are suitable for Surinamese children at 5 years of age?

MJAJ FLEURKENS-PEETERS[1], AJWM JANSSEN[2], MWG NIJHUIS-VAN DER SANDEN[2], CWR ZIJLMANS[1]
[1]Academic Hospital Paramaribo, Paramaribo, Surinam; [2]Radboud 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 method: 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.

Poster presentation 52
Multiple morbidity in middle-aged adults with cerebral palsy

EA HURVITZ, N CREMER, MD PETERSON
University of Michigan, Ann Arbor, MI, USA

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 method: A health system-based sample of 435 adults (40–60y 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 levels 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%) vs 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 multi-morbidity.
Conclusions: Middle-aged adults with CP had high estimates of multiple morbidity. Both obesity and GMFCS level IV–V were independently associated with greater risk. Future surveillance efforts are required to characterize the aetiology and temporal sequence of secondary conditions in CP, and to inform early intervention strategies to lessen the burden of chronic conditions.

Poster presentation 53
Brain structure at 29–35 weeks postmenstrual age is related to cognitive outcomes at 12 months corrected age in infants born very preterm

JM GEORGE[1], S FIORI[2], J FRIPP[3], K PANNEK[3], AK GUZZETTA[2], A COULTHARD[4], RS WARE[5], SE ROSE[3], PB COLDITZ[1], RN BOYD[1]

[1]The University of Queensland, Brisbane, Qld, Australia; [2]Stella Maris Scientific Institute, Pisa, Italy; [3]Australian e-Health Research Centre, CSIRO, Brisbane, Qld, Australia; [4]Royal Brisbane and Women's Hospital, Brisbane, Qld, Australia; [5]Menzies Health Institute Queensland, Brisbane, Qld, Australia

Introduction: This study examined the relationship between a structural MRI scoring system of brain injury and growth impairment at 29–35 weeks postmenstrual age (PMA, 'early MRI') and cognitive outcomes at 12 months corrected age, in infants born <31 weeks' gestational age.
Patients and method: Eighty-three infants in a prospective cohort study underwent early 3T MRI between 29–35 weeks PMA (mean 32^{+1} wks; SD 1^{+3} wks); 49 males, born at mean gestation 28^{+1} day (SD 1^{+6} wks) and birthweight 1076 g (SD 317g). Seventy-eight infants had a second MRI at term equivalent age (TEA; 40^{+6} d; SD 1^{+3} wks). 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 (12mo 4d; SD 1^{+2} wks) 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 ß=−1.50; 95% confidence interval CI=−2.38 to −0.61; $p<0.01$), white matter (ß=−2.00; 95% CI=−3.47 to −0.53; $p<0.01$) and deep grey matter scores (ß=−4.46; 95% CI=−7.63 to −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 (ß=−5.20; 95% CI=−8.80 to −1.60; $p<0.01$).
Conclusion: This modified early MRI scoring system documents 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.

Poster presentation 54
Improvement of visuospatial deficits following unimanual or bimanual intensive motor interventions in children with unilateral spastic cerebral palsy: a randomized trial

G ICKX[1], D EBNER-KARESTINOS[1], J PARADIS[1], M BRANDÁO[2], AM GORDON[3], SM HATEM[4], Y BLEYENHEUFT[1]

[1]Université Catholique de Louvain (UCL), Bruxelles, Belgium; [2]Universidade Federal de Minas Gerais, Belo Horizonte, Brazil; [3]Columbia University, New York, NY, USA; [4]Vrije Universiteit Brussels, Brussels, Belgium

Introduction: Although visuospatial attention deficits have been described in many children with unilateral spastic cerebral palsy (CP), 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 unilateral spastic CP.
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 (6h/d, 3wks). Four visuospatial tests (Ogden figure copy, star cancellation, line bisection, proprioceptive pointing) were performed before and after the interventions. A 2 (test session) × 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: $p=0.024$).
Conclusions: In this study, intensive interventions resulted in an improvement of visuospatial abilities in children with unilateral spastic CP. Unimanual (CIMT) and bimanual (HABIT) therapies had differential effects depending on the side of the cortical lesion.

Poster presentation 55
Sleep in children with cerebral palsy: a cross sectional-study

C IMMS[1], L TIMMERS[2], C KERR[3], M RANDALL[1], A HARVEY[4], D REDDIHOUGH[4], I NOVAK[5], P KARLSSON[5], H SMITHERS-SHEEDY[5], N SHIELDS[6]

[1]Australian Catholic University, Fitzroy, Vic., Australia; [2]Radboud Universiteit, Nijmegen, The Netherlands; [3]Queen's University Belfast, Belfast, UK; [4]Murdoch Children's Research Institute, Melbourne, Vic., Australia; [5]Cerebral Palsy Alliance, The University of Sydney, Sydney, NSW, Australia; [6]La Trobe University, Bundoora, Vic., 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 method: 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 (6–18y) 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.

Poster presentation 56
Pelvic, acetabular and lower limb skeletal deformities in spastic diplegia

A MASSAAD[1], A ASSI[2], N KHALIL[2], F YARED[2], Z BAKOUNY[2], W SKALLI[3], I GHANEM[4]
[1]*Sesobel, Keserwan, Lebanon;* [2]*Faculty of Medicine, Beirut, Lebanon;* [3]*Institut de biomécanique Georges Charpak, Arts et Métiers, ParisTech, Paris, France;* [4]*Hôtel Dieu de France, Beirut, Lebanon*

Introduction: Lower limb (LL) skeletal deformities are known to affect gait in children with cerebral palsy (CP) (Gage 2001). 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.
Patients and method: 26 spastic diplegia (age:11 SD 6y), 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), acetabular 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 [SD 13]°, $p=0.001$), true equines (23 [SD 10]°, $p=0.015$), apparent equines (26 [SD 16]°, $p=0.031$), compared to the TD (14 [SD 9]°). Acet-Abd was significantly increased in crouch compared to TD group (78 [SD 6]° vs 71 [SD 6]°, $p=0.001$). Crouch group presented a decreased Acet-Cov compared to TD (39 [SD 4]% vs 42 [SD 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 ($r=-0.55$, $p=0.041$).
Conclusion: The increased FA in all the CP groups seemed 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.

Poster presentation 57
Test–retest reliability of a new fatigue index to quantitatively evaluate fatigue in children with cerebral palsy

L BRAUERS[1], K KLINGELS[2], RJEM SMEETS[3], P FEYS[2], EAA RAMECKERS[1]
[1]*Adelante Rehabilitation Center, Hoensbroek, The Netherlands;* [2]*Hasselt University, Hasselt, Belgium;* [3]*Maastricht University, Maastricht, 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 (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 method: 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 was fair to good.

Poster presentation 58

The influence of mobility on bone mineral density in patients with cerebral palsy

A MIKOV[1], Z KABLAR[1], M MIKOV[1], S GOLOCORBIN-KON[1], L DIMITRJEVIC[2], I TURKALJ[1]

[1]*Medical Faculty, University of Novi Sad, Novi Sad, Serbia;* [2]*Medical faculty, University of Nis, NIS, 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 method: 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 −1.122SD. The difference between BMD values in these groups was not statistically significant.

Conclusions: Non-walkers had lower mean z-scores than walkers both at femoral neck and lumbar spine. Connection between BMD and hip/spine deformities was not found.

Poster presentation 59

Developmental challenges associated with preschool quality of life in high-risk children

RA DEREGNIER, L BOSWELL, M WECK, A RUSSOW, M WEISSBOURD

Ann & Robert H Lurie Children's Hospital of Chicago, Chicago, IL, USA

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 method: Fifty-five children (<28wks 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 [SD 29] vs 86.5 [SD 18], p=0.002) and social functioning (67.7 [SD 25] vs 86.6 [SD 15], p=0.0016). Emotional functioning scores were similar (71.6 [SD 23.6] vs 76.3 [SD 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 [SD 18.7] vs 78.9 [SD 26.0], p=0.019) but social functioning was similar in both groups (62.0 [SD 11] vs 71.2 [SD 31.7], NS).

Conclusions: 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.

Poster presentation 60

Neuro-sensory Motor Developmental Assessment (NSMDA) at 18–24 months predicts quality of life at 3½ to 5 years

RA DEREGNIER, M WECK, MK SANTELLA, A RUSSOW, M WEISSBOURD, C PATRICK, L BOSWELL

Ann & Robert H Lurie Children's Hospital of Chicago, Chicago, IL, USA

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 method: Fifty-two high-risk children (28 wks 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 6–11, 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 [SD 25]) than for those with MILD-MOD (68.3 [SD 27]) or NL-MIN impairments (87.6 [SD 17], p<0.05 for all comparisons). Social functioning was lower for children with severe-profound NSMDA impairments (63.0 [SD 12.6], p<0.05) and trended to be lower for those with MILD-MOD impairments (71.4 [SD 15.5]) compared to NL-MIN (85.6 [SD 19.3]). Emotional functioning was similar across NSMDA categories.

Conclusions: 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.

Poster presentation 61
Environmental barriers and its correlation with diversity and intensity of participation in leisure activities in children and adolescents with cerebral palsy

E LONGO[1], M BADIA[2], B ORGAZ[2]
[1]University Federal do Rio Grande do Norte, Santa Cruz, Brazil; [2]University 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 method: Participants in this study included 206 children and adolescents with CP (55.8% males) aged 8–18 years (mean 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.
Conclusions: The findings of this study highlight the role of the environment in explaining participation in children with cerebral palsy and the importance of providing interventions to produce environmental changes that foster the participation in leisure activities.

Poster presentation 62
Prediction of the age of onset of independent walking in spina bifida based on initial physical assessment: a retrospective chart audit

A BOTMAN[1], R QUINLAN[1], S TAYLOR[1], M PAULKA[2], R HARRIS[2], V PACEY[1]
[1]The Children's Hospital at Westmead, Westmead, NSW, Australia; [2]Macquarie University, Sydney, NSW, 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 method: 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.

Poster presentation 63
Effect of robotic walking training on the gait of ambulatory children with cerebral palsy: pilot study

M YAZICI[1], Y YAKUT[2], A LINANELIOGLU[1]
[1]Hacettepe University, Faculty of Health Sciences, Ankara, Turkey; [2]Hasan 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 method: 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, SD 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, SD 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 research on walking optimality and developing new applications in addition to physiotherapy programs is required.

Poster presentation 64

'A story-based game would drive me to keep playing': the perspectives of youth on the autism spectrum and professionals on designing a serious game

J TANG[1], M FALKMER[1], S BÖLTE[2], S GIRDLER[1]
[1]Curtin University, Bentley, WA, Australia; [2]Karolinska Institutet, Stockholm, Sweden

Introduction: Computer-based interventions (CBI) show potential in remediating the emotion recognition difficulties of people on the Autism spectrum, however further research is required to improve the engagement and generalisation of skills to everyday context. The Serious Game framework proposes five guiding principles to address the current limitations of existing CBI in Autism. Using this framework as a guide, this study aimed to qualitatively explore the perspectives of youth on the Autism spectrum and professionals experienced in this field to identify the features of computer game teaching targeting emotion recognition skills.
Patients and method: Focus groups were conducted with youth on the Autism spectrum (n=11) and their perspectives were compared with professionals experienced in social skills interventions (n=5). Qualitative data was coded using directed content analysis and framed within the Serious Game framework.
Results: The findings reflected the suggestions of youth and professional groups under the five main themes of 'motivating storyline', 'goal-directed learning', 'rewards and feedback', 'progression in levels of difficulty and individuation', and 'provision of choice'.
Conclusion: The youth with Autism emphasised the importance of game features which are 'motivating', while the professionals focused on features assisting with 'generalising' skills to everyday environments. The differing perspectives of these two groups highlight the importance of involving end-users and consultation with experts when designing and developing computer games.

Poster presentation 65

Family-centred practice and child participation: comparing the experiences of professionals and primary caregivers

JTM 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 method: 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.

Poster presentation 66

A clinical assessment and three-dimensional movement analysis: an integrated approach for upper limb evaluation in children with unilateral cerebral palsy

L MAILLEUX[1], E JASPERS[2], C SIMON-MARTINEZ[1], K DESLOOVERE[1], G MOLENAERS[1], E ORTIBUS[1], K KLINGELS[1], H FEYS[1]
[1]KU Leuven, Leuven, Belgium; [2]ETH Zurich, Zurich, Switzerland

Introduction: The clinical application of upper limb (UL) three–dimensional movement analysis (3DMA) in children with unilateral cerebral palsy (CP) remains challenging. Therefore, we aimed to investigate the relation between clinical and kinematic parameters in this target group.
Patients and method: Fifty children with unilateral CP (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 Melbourne Assessment 2 (MA2), the Assisting Hand Assessment (AHA) 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 kinematic parameters (Arm Profile Score [APS], duration, [timing of] maximum velocity, and trajectory straightness) were extracted. The APS and AVS refer to the total amount of movement pathology and the amount of movement deviation of the trunk, scapula, shoulder, elbow and wrist.
Results: Longer movement durations and higher APS-scores were found with increasing MACS-levels (p<0.001). Global kinematic parameters showed mainly low to moderate correlations with sensorimotor impairments (r=−0.28 to −0.66) and moderate to high correlations with the MA2 and AHA (r=−0.50 to −0.86). For the joint specific parameters, correlations with all clinical outcomes were mainly low to moderate (r=−0.30 to −0.67). Stronger movement deviations distally, were significantly correlated with increased muscle weakness (r=−0.35 to −0.64) and spasticity (r=0.31 to −0.55), while

proximally, only muscle weakness correlated significantly with increased movement deviations (r=−0.35 to 0.59).
Conclusion: The total amount of UL movement pathology increased with increasing MACS-levels. Moreover, the correlation between deviant UL kinematics and muscle weakness confirms the importance of muscle strengthening as a treatment goal.

Poster presentation 67
Eating and Drinking Ability Classification System in a population-based sample of preschool children with cerebral palsy

KA BENFER[1], KA WEIR[2], KL BELL[1], RS WARE[2], PSW DAVIES[1], RN BOYD[1]
[1]*The University of Queensland, South Brisbane, Qld, Australia;* [2]*Griffith University, Gold Coast, Qld, Australia*

Introduction: To determine (1) the reproducibility of the Eating and Drinking Ability Classification System (EDACS); (2) the proportion of children classified to each EDACS level in a population-based cohort of children with cerebral palsy (CP); (3) the relationships between the EDACS and direct clinical mealtime evaluation, other classification systems and health outcomes.
Patients and method: Cross-sectional population-based cohort study of 170 children diagnosed with CP at 36–60 months (mean=57.6mo [SD 8.3], 105 males). Functional abilities of children with CP were representative of a population sample (GMFCS level 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 Dyspahgia 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.
Conclusions: 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.

Poster presentation 68
Spontaneous arm movements and asymmetrical development in infants with perinatal stroke

JC HEATHCOCK, AC CHAUDHARI, J MAZZERELLA, M MCNALLY
The Ohio State University, Columbus, OH, USA

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 behavioural and biomechanical methods at 2 months of age, well before common ages of diagnosis of hemiparetic CP.
Patients and method: 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<0.05) between group for distance (1955mm), average velocity (33mm/s), peak velocity (55mm/s), and number of movement units (2 MU, coordination) and a trend (p<0.1) 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.

Poster presentation 69
Changes in tactile function during intensive bimanual training in children with unilateral spastic cerebral palsy

G SAUSSEZ, 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 investigates whether regular intensive bimanual training is sufficient to improve tactile function in children with USCP.
Patients and method: 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 was 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.

Poster presentation 70
Does including a lower extremity component during Hand-Arm Bimanual Intensive Training affect improvements of the upper extremities?

G SAUSSEZ[1], M BRANDÃO[2], AM GORDON[3], Y BLEYENHEUFT[1]
[1]*Université Catholique de Louvain, Brussels, Belgium;* [2]*Federal University of Minas Gerais, Belo Horizonte, Brazil;* [3]*Columbia University, New York, NY, USA*

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 (CP). 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 method: This study consisted of retrospective analysis of 86 children with unilateral spastic CP who received 90 hours 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 unilateral spastic CP were not attenuated by a LE component. In addition, systematic LE stimulation during bimanual intensive intervention (HABIT-ILE) led to larger functional improvements in activities of daily living involving the LE.

Poster presentation 71
Elbow flexion contractures in neonatal brachial plexus palsy: a one-year comparison of serial casting and dynamic orthosis

S BLEEKER[1], JH DE GROOT[2], RGHH NELISSEN[2], D STEENBEEK[2]
[1]*Sophia Revalidatie, Den Haag, The Netherlands;* [2]*Leiden 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 contraction reduction by a dynamic night orthosis with serial circular casting followed by night-splinting over a one year period in a single blind randomized controlled trial.
Patients and method: Forty-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° (SD 6°) vs 16° (SD 10°), at t2 9° (SD 7°) vs 14° (SD 6°), at t3 10° (SD 8°) vs 12° (SD 12°). 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.
Conclusions: 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.

Poster presentation 72
Activities and participation of children and adolescents after mild traumatic brain injury and the effectiveness of an early intervention: presentation of the Brains Ahead! study design

SAM LAMBREGTS[1], MI RENAUD[1], AJ DE KLOET[2], CE CATSMAN-BERREVOETS[3], IGL VAN DE PORT[1], CM HEUGTEN[4]
[1]*Revant Rehabilitation Centre, Breda, The Netherlands;* [2]*Sophia Rehabilitation Centre, The Hague, The Netherlands;* [3]*Erasmus MC University Medical Centre, Rotterdam, The Netherlands;* [4]*Maastricht University, Maastricht, The Netherlands*

Introduction: Approximately 20% of children and adolescents who have suffered mild traumatic brain injurie (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 method: 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.
Conclusions: 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 a psychoeducational intervention.

Poster presentation 73
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 method: 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.
Conclusions: Spinal braces were used by only 9% of all children with cerebral palsy. Goal attainment for all functional outcomes was high and more than half seemed to attain their goal in preventing deformity.

Poster presentation 74
Playful rehabilitation: virtual reality within cognitive rehabilitation for children – a review

MS VAN DEN HEERIK[1], LA SPREIJ[1], JMA VISSER-MEILY[1], ICM RENTINCK[2], M VERHOEF[3], TCW NIJBOER[1]
[1]*De Hoogstraat Rehabilitation/UMC Utrecht, Utrecht, The Netherlands;* [2]*De Hoogstraat Rehabilitation Center, Utrecht, The Netherlands;* [3]*Wilhelmina Children's Hospital, Utrecht, The Netherlands*

Introduction: Current cognitive assessment of static methods with a low ecological validity. The results are hard to generalize to the dynamic everyday life. A promising technique providing the possibility to bridge the gap between cognitive rehabilitation and everyday life, is virtual reality (VR). This review gives an overview of research using VR for cognitive assessment and/or training for children with cerebral palsy (CP) or acquired brain injury (ABI). The aim of this review is to determine to what extent VR is clinically applicable in cognitive rehabilitation for children.
Methods: A systematic literature search was conducted to collect relevant literature. Using a quality assessment articles were granted a methodological quality.
Results: Nine studies were included. Based on the quality assessment six studies were assigned a moderate quality and three studies a low quality. Six studies focussing on assessment showed the possibility to differentiate children with ABI or CP from healthy children using a VR simulation assessing attention, social cognition and executive function. Three studies found positive effects on visuo-spatial functioning in children with CP after training in a VR simulation.
Conclusion: The small amount of studies showed promising results, but are just the beginning of a new field of research. Future research will provide insight in the added value of VR in cognitive assessment and treatment within paediatric rehabilitation. Based on this review it can be concluded that results are promising, but VR is not yet applicable as 'evidence based practice' within cognitive rehabilitation for children.

Poster presentation 75
Validity and intra-rater reliability of freehand 3D ultrasound for the determination of lower leg muscle volume in children with cerebral palsy

LA BARBER[1], C ALEXANDER[2], RN BOYD[1], S REID[2], J VALENTINE[3], K STANNAGE[3], C ELLIOTT[4]
[1]*The University of Queensland, Brisbane, Qld, Australia;* [2]*University of Western Australia, Perth, WA, Australia;* [3]*Princess Margaret Hospital for Children, Perth, WA, Australia;* [4]*Curtin University, Perth, WA, 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 method: The MG, LG and SOL of both limbs of 15 children with CP (mean [SD] age 8y 1mo [2y 1mo], hemiplegia=7, diplegia=8, GMFCS level 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 2.5–3.2 ml and 3DUS was 3.1–4.1 ml.
Conclusion: Freehand 3DUS appears to be 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.

Poster presentation 76
Support needs profiles in children and adolescents with cerebral palsy

V AGUAYO[1], M BADIA[2], MA VERDUGO[2], AM AMOR[2]
[1]*University of Salamanca, Salamanca, Spain;* [2]*INICO, 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 method: 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 Neighbourhood, 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.

Poster presentation 77
Audit of neuroimaging in cerebral palsy

BA WATSON[1], JE BOTHWELL[1], S MCKINSTRY[1], P BURNS[1], G GARCIA JALON[2], M STEWART[1]
[1]*Belfast Health and Social Care Trust, Belfast, UK;* [2]*Queen's University Belfast, Belfast, UK*

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 (BHSCT).
Patients and method: Retrospective audit using SCPE recommendations on cUSS and MRI in CP[4] as the benchmark. Children born in BHSCT during 2000–2008 were iidentified 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]
Conclusions: 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.

Poster presentation 78
The Hammersmith Infant Neurological Examination (HINE) asymmetry score improves identification of hemiplegic cerebral palsy in a neonatal intensive care follow-up clinic

NL MAITRE[1], AK GUZZETTA[2], MA NELIN[1], OC CHORNA[1], FDA D'ACUNTO[2], DM ROMEO[3]
[1]*Nationwide Children's Hospital, Columbus, OH, USA;* [2]*Stella Maris Scientific Institute, Pisa, Italy;* [3]*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 cut-offs. We hypothesized that use of the asymmetry score (AS) within the HINE could differentiate hemiplegia.
Patients and method: 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 BFMF 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 77 [70,78]. 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 BFMF (R^2=0.54, 0.42 and 0.43, all p<0.0001).
Conclusions: 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.

Poster presentation 79
Routine use of the General Movements Assessment in a US Neonatal Intensive Care Unit to improve targeted neuroimaging and follow-up of infants at high-risk for movement disorders

NL MAITRE[1], MA NELIN[1], GN NORITZ[1], OC CHORNA[1], JW WILLIAMS[1], HC CAREY[1], AK GUZZETTA[2]
[1]Nationwide Children's Hospital, Columbus, OH, USA; [2]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.
Patients and method: 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 counselling, 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 could 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.

Poster presentation 80
White matter microstructure is related to intelligence quotient level in dyskinetic cerebral palsy

O LAPORTA-HOYOS[1], K PANNEK[2], J BALLESTER-PLANÉ[1], E VÁZQUEZ[3], I DELGADO[3], L ZUBIAURRE-ELORZA[4], A MACAYA[5], P PÓO[6], M MELÉNDEZ-PLUMED[3], C JUNQUÉ[7], RN BOYD[8], R PUEYO[1]
[1]University of Barcelona, Barcelona, Spain; [2]CSIRO, Australian e-Health Research Centre, Brisbane, Qld, Australia; [3]Hospital Universitari Vall d'Hebron, Barcelona, Spain; [4]Universidad de Deusto, Facultad de Psicología y Educación, Bilbo-Bizkaia, Spain; [5]Vall d'Hebron Institut de Recerca, Universitat Autònoma de Barcelona, Barcelona, Spain; [6]Servei de Neurologia, Hospital Universitari Sant Joan de Déu, Barcelona, Spain; [7]Faculty of Medicine, University of Barcelona, Barcelona, Spain; [8]Qld Cerebral Palsy and Rehabilitation Research centre, Brisbane, Qld, Australia

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 and method: Thirty-three participants with dyskinetic CP (mean age: 24.4 [SD 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.
Conclusions: Long association fibres were 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 had reduced FA in motor-related fibres and regions that might play a role in other associated comorbidities.

Poster presentation 81
Health-related quality of life in Slovenian children and adolescents with cerebral palsy

AR RADSEL, DN OSREDKAR, DN NEUBAUER, M JEKOVEC VRHOVSEK
University Medical Centre 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 method: 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. Forty-eight 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 was good, with Social Inclusion and Independence being the weakest domains. Children reported 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.

Poster presentation 82
Muscle elastography using acoustic radiation force impulse imaging in congenital muscular torticollis

MS JEON[1], YSS YANG[1], JSJ JUNG[2]
[1]Chungnam National University Hospital, Daejeon, South Korea; [2]Hallym University Sacred Heart Hospital, Hwasung, South Korea

Introduction: 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.
Patients and method: 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.
Results: The initial mean transverse diameter of affected muscles was 12.21 (SD 2.68) mm and the mean shear-wave propagation velocity was 2.35 (SD 0.46) m/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 despite remaining mass ($p<0.05$).
Conclusions: ARFI elastography could reflect the stiffness of tumorous sternocleidomastoid muscles in congenital muscular torticollis. It might be helpful to predict the improvement of cervical ROM.

Poster presentation 83
Infants with cerebral palsy show reduced plantarflexor muscle volume prior to developing ankle contractures

MC LUND[1], MS WILLERSLEV-OLSEN[2], M KOFOED-HANSEN[2], J LORENTZEN[1], JB NIELSEN[1]
[1]University of Copenhagen, Copenhagen, Denmark; [2]The Elsass Foundation, Charlottenlund, Denmark

Introduction: 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.
Patients and method: 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.
Conclusions: 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.

Poster presentation 84
Participation at long term after selective dorsal rhizotomy

PEM VAN SCHIE, E TIMMER, JG BECHER, AI BUIZER
VU University Medical Center, Amsterdam, The Netherlands

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 method: 18 adolescents/young adults with CP (age 16–25y; 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 was calculated, and relations between participation and pain and 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).
Conclusions: 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.

Poster presentation 85
Children with spastic cerebral palsy do not have excess leg muscle activity during daily activities or at rest

JS MICHELSEN[1], MC LUND[1], T ALKJÆR[1], T FINNI[2], JB NIELSEN[1]
[1]University of Copenhagen, Copenhagen N, Denmark; [2]University of Jyvaskylä, Jyvaskylä, Finland

Introduction: 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.
Patients and method: 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 7–12y). EMG was measured from four muscle groups of each leg (quadriceps, hamstrings, tibialis anterior and gastrocnemius) 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).
Conclusions: Absence of increased muscle activity during motor activities and at rest in children with spastic CP suggests 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.

Poster presentation 86
Integrated assessment of locomotor activity with wearable sensors and functional electromyography in Rett syndrome

M DIPAOLA[1], VF GESTRA[2], EE PAVAN[3], F SCOTTI[2], CA FRIGO[3], P CAVALLARI[1], ML RODOCANACHI ROIDI[2]
[1]Università degli studi di Milano, Milan, Italy; [2]IRCCS Fondazione Don Gnocchi Onlus, Milan, Italy; [3]Politecnico 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 method: We enrolled eight RTT children (mean age 10 SD 4y) able to walk unassisted and eight healthy control subjects (mean age 10 SD 4y). Clinical evaluation was performed using the Rett Assessment Rating Scale (RARS_-Body; mean value 1.65, SD 0.63). A surface electromyography (EMG) system (FREEEMG 1000 BTS s.r.l., Italy) was used to record muscle activity of soleus, tibialis anterior, biceps femoris, rectusfemoris and gluteus maximus muscles in both legs. An IMU sensor (BTS G-WALK s.r.l., Italy) 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 11.5 m 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.
Conclusions: Our preliminary results encourage the identification of specific physio-pathological EMG pattern to better define motor rehabilitation programs in RTT.

Poster presentation 87
I watch, imitate, therefore I am

S MICHELETTI[1], V SCAGLIONI[2], J GALLI[3], A MOLINARO[3], A ROSSI[2], A ALESSANDRINI[2], E FAZZI[2], M GNESI[4]
[1]Asst Spedali Civili, Brescia, Italy; [2]Asst Spedali Civili, Brescia, Italy; [3]University of Brescia, Brescia, Italy; [4]University of Pavia, Pavia, Italy

Introduction: Early habilitation programs for infants and toddlers who are at risk of learning disabilities, are necessary for the promotion of those skills which are involved in the acquisition of daily living autonomies. However, several aspects such as the distance from the local providers or the reduced number of therapists limit access for these patients. Tele-rehabilitation can be a therapy model which can go beyond the limits of local services. The aim of this study was to evaluate the utility of early telerehabiliation in 10 patients with neurological diseases.
Patients and method: 10 toddlers and preschool children aged 3–6 years (6 females, mean age 4y 6mo, SD 1y 10mo) with intellectual disability associated to visuocognitive and communicative disorders received a three months habilitation program (4 times/wks) addressed to the promotion of language comprehension and production, referential gestures and logical/ graphical preschool skills. An evaluation of IQ level (Leiter-r), communication skills (MacArthur questionnaire and phoneme/word inventory, verbal comprehension test: word-action) and visuocognitive abilities (VMI, Block Building test from NEPSY battery) was propose before, at the end of the program and over a 3-months period .
Results: A significant modification ($p<0.05$) of communicative and visuocognitive skills was present at the end of the habilitative protocol for communicative skills (both receptive and expressive skills). No significant modifications were obtained on IQ levels.
Conclusions: Telerehabilitation is an alternative service delivery model for early intervention therapy and has the potential to promote neuro-cognitive and communicative skills through remote consultation.

Poster presentation 88
Higher functioning cerebral visual impairment and academic skills in children with cerebral palsy

S MICHELETTI[1], V SCAGLIONI[2], M GNESI[3], V AVIGO[1], J GALLI[4], L PANSERA[4], E FAZZI[1]
[1]ASST Spedali Civili, Brescia, Italy; [2]ASST Spedali Civili of Brescia, Brescia, Italy; [3]University of Pavia, Italy, Pavia, Italy; [4]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 method: 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 2y and 11mo; 22 with hemiplegia, 8 with diplegia), according to the following criteria: 8–16 years, pre-perinatal brain injury documented by MRI, verbal/performance IQ levels >85 standard scores, normal-near normal visual acuity. The assessment comprised neurocognitive (executive functions, visuocognitive abilities, academic skills according to the protocol routinely used in Italy), neuromotor and neurovisual evaluation.
Results: Learning disorders were present in 54.8% of the sample with the following distribution: reading disorders in 36.7%, arithmetic disorders in 38.7% and writing disorders in 32.3%. Linear regression results showed that, among all the neurovisual, neurocognitive and neuromotor variables considered, only working memory skills are related to reading and arithmetic skills.
Conclusions: Learning disorders are particularly frequent in children with CP, also in those who show a normal IQ and mild neuromotor and neurovisual disorders. Working memory skills seem to be the only variable which is strictly related to reading and arithmetic performances in our sample.

Poster presentation 89
Gesture imitation abilities in children with and without developmental coordination disorder: a pilot study

E BIEBER[1], BCM SMITS-ENGELSMAN[2], SG SGANDURRA[3], FH FEYS[1], G CIONI[3], AK GUZZETTA[3], K KLINGELS[4]
[1]KU Leuven, Leuven, Belgium; [2]University of Cape Town, Faculty of Health Sciences, Cape Town, South Africa; [3]IRCCS Fondazione Stella Maris, Pise, Italy; [4]Rehabilitation Research Center, BIOMED, Diepenbeek, Belgium

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 method: Seven children with DCD (mean age=7y 11mo, SD=1y 6mo) 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). Inter-rater and intra-rater reliability will be analyzed.
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 ($p>0.10$).

Conclusions: 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.

Poster presentation 90
The key to empowering families

CD FORBES, J CARROLL
Bobath Children's Therapy Centre Wales, Cardiff, UK

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?
Patients and method: 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 exchange practice and adjustment of activities (coaching) which were personalised (enabling 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%.
Conclusions: 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.

Poster presentation 91
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, PA, USA

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 surveillance system to track prevalence of CP and co-morbidities. Hence, we sought to establish the prevalence of obesity in the US among children with CP using nationally representative data from the NSCH.
Patients and methods: Data was obtained from the 2011–2012 NSCH. The NSCH provides data on the healthcare of children ages 0–17. Data included a total of 95677 (unweighted) child-level interviews. The analytic sample included 312 children with CP, with sampling weights applied. Logistic regression assessed the prevalence of overweight/obesity in children with CP by calculating adjusted odds ratios (AOR) with 95% CI.
Results: 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.

Poster presentation 92
Family-centered early intervention in children with cerebral palsy

H HÜCHE LARSEN, S EJLERSEN, P DE LIPTHAY BEHREND, JJ SKAFTE JENSEN
Elsass Institute, Charlottenlund, Denmark

Introduction: 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.
Patients and method: 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 sessions 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.

Poster presentation 93
Music reduces pain perception in healthy newborns: a comparison between different music tracks and heartbeat

A ROSSI[1], G CHIRICO[2], A MOLINARO[3], S MICHELETTI[2], E SAVI[2], E FAZZI[4]
[1]*ASST Spedali Civili, Brescia, Italy;* [2]*ASST Spedali Civili, Brescia, Italy;* [3]*University of Brescia, Brescia, Italy;* [4]*ASST Spedali Civili and 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 method: 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 ($p<0.001$). 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.

Poster presentation 94
Benefits of intensive therapy for children with quadriplegic cerebral palsy

DA WALLACE, MR TRUCKS, S DELUCA
Virginia Tech Carilion Research Institute, Roanoke, USA

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 quadriparesis.
Patients and Method: An intensive-therapy protocol was used on 6 children with quadriparesis. All were assigned to receive a 6-hours intensive protocol for 5 days a week for 4 weeks, although in one case the dosage was lowered to 4 hours a day. The average age of these children was 76.2 months (SD 61.0mo) 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 (SD 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 quadriparesis could benefit from intensive therapies, and fMRI findings from one child is suggestive that better inter-hemispheric communication might be a response to intensive therapy.

Poster presentation 95
Concordance in perceptions of social support between mothers and fathers caring for children with physical disabilities

S PIRILÄ[1], J VAN DER MEERE[2]
[1]*Tampere University Hospital, Tampere, Finland;* [2]*University of Groningen, Groningen, The Netherlands*

Introduction: Much of what is known about perceived stress and needs in families raising children with physical disabilities is based on self-reports of the mothers. The present study investigated whether both informants differ in their perceptions of available social support which is seen as a buffer against parenting stress while raising a child with physical disabilities.
Patients and method: Thirty-eight intact families completed a self-report scale measuring satisfaction with respect to financial, practical, informational, and emotional support.
Results: Mothers' needs were broader and encompassed emotional, every day assistance, and informational support. Fathers felt the need for emotional and every day assistance support to a lesser degree; their strongest needs were for information. Half of the families had elevated levels of needs for support. Moderator factors were the severity of the physical disability and intelligence level of the child in addition to the social-economic background of the family.
Conclusion: Mothers and fathers needs for support were not similar. Findings suggest that families, especially mothers caring for children with multiple disabilities are most vulnerable. Consequently, there are arguments for obtaining information from both parents whenever possible to appreciate some of the complex family dynamics and to direct appropriate interventions.

Poster presentation 96
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 method: This retrospective study is based on the data of 21 children with USCP (16 girls; mean age 9.16, SD 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 ($p \leq 0.012$), 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 15.52°, SD 15.81; $p<0.001$) and with fingers kept flexed (13.71°, SD 17.25; $p=0.002$) were observed. The aROM increased in wrist extension with fingers kept extended (22.43°SD24.27; $p<0.001$), flexed (9.33°SD12.16; $p=0.002$) and in forearm pronation (17.40°SD21.28; $p=0.029$). The AoC increased only in wrist extension with fingers kept extended (9.20°SD6.56; $p=0.002$).
Conclusions: HABIT-ILE improved functional abilities and increased ROM of the more-affected wrist in children with USCP. This increase in aROM and pROM might alleviate spasticity as suggested by the AoC increase.

Poster presentation 97
Constraint-induced movement therapy: effects of multiple treatment episodes

MR TRUCKS, DA WALLACE, S DELUCA
Virginia Tech Carilion Research Inst, Roanoke, VA, USA

Introduction: Constraint-induced movement therapy (CIMT) is recognized as one of the most efficacious treatments for children with Cerebral Palsy (CP; Novak et al DMCN 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 h/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.

Poster presentation 98
Using a machine learning approach to predict the outcome of different intervention programs for children with unilateral cerebral palsy towards tailored intervention

HG VAN DEN BOORN[1], CM BAAS[1], PBM AARTS[2], B STEENBERGEN[1], MLA JONGSMA[1]
[1]Behavioural Science Institute, Nijmegen, The Netherlands; [2]Sint Maartenskliniek, Nijmegen, The Netherlands

Introduction: Unilateral cerebral palsy (CP) 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 method: We obtained EEG recordings in a group of 65 children with unilateral CP (3–18y) 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 showed promising results in predicting the outcome of intervention in individual children. In the future this method might be used as a screening tool in order to select the optimal intervention approach for each individual child with unilateral CP.

Poster presentation 99
Neurological recovery after childhood stroke

T APRASIDZE, N TATISHVILI, T SHATIRISHVILI
M Iashvili Children's Central Hospital, Tbilisi, Georgia

Introduction: To study sensorimotor outcome of childhood stroke.
Patients and method: 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, haemorrhagic stroke in 28, and cerebral sinovenous thrombosis (CSVT) in 7 patients. Focal signs occurred in all cases of AIS, in 11 of haemorrhagic stroke, and 6 of CSVT. Seizures were presenting symptom in 30 patients. Risk factors were identified in 42 patients. Outcomes**:** Death occurred in 10 patients: 1 arteriovenous malformation, 5 leukaemia, 1-trombocytopenic purpura, 1 Factor VIII deficiency. Neurologic deficit at discharge (hemiparesis), was found in 39 patients, 32 with AIS and 7 with haemorrhagic 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, moyamoya syndrome. Other risk-factors were identified as follows: cerebral aneurysm, dissection, encephalitis, vasculitis post-varicela zoster virus, haemolytic anaemia, hypochromic microcytic anaemia, thrombocytopenic purpura, hypocoagulation (vitamin K), Sturge-Weber syndrome.
Conclusion: The reported outcome after childhood stroke is variable with long-term neurological deficits or disability in more than half of childhood stroke survivors. Aetiology was one of the determinants for the mortality, recurrence and neurological recovery after stroke.

Poster presentation 100
Reliability and feasibility of the Portuguese version of Eating and Drinking Ability Classification System (EDACS-PT) in children with cerebral palsy

AF SANTOS[1], J ALVARELHÃO[2], E SALAZAR[1]
[1]Associação do Porto de Paralisia Cerebral, Porto, Portugal; [2]Universidade de Aveiro, Aveiro, Portugal

Introduction: Eating and drinking are activities that children with cerebral palsy (CP) often present limitations in performance, due oromotor 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 method: 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 SLTs and between SLT and parents was calculated, and 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 (95% CI: 0.92–0.98) and between SLT1 and parents was 0.84 (95% CI: 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.

Poster presentation 101
Effect of a low-cost multi-disciplinary team-led experiential workshop for midwives on dysphagia in children with cerebral palsy

S HETTIARACHCHI[1], G KITNASAMY[2], D GOPI[2], R POOBALAN[2], R MAHENDRAN[2], P KUMARA[2], Y YOGARAJ[2], F SHAMRA[2], B BANDARA[2], P GOWRITHARAN[3]
[1]University of Kelaniya, Ragama, Sri Lanka; [2]Cerebral Palsy Lanka Fundation, Colombo, Sri Lanka; [3]Freelance 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 method: 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.

Conclusions: 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'.

Poster presentation 102
Optimal muscle fascicle length for producing force may explain gait strategies in adults with cerebral palsy

R FRISK[1], J LORENTZEN[2], LA BARBER[3], JB NIELSEN[1]
[1]University of Copenhagen, Copenhagen, Denmark; [2]Elsass Fonden, Charlottenlund, Denmark; [3]The University of Queensland, South Brisbane, Qld, Australia

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 method: 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.
Conclusions: 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.

Poster presentation 103
Spastic paraparesis: the relevance of the cerebral peduncles

S FIORI, R PASQUARIELLO, D SCELFO, G ASTREA, FM SANTORELLI, G CIONI, R CANAPICCHI, R BATTINI
IRCCS Stella Maris, 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, hypoplasia of cerebral peduncles was noted; so diffusion MRI was acquired and tractography with constrained spherical deconvolution performed. Four healthy age-matched controls diffusion images were also analysed. Short-tracks colour-encoded track-density image were generated. Corticospinal tracts were reconstructed based on a multi-region of interest approach.
Results: Corticospinal tract reconstruction revealed hypoplasia of cerebral peduncle in the propositus, compared to reconstructions obtained in the controls on multiple planes (axial, sagittal). Typical appearance of corticospinal tracts in the pons was missing in the propositus.
Conclusion: Structural MRI should be carefully searched for subtle malformations in spastic paraparesis. Advanced neuroimaging techniques such as diffusion tractography can contribute to diagnosis. A corticospinal neuron axon guidance defect can be here hypothesized and genetically explored.

Poster presentation 104
A pilot study to evaluate the usefulness of a screening questionnaire in assessing feeding problems and undernutrition in children with cerebral palsy

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 method: 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 level 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.
Conclusions: 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.

Poster presentation 105
Caregivers' perspective on health-related quality of life in children with cerebral palsy undergoing conventional versus intensive rehabilitation

JS 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).
Patients and method: 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 (63%) 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.

Poster presentation 106
Effect of derotational straps on alignment, balance and gait in children with cerebral palsy following single event multilevel surgery

D SHARAN, JS 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 method: 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.

Poster presentation 107
Effectiveness of pre-programmed touch screen smart tablet gaming for the improvement of fine motor skills among children with cerebral palsy

D SHARAN, JS 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 touchscreen hand held device can provide a playful, motivating tool for training the impaired upper extremity in children with cerebral palsy (CWCP).
Patients and method: 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 and 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 could be included in the hand function rehabilitation programme in children with cerebral palsy to improve fine motor activities.

Poster presentation 108
Can selective motor control in children with spasticity predict improvement in gross motor function after selective dorsal rhizotomy?

LR GROOTVELD, PEM VAN SCHIE, EAM BOLSTER, AI BUIZER
VU University Medical Centre, 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 method: 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) and (2) mean SMC per joint (Spearman's r=−0.18, p=0.85).

Conclusions: Children selected for SDR in general had good SMC, but there was variation in SMC among individuals. Within the group 40% improved by 10 points or more on GMFM-66. We found no evidence of SMC being a predictor for outcome in GMFM-66 after SDR.

Poster presentation 109
Investigation of field conditions of early childhood intervention with infants with congenital visual impairment: OPTIMUM cohort

J DALE[1], E SAKKALOU[1], M O'REILLY[1], S GLEW[1], A SALT[2]
[1]*UCL Great Ormond Street Institute of Child Health, London, UK;* [2]*Great Ormond Street Hospital NHS Foundation Trust, London, UK*

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 method: 81 of 90 infants (mean age 13mo) 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 1–6 weeks. Children with PVI received a significantly higher number of home visits than those with SVI (median 11 and 5 respectively, p<0.001). Frequency of home visits decreased significantly from the first to second six months (p<0.001) 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.

Poster presentation 110
Evaluation of Duchenne muscular dystrophy children with no treatment history

F WALHAIN[1], M DECLERCK[1], K BASTENIE[1], M FLEURKENS[2]
[1]*Anton de Kom University of Suriname, Paramaribo, Surinam;* [2]*Academic Hospital Paramaribo, Paramaribo, Surinam*

Introduction: In well-developing countries, therapeutic interventions 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.

Patients and method: 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.
Results: 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.
Conclusions: The evaluation of physical status and disease progression of DMD children with no treatment history 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 resource poor settings.

Poster presentation 111
Sensorized objects for assessing manipulation capabilities in children with hemiplegia

F CECCHI[1], I MANNARI[1], FP FALOTICO[1], E BEANI[2], G CIONI[2], C LASCHI[1], P DARIO[1], G SGANDURRA[2]
[1]*Scuola Superiore Sant'Anna, Pontedera (PI), Italy;* [2]*IRCCS Fondazione Stella Maris, 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 [SD 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.

Poster presentation 112
Effects of neuropsychological group intervention on children's executive functions

K NIVALA[1], E VIERIKKO[1], K RANTANEN[2]
[1]*University of Tampere, Tampere, Finland;* [2]*Tampere 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 behavioural aspects of executive functions compared to children in mainstream schools.
Patients and method: Thirty-four 7- to 13-year-old children (mean age 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 include subscales for behavioural 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 behavioural regulation (i.e. inhibition and emotional control, p<0.05), and metacognition (i.e. working memory, p<0.01, planning and monitoring, p<0.05) compared to controls. Especially, younger children (6–8y) benefited more of the intervention than older children (9–13y). Teachers reported more persistent EF problems, and despite positive trend, no significant changes after the EXAT were found.
Conclusions: The results documented effects of EXAT 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.

Poster presentation 113
Degeneration of the corticospinal tract and bimanual performance in children with unilateral cerebral palsy

SW MEIJER[1], CM VAN RIJN[1], PBM AARTS[2], D GREEN[3], B HOARE[4], B STEENBERGEN[1], MLA JONGSMA[1]
[1]*Radboud University, Nijmegen, The Netherlands;* [2]*Sint Maartens Kliniek, Nijmegen, The Netherlands;* [3]*Oxford Brookes University, Oxford, UK;* [4]*Monash Children's Hospital, Melbourne, Australia*

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 (CP). This study

examined the relationship between degeneration of the CST and simple and complex motor behaviour in children with unilateral CP.
Patients and method: Forty-nine children (aged 5–23y) with unilateral CP 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=0.52). No relationship between peduncle asymmetry and bimanual performance (AHA and CHEQ combined) was observed. Unimanual capacity was correlated with bimanual performance (r=0.72).
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 unilateral CP. 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.

Poster presentation 114
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 affect development and occupational participation.
Patients and method: 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 ($p \leq 0.05$).
Conclusions: Certain sensory processing patterns may help to predict children's development of habituation, volition, communication and interaction skills and motor skills which may affect 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.

Poster presentation 115
Normative values for the morphology and structure of the medial gastrocnemius in children

F CENNI[1], SH SCHLESS[1], L BAR-ON[1], BM KALKMAN[2], G MOLENAERS[3], K DESLOOVERE[1]
[1]KU Leuven, Leuven, Belgium; [2]Alder Hey Children's NHS Foundation Trust, Liverpool, UK; [3]University Hospital Leuven, Leuven, Belgium

Introduction: 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 years.
Patients and method: Sixty-five TDC (10.0 [SD 3.2]; 41 boys) were recruited. Children lay prone with 20° knee flexion and the ankle in a resting position. 3DfUS was used to recreate the MG in 3D and a custom-made Python package was used for data processing. The Pearson's correlation coefficients (R^2) 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 (R^2>0.70) 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 7.5 mm/year, respectively. Significant high correlations (R^2>0.78) were also found between volume and length.
Conclusions: This investigation provides normative values for three parameters of the MG acquired using 3DfUS. 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.

Poster presentation 116
Testing first the dominant hand in the Jebsen–Taylor Test of Hand Function (JTTHF): proposition of a modified protocol and normative values

J PARADIS[1], J ANDRIS[1], C LUYCKX[1], C ARNOULD[2], Y BLEYENHEUFT[1]
[1]Université Catholique de Louvain, Bruxelles, Belgium; [2]Haute 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.
Patients and method: 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.

Poster presentation 117
Early social responsiveness and shared attention skills of children with cerebral palsy

K PRICE, MT CLARKE, J SWETTENHAM
University College London, London, UK

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. However, there are few guidelines for assessment of these skills in this group of children. 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 method: 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. A measure of social responsiveness/shared attention accessible by all three groups was derived from established assessments.
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.

Poster presentation 118
Effect of a 5-day hybrid Constraint-Induced Movement Therapy program on activity and participation in 5- to 12-year-old children with unilateral cerebral palsy

B SNIJDERS, E SCHREURS
Revant 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 method: During the period 2013 to 2015, children with unilateral CP attended hybrid CIMT intervention during a day-camp (circus Revanti) 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 11.10y) 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 5-day hybrid CIMT program can increase performance in activity and participation.

Poster presentation 119
Assessing and reporting body composition and fitness to families of children with mobility impairments: a mixed methods study

D O'BRIEN[1], H KUBIS[2], L SPENCER[2], N BRAY[2], M JACKSON[3], R WHITAKER[4], J NOYES[2]
[1]LJMU, Liverpool, UK; [2]Bangor University, Bangor, UK; [3]Liverpool Hope University, Liverpool, UK; [4]Whitres, Bangor, UK

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 method: 22 children who use wheelchairs (age: 6–18y, 10 males, 14 CP). 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.

Poster presentation 120
Comorbidities and access to health care in a Canadian cohort of individuals with Down syndrome

OS IPSIROGLU[1], N BEYZAEI[1], D MCKENNA[2], P HANBURY[2], M CHAN[1], E TSE[3], M BERGER[1], S STOCKLER[1]
[1]University of British Columbia, Vancouver, BC, Canada; [2]Down Syndrome Research Foundation, Burnaby, BC, Canada; [3]University of Toronto, Toronto, ON, 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 and method: An anonymous online REDCap survey for parents/caregivers of individuals with DS was conducted in 2015. The survey comprised 80 questions in 5 parts: (1) demographics, (2) diagnoses, medications and supplements, (3) development, (4) sleep/wake-behaviours, and (5) 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%).
Conclusions: 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 multi-professional teams.

Poster presentation 121
Experiences of women with cerebral palsy accessing women's healthcare services

R BYRNE[1], D GAEBLER[2], E FOWLER[3], S GRAY[4], T PICKAR[5], DP ROYE[5]
[1]Cerebral Palsy Foundation, New York, NY, USA; [2]Rehabilitation Institute of Chicago, Chicago, IL, USA; [3]Center for Cerebral Palsy at UCLA, Los Angeles, CA, USA; [4]Boston Children's Hospital, Boston, MA, USA; [5]Columbia University Medical Center, New York, NY, USA

Introduction: To describe and define the experiences of women with cerebral palsy (CP) in women's health care.
Patients and method: 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 disempowered 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.