Università degli Studi di Padova

ECIDD
European Conference on Psychological Theory and Research
On Intellectual and Developmental Disabilities

DPSS
Dipartimento di
Psicologia dello Sviluppo
e della Socializzazione

12th European Conference on psychological theory and research on Intellectual and Developmental Disabilities

Silvia Lanfranchi (Ed)

Abstracts

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PADOVA CONVENTION & VISITORS BUREAU

Welcome to Padova!

We are very pleased to welcome you to the 12th European Conference on psychological theory and research on Intellectual and Developmental Disabilities, ECIDD-2018, taking place at the Department of Developmental Psychology and Socialization, University of Padova (Italy) from Thursday, June 28, until Saturday, June 30, 2018.

ECIDD was first established in 1996 in Aix-en-Provence (France) under the name PTRMR (Psychological Theory and Research on Mental Retardation). The main themes of this conference, that is held every 2 years, are psychological aspects of intellectual and related developmental disabilities. This conference offers a forum for the exchange of findings in basic and applied research on intellectual and developmental disabilities and aims to promote collaboration among researchers in this field.

The meeting will include individual paper sessions, two symposia and a poster session. Each day, the conference will begin with a keynote address. On Thursday, Herbert Roeyers, from the University of Ghent (Belgium), will address the issue of the early detection of autism spectrum disorder. On Friday Deborah Fidler, from the University of Colorado (USA), will talk about executive functions and goal-directed behavior in children with Down syndrome. On Saturday, Emily Farran, from the University College of London (UK), will talk about navigation and spatial domain in neurodevelopmental disorders.

We hope this conference will be an intellectually exciting and enriching experience, as well as a pleasant social event.

Silvia Lanfranchi

DPSS – Department of Developmental Psychology and Socialization,

University of Padova

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Scientific Programme

Thursday, June 28

8:15-8:45	**Registration**
8:45-9:15	**Welcome & Introduction**
9:15-10:15	**Keynote 1** Herbert Roeyers (University of Ghent) Early detection of autism spectrum disorder: approaches, pitfalls and benefits
10:15-11:05	**Session 1 - Autism** (Chair C. Cornoldi) Visuospatial abilities and processing styles in autism spectrum disorders with and without a perceptual reasoning peak *R. Cardillo, S. Lanfranchi, I. Mammarella* The effects of a swimming program on social skills, autistic behaviors and aquatic skills in ASD children *M. Zanobini, F. Ottonelli, S. Solari*
11:05-11:30	**Coffee Break**
11:30-12:45	**Session 2 - Developmental and cognitive profiles in individuals with intellectual disabilities** (Chair C. Mähler) Developmental course in Down syndrome – the Heidelberg study *K. Sarimski* Avoiding the floor effect in the WISC-IV (Wechsler Intelligence Scale for Children-4th Edition) using Z scores and equivalent age: average profile and factor analysis on individuals with intellectual disability *E. Toffalini, C. Cornoldi* Borderline intellectual functioning: analysis of subtypes *F. Pulina, S. Lanfranchi, R. Vianello*
12:45 –14:30	**Lunch Time**
14:30-16:30	**Symposium - Working memory and executive functions in individuals with intellectual disabilities**(Proponent and Chair M. C. Passolunghi) Meta-Analysis of Working Memory in Individuals with Intellectual Disability *H. Danielsson, L.Palmqvist, L. Henry* Spatial-sequential and spatial-simultaneous working memory in Williams syndrome *B. Carretti, S. Lanfranchi, L. De Mori, I. Mammarella, R. Vianello*

	Investigating Working Memory in Students with Mild Intellectual Disabilities and Borderline Intellectual Functioning using Developmental Trajectories *G. Bruns, B. Ehl, M. Grosche* Response inhibition and interference suppression in individuals with Down Syndrome *M. C. Usai, L. Traverso, M. Fontana, M. C. Passolunghi* Inhibitory control in children with intellectual disabilities with and without autism spectrum disorders *Y. Ikeda, H. Okuzumi, M. Kokubun*
16:30-17:00	**Coffee Break**
17:00-17:50	**Session 3 - Executive functions and Motor coordination** (Chair H. Danielsson) Executive functions and pre-literacy in kindergarten children at risk for Developmental Coordination Disorder *M. Alesi, D. Pecoraro, A. Pepi* The relationship between executive function and language in children with motor difficulties and Developmental Coordination Disorder *M. Bernardi, H. C. Leonard, E. L. Hill, N. Botting, L. Henry*
18:00	**Welcome reception**

Friday, June 29

8.45-9.45	**Keynote 2** Deborah Fidler (University of Colorado) Executive function and goal-directed behavior in children with Down syndrome
9.45-10.35	**Session 4 - Profound Intellectual and Multiple Disabilities (PIMD)** (Chair B. Carretti) Assessment of voice discrimination in children with Profound Intellectual and Multiple Disabilities (PIMD) *G. Petitpierre, J. Dind, C. Gremion* Identification of the expressions of self-awareness in children with profound intellectual and multiple disabilities (PIMD): creation of an observation tool based on developmental psychology research *J. Dind*
10.35-11.00	**Coffee Break**

11.00-12.40	**Session 5 - Executive functions in learning and intellectual disabilities** (Chair M. Hessels) The development of executive functioning in preschoolers with developmental disorders: ADHS Symptoms, Specific Language Impairment and Intellectual Disabilities *C. Mähler, K. Schuchardt* Meta-analysis of Executive Functions in Intellectual Disability *M. Spaniol, H. Danielsson* Variables associated with Planning Ability in Children with and without Intellectual Disability *L. Palmqvist, H. Danielsson, A. Jönsson, J. Rönnberg* Behavioural Patterns in a Computerized Training Program for Individuals with Intellectual Disabilities *A. Jönsson, L. Palmqvist, H. Danielsson*
12.40-14.00	**Lunch Time**
14.00-15.40	**Session 6 - Math in learning and intellectual disabilities** (Chair G. Büttner) Math Intervention Using Tablets for Children with Intellectual Disabilities *D. Schöld, U. Träff, R. Östergren, A.Levén* The number race: an adaptive videogame to improve basic numeracy in children with Down Syndrome *S. Lanfranchi, F. Sella, M. Zorzi* Mathematical ability in subtypes of readers *Å Elwér, U. Träff, S. Samuelsson* Counting and subitizing abilities in Williams syndrome and Down syndrome: Evidence from eye tracking *E. Ranzato, J. Van Herwegen*
15.40-16:40	**Coffee break and poster session**
16:40-17.30	**Session 7 - Language in learning and intellectual disabilities** (Chair C. Meneghetti) Developmental dyslexia: How taxonomic and thematic long-term memory organization affect recall *C. Belacchi, C. Artuso, F. Bellelli* Bilingualism in individuals with developmental disabilities, hindrance or benefit? A case-study of a simultaneous English-Spanish bilingual with Prader-Willi Syndrome. *E. García-Alcaraz, J. M. Liceras*
18:15	**Guided tour to Palazzo Bo**

Saturday, June 30

8.45-9.45	**Keynote 3** Emily Farran (University College London): Navigation and the spatial domain in neurodevelopmental disorders
9.45-10.55	**Session 8 - Learning and intellectual disabilities** (Chair I. Mammarella) Environment learning from virtual exploration in individuals with Down syndrome: perspective, sketch maps, and individual differences *C. Meneghetti, E. Toffalini, B. Carretti, S. Lanfranchi* Text comprehension in individuals with Down syndrome: Effectiveness of a short intervention on inferential skills for individuals with Down syndrome *M. Roch, L. Mattera* Meta-analysis of Cognitive and Linguistic Variables Associated with Reading Ability in Individuals with Intellectual Disabilities *K. Nilsson, Å. Elwér, D. Messer, H. Danielsson*
10.55-11.20	**Coffee Break**
11.20-12.50	**Symposium - Social cognition and inhibition: How to support emotion regulation and social adjustment in children?** (Proponent and chair N. Nader-Grosbois) How better understand social competences and maladjustment in children with developmental disorders? From a heuristic model to research studies *N. Nader-Grosbois* Inhibition and social cognition in preschoolers with externalizing behavior *N. Houssa, A. Volckaert, N. Nader-Grosbois, M. P. Noël* Theory of Mind and Social information processing Intervention in children with in intellectual disabilities *E. Jacobs, N. Nader-Grosbois* Emotion-related socialization behaviours in ASD children *S. Mazzone, N. Nader-Grosbois*
12.50	**Concluding remarks**

Keynote1

Early detection of autism spectrum disorder: approaches, pitfalls and benefits

Herbert Roeyers

(University of Ghent)

Autism spectrum disorder (ASD) is a serious lifelong neurodevelopmental disorder that impairs a person's ability to communicate and interact with others. It also includes restricted and repetitive interests, activities and behaviours. ASD symptoms frequently present in the first two years of life, but often children are not diagnosed until four years or later. Over the past two decades there has been a growing interest in early detection of ASD, not only from the scientific world but also from professional associations and public health systems all across Europe. Early detection may result in a faster access to a wider range of resources and services, such as early intervention programmes. We will give an overview of the different screening procedures and discuss their advantages and disadvantages. It becomes increasingly clear that a multi-stage approach in early detection is most promising because it takes into account the inherent problem pertaining to age and pattern of symptom onset and intensity, as they may vary from case to case.

Prospective longitudinal studies with infants at high risk of developing ASD may be very informative to further improve the quality of early detection programmes. In the second part of the presentation we will describe recent progress in 'high-risk infants' research in ASD, with special reference to the Ghent baby study, which includes a cohort of siblings (younger brothers and sisters of children with an ASD diagnosis) and a cohort of preterm-born infants. Findings that will be highlighted include the prevalence of ASD in preterm-born children, variations in early trajectories of ASD and the association between contextual factors and later development. Implications for early detection and diagnosis as well as for early intervention will be formulated.

Session 1

Autism

Visuospatial abilities and processing styles in autism spectrum disorders with and without a perceptual reasoning peak

Ramona Cardillo, Silvia Lanfranchi, Irene C. Mammarella

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Studies in literature suggested that individuals with Autism Spectrum Disorders (ASD) have a diminished sensitivity to perceptual cohesiveness (PC) and a locally oriented processing of visuospatial material. However, despite thirty years of research on this topic conflicting results often emerged.

The present study aimed to investigate different sub-domains of visuospatial abilities and their interplay with the global-local processing in participants with ASD without intellectual disability (ID). For this purpose processing speed, visuo-perceptual, visuo-constructive and visuospatial working memory (VSWM) tasks have been proposed with different levels of PC (derived by Caron, et al. 2006). Two groups (N=39) of participants with ASD were tested and compared with typically development (TD) participants (N=38) matched for age, gender and perceptual reasoning index (PRI). Specifically, the groups were divided in i) ASD-NP and TD-NP with average scores in the perceptual reasoning index (PRI 85-111); ii) ASD-P and TD-P with a peak in that ability (PRI 115-141).

Analysis were conducted using R and were performed using generalized linear mixed effect models.

Results showed that participants with ASD-NP performed poorly in all domains, revealing weaker spatial integration abilities in the visuo-perceptual domain and a diminished sensitivity to perceptual coherence in VSWM tasks, the ASD-P group used both global and local processing effectively for the task in hand, and a local bias only emerged in the visuo-constructive task.

These results suggested that the use of a local or global processing style by individuals with ASD can vary, depending on different factors, which may affect their performance, such as the cognitive visuospatial functioning and the different domains examined by a task. In addition, the presence of a high cognitive potential seems to support the ASD-P group, allowing it to overcome the tendency for local processing.

The effects of a swimming program on social skills and autistic behaviours in ASD children

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Aim of this study was to determine the effectiveness of a 6 months water exercise swimming program (Acqua Mediatrice di Comunicazione) on the aquatic skills and social behaviors of children with autism. The research involved 33 children diagnosed with autism spectrum disorders, aged 3-8 years. During the study, 3 children withdrew for personal reasons. From January to May 2017, 13 children (experimental group, 10 males) received the swimming program, while 17 children (control group, 13 males) participated to different psychoeducational laboratories. Both groups continued their regular treatment of speech therapy and psychomotricity throughout the study. The aquatic skills were rated with the HAAR checklist: the experimenter attributed the scores during the test. The autistic behaviors were rated with the Autism Behavior Checklist (ABC), based on teachers and parents reports and the social skills were assessed with the Social Responsiveness Scale (SRS), filled by parents. The results showed an improvement in all the subscales of the ABC - excluding that of language, independently of the activities in which children were involved. Furthermore, a significant Time by Group interaction for the Relating subscale of the ABC emerged, indicating that the experimental group improved significantly more than the control group. No significant Time by Group interactions were found in the subscales of SRS. Nevertheless, paired t-test within each group shown a significant improvement limited to the experimental group in the total severity score and in two subscales, i.e. social communication and autistic mannerisms. Regarding the aquatic abilities, all the children of the experimental group improved significantly their performance in all the activity phases. Although this research underlines how the aquatic training provides significant improvements in important areas of autism spectrum disorder, further investigation are needed to corroborate these findings. In this vein, a follow up study on the experimental group is in progress.

Session 2

Developmental and cognitive profiles in individuals with intellectual disabilities

Developmental course in Down syndrome – the Heidelberg study

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Purpose: Longitudinal data from the "Early Intervention Collaborative Study" (Hauser-Cram et al.) and research from Fidler et al. as well as the results of several cross-sectional studies point to associations between the developmental of adaptive competence, behavioral abnormalities and family stress in children with developmental disabilities. The purpose of our study was to analyze patterns in the developmental course of children with Down syndrome in the first five years of life in order to replicate some of these results in a German sample and to explore relationships between developmental progress and parental resources. **Hypotheses**: 1) The domains of adaptive competence differentiate early in childhood. 2) Early communicative competencies predict later language development. 3) Behavioral abnormalities are associated with early indicators of executive functioning deficits. 4) Parental resources (and stress) contribute to the explanation of individual differences in adaptive and behavioral development. **Methods**: 76 parents (convenient sample) completed the Vineland Adaptive Behavior Scales-II (VABS-II), a German version of the MacArthur communicative Developmental Inventory (CDI) and a German version of the Impact on Family Scale (FaBel) each year and, in addition, the Strengths and Difficulties questionnaire (SDQ-German) and the Behavior Rating Inventory of Executive Functioning (BRIEF-P) when the children had reached the age of five years. Statistical analyses included an ANOVA with repeated measures, correlation and regression analyses. **Findings**: A profile of specific weaknesses in the motor und productive language domain is already recognizable when the children are two years of age. Early nonverbal and verbal competencies in the first two years of life only predict lexicon when the children are three years of age, but do not predict the language development in the preschool age. Results from the SDQ and BRIEF-P are strongly correlated. Correlation analysis points to the role of early parenting stress and coping resources for explaining differences in development, but we did not find a direct relationship between early family stress and later adaptive competence or behavioral problems. **Conclusions**: The interrelationship of individual and social variables contributing to the development of children with Down syndrome is complex so that it remains difficult to predict developmental course.

Avoiding the floor effect in the WISC-IV (Wechsler Intelligence Scale for Children-4th Edition) using Z scores and equivalent age: average profile and factor analysis on individuals with intellectual disability

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The Wechsler Intelligence Scale for Children – 4th edition (WISC-IV) is currently the most used battery for assessing intelligence in children. Individuals with moderate or severe intellectual disability, however, are likely to show a "floor effect", with a flat profile on scaled scores, despite some variability in the raw scores. In fact, the WISC-IV limits scaled scores on single subtests to 3 SDs below average, and the total IQ to 4 SDs below average. One proposed method to go beyond floored profile is to calculate Z scores (e.g. Orsini, Pezzuti, & Hulbert, 2015) using the mean and SD of raw scores of children in a given age range. This method, however, poses some problems, that may be overcome by the use of equivalent age of a child having intellectual disability. The present study considered the pros and the cons of the different methods, also on the basis of the profiles emerging from single case examples. Furthermore, we examined the profiles of a sample of 240 cases of individuals with intellectual disability, and we conducted a factor analysis on the traditional scaled vs. recalculated scores. Both methods eliminate the floor effect and – unlike the traditional scaled scores – they suggest that the factorial structure of the WISC-IV in individuals with intellectual disability is very similar to that previously reported in the normative sample of typically developing children, although with differences in some of the loadings. Importantly, the intellectual profiles obtained with the two methods when examining individual cases are partly different, and thus they provide different information. The one based on age equivalence seems to offer a better differentiated profile,and has a more immediate interpretation. It is concluded that the assessment of intelligence using the WISC-IV on children with moderate or severe intellectual disability should be reconsidered.

Borderline intellectual functioning: analysis of subtypes

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Borderline Intellectual Functioning (BIF) is a pervasive condition that may affect an individual's overall functioning. Despite its high prevalence (i.e. the 13,6% of population according with the normal distribution of intelligence), BIF had just little attention.
Beyond the intellectual quotient between one and two standard deviations below average, little is known about intellectual functioning of individual with BIF and given its broad inter-individual variability, a clear profile is far from clear.
Some authors suggested as BIF may be characterized by different subgroups instead to be considered a homogeneous population (e.g. Vianello, Di Nuovo, & Lanfranchi, 2014), but no studies analyzed whether these groups are characterized by different cognitive profiles and specific characteristics.
The present contribution was designed to explore inter-individual variability to identify any subgroups among children with BIF revealing homogeneous patterns in their cognitive profiles. To this aim the WISC-IV profiles of 204 school-age children with BIF were analyzed by using different cluster analysis procedures.
The results suggested the presence of three different subgroups characterized by differences in their cognitive profiles.
One subgroup included children who obtained higher scores in Perceptual Reasoning, which was in the normal range, while subgroup's performance in Verbal Comprehension and Working Memory was in the borderline range, and Processing Speed was on the boundary between borderline and normal ranges.
The second subgroup included children with a peak in Processing Speed component, which was not impaired, while Verbal Comprehension, Perceptual Reasoning, and Working Memory abilities were in the borderline range, with the later showing the lowest scores.
Finally, the third subgroup was characterized by normal Verbal Comprehension and Perceptual Reasoning abilities, and borderline performance in terms of Working Memory and Processing Speed.
An exploratory analysis suggested that the clusters differed slightly in terms of the socio-economic status and the presence of comorbid disorders.

Symposium

Working memory and executive functions in individuals with intellectual disabilities

Proponent: Maria Chiara Passolunghi, Department of Life Sciences, University of Trieste

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This symposium is aimed to investigate strengths and weaknesses in working memory processes and executive functions in individuals with intellectual disability. The topic is addressed according to different theoretical perspectives, analysing the performance of groups of individuals with intellectual disabilities due to genetic causes (Down and Williams Syndrome) and groups of individuals with mild intellectual disabilities and borderline intellectual functioning of unknown ethology. The performances of these groups were compared to the performance of groups of individuals matched on mental age.

Danielsson, Palmqvist and Henry did a meta-analysis of working memory in individuals with intellectual disability. The main result was that people with intellectual disability have lower working memory abilities than mental age-matched controls and that the largest difference is for the 'phonological loop' component of the working memory system. Lanfranchi, Carretti, De Mori, Mammarella and Vianello investigated spatial working memory performance in individuals with Williams Syndrome, analysing whether their impaired WM performance regards both simultaneous and sequential spatial formats. Bruns, Ehl and Grosche, investigate the developmental trajectories of two processes connected to Baddeley's working memory framework: subvocal *rehearsal* and lexical *redintegration* in individualswith mild and borderline intellectual disabilities, that often show deficits in working memory processes. The other two studies are aimed to investigate inhibition processes in individuals with Down Syndrome (Usai, Traverso, Fontana, & Passolunghi) and in individuals with intellectual disability of unknown etiology (Ikeda, Okuzumi, &Kokubun). In particular, in the study with individuals with Down Syndrome different type of inhibitory tasks was used within a framework model of inhibition that considers two inhibitory components: *response inhibition* and *interference suppression.* Response inhibition represents the capacity to suppress prepotent but inappropriate response. On the other side, interference suppressions is the ability to filter out irrelevant information. The study of Ikeda, Okuzumi and Kokubun focused on inhibitory processes in individuals with intellectual disability of unknown etiology with and without autism spectrum disorder analyzing their performance in two Stroop-like tasks: the Real Animal Size Test and the Pictorial Animal Size Test.

Overall, these studies analyze the various components of working memory (e.g. visuo-spatial and phonological loop components) and compare several types of processes: simultaneous vs sequential processing; attentional control (active vs passive); subvocal rehearsal vs lexical redintegration; response inhibition vs interference suppression, showingstrengths and weakness in these individuals. The results of these studies can provide a good starting point, not only for expanding the theoretical framework, but also for stimulating working memory, executive processes and cognitive development in these individuals.

Meta-Analysis of Working Memory in Individuals with Intellectual Disability

Henrik Danielsson[1], Lisa Palmqvist[1], Lucy Henry[2]

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Working memory has been investigated in people with intellectual disability for several decades, however, the results are variable. To get an overall picture of the literature and to better understand potential reasons for the variation in results, a meta-analysis was conducted. A literature search on several terms related to working memory and intellectual disability found 1727 potential articles of interest. Inclusion criteria were that at least one control group of typically developing children was also tested, that IQ or mental age was reported, and that working memory performance included enough details so that effect sizes could be calculated. After abstract screening, reading full text articles, and coding of the articles, a mixed effects meta-analysis was conducted. Preliminary results show that people with intellectual disability have lower working memory abilities than mental age-matched controls and that the largest difference is for the 'phonological loop' component of the working memory system. The average difference between groups was slightly below one standard deviation. A similar pattern was found for comparisons between those with intellectual disability and chronological age-matched controls although the magnitude of the difference between groups was larger - slightly over one standard deviation. The variation between effect sizes was large, indicating that there are other moderators influencing the results. Relatively few studies were included in the meta-analysis, which limited the number of potential analyses of moderators, but more detailed results with analyses of potential moderators will be presented at the conference. Anyone with unpublished data in this area is encouraged to share it so that all relevant data can be included in the meta-analysis.

Spatial-sequential and spatial-simultaneous working memory in Williams syndrome

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Williams syndrome (WS) is a neurodevelopmental disorder associated with an impaired capacity for visuospatial representation. Individuals with WS have a specific weakness in spatial processing, while visual components are relatively well preserved. This dissociation is apparent in working memory function too.

In a first study we aimed to further investigate spatial working memory performance in individuals with WS, analyzing whether their impaired WM performance regards both simultaneous and sequential spatial formats. To this purpose we compared visuospatial working memory performance in 18 individuals with WS and 18 typically developing (TD) children matched for nonverbal mental age. Two aspects were considered: task presentation format (i.e., spatial-sequential or spatial-simultaneous), and level of attentional control (i.e., passive or active tasks). Our results showed that individuals with WS performed less well than TD children in passive spatial-simultaneous tasks, but not in passive spatial-sequential tasks.

The former's performance was also worse in both active tasks. These findings suggest an impairment in the spatial-simultaneous working memory of individuals with WS, together with a more generalized difficulty in tasks requiring information storage and concurrent processing, as seen in other etiologies of intellectual disability.

In a second study we aimed to explore whether the manipulation of the arrangementmight reduce the difficulties showed by individuals with WS. These issues were examined by administering simultaneous and sequential spatial tasks, in which the information to be recalled was presented in random or arranged configurations. Our results showed that individuals with WS performed less well than TD children in the spatial-simultaneous task, but not in the spatial-sequential one. The presence of a pattern enhanced the performance of both groups, but the difference between the two groups' performance in the spatial simultaneous task remained, albeit to a lesser degree.

Investigating Working Memory in Students with Mild Intellectual Disabilities and Borderline Intellectual Functioning using Developmental Trajectories.

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Background: Students with Mild and Borderline Intellectual Disabilities (MID: IQ 55 – 70; BIF: IQ 71 – 84) often reveal deficits in working memory (WM); a core issue is the reconstruction of fading memory traces through subvocal *rehearsal* or lexical *redintegration*. Recent studies focused on lacking automatic activation of rehearsal, but to our knowledge there are no studies on redintegration in MID/BIF. In our study we use a new and more informative approach of developmental trajectories (Thomas et al. 2009) offering more scenarios of identifying patterns of development than traditional group-matching approaches.

Question: Developmental trajectories are used to address the question whether students with MID/BIF show deficitary patterns of development (delay or qualitative difference) in the WM-processes of rehearsal and redintegration.

Method: n = 207 students (87 MID/BIF, 102 MA, 18 CA) completed WM-span tasks with short (1-syllable) and long (3-syllables) real and pseudowords. The difference between short and long words constitutes *rehearsal* while the difference between real and pseudo-words reflects *redintegration*. As variables for mental-age matching, a measure of cognitive capacity (CFT 1-R) and vocabulary (WWT German) were administered.

Results: Trajectories reveal a delay in onset but no slowed rate in *rehearsal* ($F(1, 203) = 5.385$; $p = .021$) and even no impairment at all in *redintegration* ($F < 1$). Results are confirmed by the standard Anova approach ($F(2, 204) = 12.65$; $p < .001$ for rehearsal and $F(2, 204) = 0.19$; $p = 82$ for redintegration).

Conclusions: This study adds to the evidence that MID/BIF show a delay concerning subvocal rehearsal in line with their general mental retardation. It is encouraging to find that redintegration does not seem to be impaired at all, offering a potential point of strength to foster working memory and cognitive development in these children.

Response inhibition and interference suppression in individuals with Down Syndrome

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The present study aims to investigate inhibition in individuals with Down Syndrome compared to typical developing children. Previous studies found contradictory results and are difficult to compare given the different type of inhibitory tasks used. In the present study a multicomponential framework of inhibition was used considering two inhibitory components: response inhibition that is the capacity to suppress prepotent but inappropriate responses, and interference suppression that is the ability to filter out irrelevant information.
Thirty-two individuals with Down Syndrome (DS) with a mean age of 14 years and 4 months and sixty-five typical developing (TD) children that constituted two separated TD groups, TD5 with a mean age of 5 years and 6 months and TD6 with a mean age of 6 years and 2 months respectively, participated to the study. A comprehensive battery of inhibitory tasks (Go/No-Go task, Preschool Matching Familiar Figure Task, Fish Flanker Task, and Dots task) and the Coloured Progressive Matrices (CPM) were administered.
Results show that performance of individuals with Down Syndrome do not differ from the both the TD groups in the CPM and were similar to that of youngest TD children considering both response inhibition and interference suppression. Differently, the oldest TD group outperformed the Down Syndrome group in both the inhibition components. Moreover, the oldest TD group outperformed the youngest TD group in interference suppression. Summarizing, in this study two inhibition components (response inhibition and interference suppression) were considered in individual with Down Syndrome and typical development. The findings suggest that individual with Down Syndrome show a developmental delay in both the inhibition components.

Inhibitory control in children with intellectual disabilities with and without autism spectrum disorders

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Inhibitory control plays an important role in various aspects of child development. The aim of this study was to compare inhibitory control of children with intellectual disabilities (ID) of unknown etiology, children with ID and autism spectrum disorders (ASD), and typically developing (TD) children. This study examined 41 children in three groups: 11 children with ID of unknown etiology, 9 children with ID and ASD, and 21 TD children who were matched for mental age. Two Stroop-like tasks were administered: the Real Animal Size Test and the Pictorial Animal Size Test. In these tests, participants are presented with pictures of animals (large animals such as an elephant, a giraffe, and a whale vs. small animals such as a frog, a bird, and a squirrel) printed as either big or small images that are mismatched with the animal's real size. Participants must decide the size of the animals (big vs. small) based either on the size in real life or the size of the picture, resisting interference of irrelevant sizes in real life or in a picture. Interference was greater in the Pictorial Animal Size Test for all groups. Interference was greater in children with ID of unknown etiology compared to TD children, whereas interference was comparable between children with ID and ASD and TD children. Results of this study suggest that inhibitory control is unimpaired in children with ID and ASD but impaired in children with ID of unknown etiology, relative to mental-age matched TD children.

Session 3

Executive functions and Motor coordination

Executive functions and pre-literacy in kindergarten children at risk for Developmental Coordination Disorder

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Developmental Coordination Disorder (DCD) is an umbrella term for a neurodevelopmental disorder generally characterized by motor deficiencies which significantly or persistently hamper daily living and school activities. Kindergarten children at risk for DCD have impairments is Executive Functioning (EF) as well as in pre-literacy skills. However little is known about EF in Kindergarten children at risk for Developmental Coordination Disorder (DCD), despite this age being one of the most critical and intensive period of motor and cognitive development.

Executive functions and pre-literacy abilities were compared among Kindergarten children at risk for Developmental Coordination Disorder (DCD) and Typically Developing (TD) children.

Participants were 36 Italian children, 18 at risk for DCD (9 boys and 9 girls) who had a mean age of 4.6 years and 18 with TD (9 boys and 9 girls) who had a mean age of 4.6. Children at risk for DCD were identified, using DSM-5 criteria (APA, 2013), based on their performance on standardized tests from the Movement Assessment Battery for Children-2 (Henderson, Sugden, & Barnett, 2007)

Executive functions were measured by tasks targeting working memory, fluency, inhibitory control. Pre-literacy abilities were measured by tasks of letters or shapes identification, objects naming.

Significant differences were found between DCD and TD children on cold EF tasks of visuospatial working memory abilities, fluency and inhibitory control and preliteracy outcomes.

The findings suggest that DCD may be associated with general impairments to cognitive processes that involve executive functioning. Thus, the effects of DCD appear to extend into other cognitive systems. The findings also suggest that early pre-school interventions targeting EF may have positive effects for children with DCD.

The relationship between executive function and language in children with motor difficulties and Developmental Coordination Disorder

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Background and aim. Motor coordination is fundamentally interrelated with both executive function (EF) and language, which in turn are related to each other. Studies investigating the relationship between EF and language have failed to understand the direction and nature of this association, suggesting a third factor may be involved. The aim of the current study was to explore whether motor coordination contributes to explain the relationship between EF and language.

Method. 7-11 year-old typically developing children (*n*=71), children with Developmental Coordination Disorder (DCD; *n*=23) and children with motor difficulties but no DCD diagnosis (*n*=57) were assessed on measures of motor coordination and expressive and receptive language. A comprehensive assessment of EF was administered including measures of all the following EFs: executive-loaded working memory, cognitive flexibility, planning, fluency and response inhibition. A moderation model was tested using motor coordination as the moderating variable. Both directions of the association between EF and language were investigated using composite scores of verbal EF and nonverbal EF.

Results. Moderation effects were significant when EF was the predictor of language outcomes, but not when language was the predictor of EF outcomes. Specifically, the interaction between motor coordination and *verbal* EF had a significant effect on both expressive and receptive language, while the interaction between motor coordination and *nonverbal* EF had a significant effect on expressive language only. In all three models, the relationship between EF and language was positive and significant at low and moderate levels of motor skills, but not at high levels of motor skills. The relationship between *nonverbal* EF and receptive language was significant at all levels of motor skills.

Conclusions. Results suggest that EF predicts language outcomes when motor skills are poor to moderate, but not when motor skills are average or above. Therefore, poor to moderate motor coordination skills could represent a risk factor for language ability, with EF skills acting as a potential protective factor in these children.

Keynote 2

Executive function and goal-directed behavior in children with Down syndrome

Deborah Fidler

(University of Colorado)

Executive function (EF) refers to the cognitive skills necessary for goal-directed behavior. An increasing body of research has demonstrated that EF is essential for many important adaptive outcomes throughout the lifespan. For individuals with Down syndrome, EF has been linked to academic outcomes, functional performance, and employment in adulthood. In this presentation, we will examine the development of EF during early and middle childhood with a focus on identifying patterns of relative strength and challenge. We will also discuss potential targets for intervention during the infant and toddler years in DS in order to promote positive developmental cascades and adaptive outcomes.

Session 4

Profound Intellectual and Multiple Disabilities (PIMD)

Assessment of voice discrimination in children with ProfoundIntellectual and Multiple Disabilities (PIMD)

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Introduction: Research in developmental psychology opens new methodological perspectives in the study of cognitive and psychological functioning of people with PIMD. **Objective:** This study is inspired by Legerstee, Anderson & Schaffer's (1998) experimental study in infants. It aims to observe whether children with PIMD are able to discriminate between two auditory stimuli, i.e. their own voice and the voice of a peer. We also assume that the PIMD children's behaviors will differ according to their self-awareness abilities. **Method:** Each participant (N=17) was presented alternately with a one-minute recording of their own voice and the voice of a peer, during three videotaped sessions. Four variables were coded along frequencies and durations: facial expressions (smiles), vocalizations, active alert behaviors and head/trunk orientations. 40% of the data was coded by a second annotator with an inter-observer reliability of 88.9%. We conducted nonparametric tests at two different levels: whole sample and cluster levels. **Results:** Wilcoxon tests showed a significant difference in the smile duration in the whole sample when the children were exposed to the voice of a peer rather than to their own voice. At the cluster level, the same difference was found in the cluster with the best self-awareness profile. A significant interaction between cluster and exposition (peer/self) was also found with the "alertness" variable. **Discussion:** It is possible for certain participants to discriminate between the two stimuli. The discrimination is more obvious in the group of children with the best self-awareness profile. These children laugh longer when exposed to the voice of their peer in comparison to their own voice. Independently of these results, our research highlights several issues relating to methodological constraints and conceptual backgrounds, some of which could be taken into account in order to optimize future experimental research with people with PIMD.

Identification of the expressions of self-awareness in children with profound intellectual and multiple disabilities (PIMD): creation of an observation tool based on developmental psychology research

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The development of self-awareness is an important topic of research in developmental psychology research; this topic is nevertheless rarely investigated in the field of research in intellectual disabilities, and even less in the target-group of children with PIMD.
The aim of my doctoral research is the empiric validation of two theoretical models on self-awareness development, testing their predictions on a sample of children with PIMD. I have created an observation instrument based on research in infancy. It is a situation-based list of inducing tasks and natural observation situations on ecological self-awareness indicators. The expected critical and non-critical behaviours are described in each item and are scored on a three-level score. 23 children with PIMD aged from 4 to 12 years old participated to the study. The list has been tested and stabilized during a pre-experimental stage and then administrated during the experimental stage. The natural situations were observed in classrooms by special needs education teachers; the inducing situations were administrated by myself during videotaped sessions. All the items were presented three times, resulting on 180 measures per child. The situation-based list shows good psychometric qualities.
The results of a cluster analysis led on the participants performances in each subscale of the list enables to distinguish three clusters of participants. The clusters' scores differ significantly. Actually, the distinct level of complexity of behavioural expressions in these subgroups matches with the theoretical description of three different forms of self-awareness in children with PIMD. A part of the participants showed indicators of ecological self-awareness, another part showed behaviours referring to some more basic forms of self-awareness.

Session 5

Executive functions in learning and intellectual disabilities

The development of executive functioning in preschoolers with developmental disorders: ADHS Symptoms, Specific Language Impairment and Intellectual Disabilities

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Children with specific language impairments (SLI), children with intellectual disabilities (ID) and Attention Deficit Hyperactivity Disorder Symptoms (ADHD) usually have difficulties in executive functioning. The aim of the study was to find out if children with specific developmental disorders show typical and definable abnormalities in executive functioning, and if the development of executive functioning follows the same or a different developmental course compared to typically developing children. Based on the executive functioning model by Miyake et al. (2000) we investigated children´s abilities in Updating, Shifting and Inhibition tasks and preschool teachers' reports about children's self-regulation.

We investigated 22 children with ADHD Symptoms, 24 children with SLI, 24 children with ID and a control group of 35 typically developing children in a longitudinal design. We tested the children´s executive functioning at ages 5 and 6 years using the following instruments: Updating: Wordspan backwards, Complex span; Inhibition: Head-Toes-Knees-Shoulders Task (HTKS); Shifting: Dimensional Change Card Sort Test (DCCS); questionnaire about self-regulation before school entry.

Our results showed that some abnormalities in executive functioning overlap between the groups of children with developmental disorders, but there are also definable and specific patterns of abnormalities for every specific disorder. While children with ID have a specific deficit in updating, children with ADHD Symptoms have predominantly problems in the inhibition and shifting component of executive functioning. Children with SLI showed most problems in the shifting component. The preschool teachers only rated the self-regulation abilities of ADHD children as deficient. Our results indicate that problems in executive functioning are not necessarily observed as overt behavior in all children. The relevance of our results for diagnostics and interventions for children with executive functioning deficits will be discussed.

Meta-analysis of Executive Functions in Intellectual Disability

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Executive functions (EF) are higher order functions, which have the role of a controller and modulator of cognitive abilities. The overall consensus in the literature is that people with intellectual disability (ID) perform significantly worse on EF tasks than chronological-age-matched groups. The comparison with mental-age-matched (MA) groups is less clear. To systematically examine such comparisons, a meta-analysis was conducted, comparing three types of EFs: *(1) inhibition, (2) shifting, and (3) updating* in people with ID to a typically developing MA group. Inclusion criteria were that *(1)* the ID group had no dual diagnosis and IQ < 70; *(2)* a MA control group was tested; (3) both groups had a minimum of 10 participants; *(3)* at least one out of the three EF was tested; *(4)* enough information was available to calculate an effect size. The literature search yielded 1004 potentially interesting articles. 10 studies (with 33 effect sizes) remained and were included in the quantitative synthesis. A three-level meta-analysis found a small but statistically significant effect size *(g = - 0.32, 95% CI = - 0.61, - 0.04 and p = 0.024)*. On average, people with ID performed worse than MA on EF tasks. The heterogeneity between effect sizes was large, but it could be attributed to differences within studies rather than between studies. The effect of type of EF was not significant. A subgroup-analysis based on EF type showed a significant effect size for updating but not for shifting and inhibition. This was partly because the effect size is larger for updating and partly because the variation between studies was much smaller for updating compared to shifting and inhibition. The conclusion is that individuals with ID have more problems with EF than mental-age-matched controls, but more research is needed to better understand the large variation between studies.

Variables associated with Planning Ability in Children with and without Intellectual Disability

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Planning is a complex cognitive ability and is something that we engage in often in our everyday life. Individuals with intellectual disability have low planning abilities as well as other executive functions. However, research investigating how everyday planning relates to cognitive abilities in this group is scarce. This study investigated potential associations between cognitive variables (mental age, working memory, semantic category fluency, and cognitive flexibility) and group belonging to everyday planning ability. Planning ability was measured using a pen-and-paper children's cooking task. The abilities were assessed in 130 participants; 67 adolescents with intellectual disability and 63 mentally age-matched children with typical development. The participants were recruited in schools in the southern parts of Sweden, and the adolescents with intellectual disability all went to schools for children with special needs. A robust multiple regression analysis was used to correct for violations of assumptions. The analysis showed that planning ability had positive and strong associations with cognitive flexibility and group belonging, the ID group had better planning ability than the comparison group. Further, the interaction term of mental age*group and flexibility*group was nearly significant, signalling that different variables can be more group dependent, this must however be further investigated. Planning in everyday life involves being able to handle an ever-changing world and shift your behaviour to it. Cognitive flexibility might thus be important when planning. The results also showed that the ID group performed better on the planning task, suggesting they have had time to learn planning a recipe as they are older in age than the TD group.

Behavioural Patterns in a Computerized Training Program for Individuals with Intellectual Disabilities

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Little is known about behaviour of individuals with intellectual disabilities (ID) in computerized training programs; knowledge that is important to design effective programs. This study used log data from a computerized program for improvement of planning skills to investigate patterns of behaviours in individuals with ID and mental age-matched controls. Here we present results from the two behaviours playing actively and ability to learn. These behaviours were measured in the data as clicks per minute and error rate. The results showed that individuals with ID overall played less active than the TD individuals. Especially in the early sessions the individuals with ID had a much lower playing activity than the TD individuals. However, after a passive beginning the ID group started to play more actively. Looking at the ability to learn the application there were no significant differences, both groups improved. From this we conclude that the participants with ID did improve by using the application and that they were more careful, scared of wrongdoing, or less motivated to play when first introduced to the application. These findings matched similar findings about executive functions in individuals with ID.

Session 6

Math in learning and intellectual disabilities

Math Intervention Using Tablets for Children with Intellectual Disabilities

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The purpose of the study was to evaluate an app's usability in a population of children with intellectual and/or developmental disability (IDD). The app is developed for iPad® and designed to help children learn basic mathematics. Many children with IDD never learn enough basic mathematics to achieve independence in everyday life, so it is important to find new and better ways to teach these individuals. We performed a multiple baseline single-case study with four participants with intervention length of 6 weeks. Three of the four participants had significant improvement during intervention, and all participants improved in some regard when comparing pre-test results to post-test results. Mainly the participants improved in terms of speed, which is an important aspect of what the app aims to enhance. There were also some signs of a greater understanding of the number line for two of the participants. The results indicate that the app is an effective tool for intervention for children with IDD. A concern with this intervention was a relatively low level of activity among the participants, but results in spite of low activity also suggest that the app worked well for the participants.

The number race: an adaptive videogame to improve basic numeracy in children with Down Syndrome

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Basic numerical skills are fundamental for daily living in the modern society, and support school mathematics achievement. Several studies have shown difficulties of children with Down Syndrome (DS) in this area and particularly in discriminating numerosities (e.g. Sella et al., 2013), counting (e.g. Gelman and Cohen, 1988; Nye et al., 2001) and numerical estimation (e.g. Lanfranchi et al., 2015).

The present work aims to explore the possibility to train basic numerical skills in children with DS trough play with an adaptive videogame, "The Number Race" (Wilson et al., 2006; the Italian version by Berteletti et al., 2010), that is aimed at enhancing number sense, cementing the links between representations of number, conceptualizing and automatizing arithmetic, and maximizing motivation.

A group of children with DS (age 7-14 years) took part to the study. Half of it was trained on basic numerical skills (experimental group) while the other half (control group) was trained on basic reading abilities (letter, syllable and small words reading). Compared to the control group, the experimental group showed a great improvement in many basic numerical skills, such as number comparison, number estimation, counting and calculation.

Mathematical ability in subtypes of readers

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Reading comprehension difficulties are experienced by different types of readers, both individuals with compromised decoding and individuals with compromised linguistic comprehension. Whereas poor decoders show difficulties with phonological processing and retrieval, poor comprehenders show compromised results in vocabulary, grammar, inference making and comprehension monitoring. Relatively little is known about how these cognitive and language profiles are related to other subject areas such as mathematic ability. In this study, three groups of readers were selected using the simple view of reading framework, with cutoffs on measures of listening comprehension and speeded decoding. The subgroups of poor oral comprehenders, poor decoders and typical readers were selected from a Swedish twin data base and their results on cognitive and language skills together with mathematical abilities were compared at grade 4 and three or four years later at grades 7 and 8.
The cognitive and language profiles of the two deficit subtypes of readers were stable between grade 4 and later grades at 7 and 8. The results in mathematic ability support the idea that different types of cognitive and language profiles selectively impair different mathematical domains. The poor decoder profile was associated with lower levels of arithmetic fluency across time and problem solving at grades 7 and 8. The subgroup of poor oral comprehenders was compromised in problem solving skills at both test occasions and arithmetic ability at grade 4. The results suggest a domain general deficit in retrieval and fluency in poor decoders and in building mental representations in poor oral comprehenders.

Counting and subitizing abilities in Williams syndrome and Down syndrome: Evidence from eye tracking

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We explored counting and subitizing abilities in two developmental disorders, Williams syndrome (WS) and Down syndrome (DS) using eye tracking and we compared their outcomes with TD group matched for mental age. The use of eye tracking allowed us to investigate how visual processing and scanning abilities affect mathematical abilities of those atypical populations compared to typical controls.

TD children (N= 23), individuals with DS (N= 23) and individuals with WS (N=24) were asked to report ‘‘how many’’ dots were presented on the screen for an unlimited duration, as rapidly as possible, while remaining accurate. Participants were presented with 1 to 6 dots over 12 trials, in half of the trials these dots were presented in a random pattern, in the other half they were presented as a dice pattern. Differences in counting and subitizing accuracy, RTs, and eye movements were recorded. Overall cognitive ability (fluid intelligence, and visuospatial abilities) and mathematical abilities (number familiarity and formal mathematical knowledge) were also assessed. Analyses of RT and error rate showed that DS and WS are not impaired when subitizing and counting. Preliminary analyses of the eye tracking data yielded different gazing behaviours in terms of fixation durations and number of fixations for DS population. We also analysed whether participants used explicit counting strategies (verbal counting, pointing, head nodding) during the counting and subitizing conditions. In summary, our results suggest that RTs and error rates are not sensitive enough to gain information on cognitive processing of subitizing and counting as eye tracking data suggest subtle differences between the groups that the abovementioned measures did not detect. Thus the impact of attention issues during these task in DS and WS needs to be taken into account as it could underpin processing difficulties that cannot be identified otherwise.

Session 7

Language in learning and intellectual disabilities

Developmental dyslexia: How taxonomic and thematic long-term memory organization affect recall

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Semantic long-term memory (LTM) representations can be distinguished in two main classes: thematic (i.e., concrete, context-dependent) and taxonomic (i.e., more abstract, space-time independent; see Blaye et al. 2001; Mandler et al. 1987). In typically developing children, taxonomies are usually acquired after thematic representations; an understudied topic, we addressed here, was to investigate how LTM semantic representations may modulate WM recall in atypically developing children, in particular children with developmental dyslexia.

A sample of 66 children with developmental dyslexia (mean age 10.69 years; 45 males) balanced with a control group for age, gender, schooling and IQ, was administered a semantic WM task (see Belacchi et al. 2017) in order to collect recall accuracy and possible intrusions. Here, children, had to listen to groups of lists composed of words semantically associated (thematic, e.g. light-heat-fire, or taxonomic, e.g., shop-drugstore-coffee) or arbitrarily associated, and afterwards to recall the last words among each group.

Both taxonomic and thematic associations supported recall (compared to arbitrary associations) in the two groups of children. More specifically, data showed that in typically developing children the taxonomic association boosted WM recall (vs. the thematic one). On the contrary, dyslexic children performed poorly (compared to control) on a double task requiring recall of semantically associated words. Whereas in typical development taxonomies favour LTM organization and WM performance, in developmental dyslexia taxonomies do not. Results could be interpreted in the light of a possible lack of integration between intelligence (abstract reasoning) and language (linguistic abstract representations) in developmental dyslexia.

Bilingualism in individuals with developmental disabilities, hindrance or benefit? A case-study of a simultaneous English-Spanish bilingual with Prader-Willi Syndrome

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Even though bilingualism has been proven to have multiple benefits for typically developing (TD) populations, individuals with developmental disabilities (DD) are often discouraged to learn an L2 under the assumption that it will have a negative effect on their L1 (Paradis et al. 2011). However, previous research focused on bilingualism in individuals with DDs has shown that their linguistic abilities do not differ from those of their monolingual counterparts (Kay-Raining Bird et al. 2016). The main objective of this paper is to provide an analysis of the narrative skills of a 33-year-old English-Spanish bilingual with Prader-Willi Syndrome (PWS), a linguistic area that has proven to be problematic for monolingual speakers with this syndrome (Garayzábal-Heinze et al. 2012). Two wordless picture books (*Frog story series*) were used as the elicitation method. Over two sessions, the PWS bilingual produced four narratives (two in Spanish and two in English), which were compared to four analogous narratives produced by a 25-year-old TD bilingual with comparable proficiency level in both languages. Following Gonçalves and collaborators' narrative evaluation protocol (Garayzábal-Heinze et al. 2012 for details), the narratives were analyzed according to three dimensions: *structure and coherence, process and complexity and content and multiplicity*. Overall, the results for the PWS individual showed a poor narration quality in the three dimensions, revealing non-TD narrative skills but a clear match with the monolingual PWS counterparts. Results also evidenced that narrative skills were equally impaired in both languages but that they improved with practice/experience in both languages. These findings lead us to conclude that bilingualism does not have a negative effect, which, in turn, implies that, rather than being discouraged, it should be encouraged and special attention should be given to the development of narrative skills in the PWS' school curriculum.

Keynote 3

Navigation and the spatial domain in neurodevelopmental disorders

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Our understanding of the development of spatial cognition has largely centred on specific questions. For example, in typical development, there has been extensive investigation regarding the existence of a geometric module, whilst in neurodevelopmental disorder research, the functions of the ventral and dorsal visual streams, and their potential dissociations, have received a lot of attention. Current research highlights that the notion of intact vs. spared spatial functions is simplistic. I am interested in *how* a task is completed. This analytical question can be approached with reference to a number of methodological techniques. For example: by taking into account the developmental influence of early impairments on later function; by using cross-syndrome comparison; and by considering interactions across genes, behaviour, environment and the brain. I will present research, predominantly in relation to the ability to navigate large scale space, in which we have taken these methodological considerations into account.

The ability to navigate successfully in large scale space is crucial to everyday living. For people with learning difficulties, the ability to learn their way around environments has a significant impact on daily life and independence. First, I will discuss findings from a series of cross-syndrome comparisons of the navigation abilities of individuals with Down Syndrome and individuals with Williams Syndrome, using desktop virtual reality. Both groups demonstrate impaired large-scale spatial cognition, yet comparison between the groups reveals syndrome-specific differences in the strategies employed, and the mechanisms which drive spatial performance for each group. Second, I will explore the relationship between motor ability and large-scale spatial cognition in three groups who have impaired motor performance: Cerebral Palsy, Attention Deficit Hyperactivity Disorder and Williams Syndrome. Findings so far suggest that, whilst the achievement of motor milestones is related to spatial cognition in typical development, impaired motor abilities do not necessarily lead to impaired spatial cognition in neurodevelopmental disordered groups. This has implications for our understanding of the use of alternative developmental pathways with respect to the development of spatial cognition.

Session 8

Reading and intellectual disabilities

Environment learning from virtual exploration in individuals with Down syndrome: perspective, sketch maps, and individual differences

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The ability to learn new environments is a crucial goal for the personal autonomy of individuals with Down syndrome (DS), and it is closely tied to visuospatial abilities. Environment knowledge can be acquired through direct navigation, maps, or a combination of these modalities. The present study examined the role of the perspective (survey vs. route) on the acquisition of environment knowledge presented through virtual exploration, and the aid of sketch maps, comparing individuals with DS and typically developing (TD) children matched on both verbal and visuospatial measures of intelligence. The ability to locate landmarks in layouts representing the environments was regarded as the main measure of interest, i.e., as a proxy of the ability to learn configural knowledge of an environment. The DS and the TD children groups had overall similar performance in terms of landmark location accuracy, and both groups performed well above the chance levels in all exploration conditions. Importantly, however the DS group benefited less than TD children from facilitating conditions; these conditions included viewing a sketch map before exploring, and viewing the environment in survey (rather than route) perspective. Further measures on the ability to re-navigate viewed environments suggested that individuals with DS incurred more pauses and errors than TD children, but in this case the between-group difference was not moderated by any exploration condition. Discussion focuses on the difficulty of individuals with DS to benefit from additional configural information (i.e., from survey view, or from a sketch map), which may be related to difficulty in elaborating simultaneous information, or to integrate information from different sources.

Text comprehension in individuals with Down syndrome: Effectiveness of a short intervention on inferential skills for individuals with Down syndrome

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Individuals with Down syndrome struggle with text comprehension and this is partially due to poor ability to integrate information of the text through inferential skills. The current study was aimed to test the effectiveness of a short intervention on inferential skills targeting the ability to infer solutions to problematic everyday situations presented as short stories and to analyze the relationship between inference making and text comprehension in Down syndrome. The study involved 22 participants with Down syndrome, 11 were assigned to intervention group and 11 to control group. The two groups were matched for age, non-verbal reasoning and text comprehension. All participants were tested before and after the intervention on 2 tasks requiring inferential ability (text and knowledge based inferences, inferring the correct sequence of a picture story). The training was delivered in 11 weekly 30 minutes sessions. The activities concerned ordering and completing pictured stories representing everyday life situations: the participants were required to find new and different solutions to problematic situations. The results showed that individuals with Down syndrome who took part to the intervention improved in the ability to make different types of inferences and that the ability to make inferences is related to their text comprehension ability. The current study demonstrated that individuals with Down syndrome benefited from a short intervention and that they generalized learned inferences to different tasks and requests.

Meta-analysis of Cognitive and Linguistic Variables Associated with Reading Ability in Individuals with Intellectual Disabilities

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Individuals with intellectual disabilities (ID) have low reading abilities, involving decoding and reading comprehension. Despite this, research on the underlying abilities associated with reading ability in this group is sparse and disparate. This meta-analysis aimed at identifying which cognitive and linguistic variables that were associated with reading abilities in individuals with ID, and whether these variables were similar or different to the ones identified in previous research on typically developing children. A literature search was conducted using keywords associated with "intellectual disabilities" cross-referenced to keywords associated with "reading", and keywords associated with "correlation". Inclusion criteria were that measurements of decoding and/or reading comprehension, correlational data, and IQ was reported and a minimum sample size of 10 participants. Preliminary findings indicate that the following variables are associated with decoding, in descending order according to magnitude: phonological awareness (r = .59), rapid automatized naming (r = .49), phonological short-term memory (r = .48), vocabulary (r = .33), and IQ (r = .30). Variables associated with reading comprehension, in descending order according to magnitude, were: decoding (r = .63), IQ (r = .44), listening comprehension (r = .41), and vocabulary (r = .31). Hence, the variables associated with reading abilities in individuals with ID appear to be similar to the variables identified in previous research on typically developing children. However, in typically developing children, IQ is not strongly correlated with decoding, whereas the mean effect size identified in this meta-analysis showed a correlation in the medium range between IQ and decoding for ID.

Symposium

Social cognition and inhibition: How to support emotion regulation and social adjustment in children?

Proponent: Nathalie Nader-Grosbois, Université Catholique de Louvain, Louvain-la-Neuve, Belgium

How better understand social competences and maladjustment in children with developmental disorders? From a heuristic model to research studies

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This presentation introduces an integrated scientific approach of emotional and social competences of typically and atypically developing children, in referring to a heuristic model of social competences (Nader-Grosbois, 2011), inspired from Yeates et al. (2007). It structures research studies about hypotheses, targeted relevant variables to assess and interpretations of results, in order to better understand the development of social cognition, emotion regulation in social interactions and social adjustment, and their dynamic links. It allows examining in which measure executive function, individual characteristics (age, developmental age, diagnosis…) and parental characteristics and psychoeducative practices or intervention could induce variability in these social competences. This integrated approach helps to coordinate studies targeting socio-emotional competences and social cognition in my research team, led toward children with intellectual disabilities, with autism spectrum disorders and with externalizing behavior disorders. Some studies test the efficiency of inhibition and social cognition trainings toward children with externalizing behavior disorders (Marine Houssa & Alexandra Volckaert), or compare effect of Theory of Mind and social information processing in children with intellectual disabilities (Emilie Jacobs). Other studies examine how parents socialize emotions toward their typically developing children and with autism spectrum disorders (Stéphanie Mazzone). In these studies, recent adapted instruments to these children are used, both direct and indirect measures of inhibition, social problem solving, ToM abilities in several mental states, emotion regulation *versus* dysregulation, socio-affective profiles and social adjustment. Several questionnaires are also completed to evaluate parents' reactions toward their child's emotion and conversations about emotions. The goal of these studies is to better guide interventions toward these children and their parents to improve their efficiency.

Inhibition and social cognition in preschoolers with externalizing behavior

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In preschoolers, externalizing behavior problems are a primary cause of consultation. It is known that externalizing behavior could result from individual and environmental risk factors. Individual risk factors included notably social cognition and executive functions. A high level of externalizing behavior has usually been related to dysfunction in social cognition and to poor skills in executive functions.

The aim of the present experimental study is to compare the impact of two very targeted child-oriented trainings in the increasing of social competence and decreasing of externalizing behavior in preschoolers. One training targeted social cognition abilities, and more specifically the understanding of mental states (Theory of Mind; Flavell, 1999) and social problem solving (social information processing; Crick & Dodge, 1994) while the second one targeted executive functions capacities, and more particularly inhibition. By groups of 3-4, children took part in 15 training sessions on 8 weeks (2 sessions of 45 minutes per week). These two trainings were compared on 48 preschoolers presenting clinically relevant levels of externalizing behavior. 16 children benefited from the social cognition training, 16 others received the inhibition training, and the 16 other children were allowed to the control group (waiting list). The comparison of those results highlighted how each training could help preschoolers with externalizing behavior in their behavior, emotion regulation and social adjustment. In comparison to a waiting-list control-group, the two trainings were effective in decreasing externalizing behavior and differentiated impacts of the two trainings were obtained on different dimensions of profiles of social competence and emotion regulation. Results are discussed for their research and clinical implications.

Theory of Mind and Social information processing Intervention in children with in intellectual disabilities

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In children with intellectual disabilities (ID), researches emphasized "*limitations in adaptive behavior",* including social maladjustment and in emotion dysregulation. Surrounding and professionals are preoccupied about behavior disorders, difficulties in social interactions and in socio-emotional situations. These difficulties impede their social inclusion and increase their reject.

These difficulties have been studying in link with deficit or delay in socio-emotional domain, notably in Theory of Mind (ToM) or Social information processing (SIP). In the present study, we test causal contribution of ToM or SIP on social (mal)adjustment. Concretely, we explore which effects have a ToM or SIP training in children with ID, on ToM and SIP competences, social (mal)adjustment and emotion regulation.

45 children with ID are allocated to a control group, a ToM training group or a SIP training group. Trainings are done by group of 3 children, during 45 minutes and focused either ToM or SIP. Before and after trainings, we evaluate the children's competences in ToM (ToM-emotions et ToM-beliefs, Nader-Grosbois &Thirion-Marissiaux 2011 ; ToM Task Battery-vf, Nader-Grosbois & Houssa, 2016; ToMI-vf, Houssa, Mazzone & Nader-Grosbois, 2014), in SIP (RES, Barisnikov et al., 2004), in social adjustment (EASE, Hughes & Soares-Boucaud, 1997; PSA, Dumas, Lafrenière, Capuano & Durning, 1992), and in emotion regulation (ERC-vf, Nader-Grosbois & Mazzone, 2015).

Thanks to ANOVA on repeated measures and comparison on the progression of the group, we examine the differentiate effects of ToM or SIP trainings on the comprehension of mental states, on social problem solving competences, on social adjustment, and on emotion regulation. Finally, we discuss improvements of ToM or SIP competences in the experimental groups, compared to the control group and implications of intervention in social cognition and social adjustment.

Emotion-related socialization behaviors in ASD children

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Emotion-Related Socialization Behaviours (ERSBs) are parents' behaviours that tend to promote their children's socio-emotional abilities. They are three types of ERSBs: reactions to children's emotions, emotion-related conversations and emotional expressiveness. When parental ERSBs are favourable for the children's development, they are considered as being supportive, while when they are not, they are considered as being non-supportive. Few studies have investigated ERSBs in parents of children with an Autism Spectrum Disorder (ASD). As ASD children show deficits in socio-emotional competences, it is important to explore how parents could support their development.

Two studies have been conducted to examine the relation between parents' ERSBs (parental reactions in Study 1 and conversations in Study 2) and ToM abilities, emotional regulation and social adjustment in ASD children. In Study 1, participants are 39 mothers and 31 fathers and their ASD children. In Study 2, participants are 23 mothers and their ASD children. Children's ToM abilities are assessed by direct measures and by a questionnaire. Children's emotional regulation and social adjustment are assessed by a questionnaire. Parents completed a questionnaire about their reactions toward their children's emotions and mothers completed a questionnaire about their emotion-related conversations.

Our results highlighted several links that were distinct according to children's abilities. Some of these links were similar between mothers and fathers, while others were different. For ToM abilities, we obtained a positive relation with problem-focused responses, reactions of socialization, reprimand and emotional terms used during conversations. For emotional regulation, paternal comforting reactions are negatively related. For social adjustment, paternal problem-focused responses are positively related, while comforting reactions are negatively associated. Moreover, maternal emotion-related conversations are positively related with children's social adjustment.

The identification of supportive or non-supportive strategies as protective or risk factors should be considered in individualised intervention program toward parents having an ASD child.

Posters

1. Motor proficiency in Children with Down Syndrome

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Increasing research has demonstrated the relationship between motor competence and intellectual functioning proving how children with mild or moderate Intellectual Disability show a delay on gross motor development with important impairments in daily functioning. Traditional studies highlighted the positive role of early motor activities such as grasping, crawling, kneeing, in increasing the opportunities to interact and explore spaces and objects by developing the repertoire of learning experiences. Increasing research has targeted the gross motor development with locomotion and object control components in Down Syndrome (DS) people

The study aims to analyze gross motor proficiency as a function of different intellectual profiles by comparing locomotion and object control skills endorsed by children with Down Syndrome, children with Borderline Intellectual Functioning and typically developing children.

Methods: Group 1 was composed of 18 children with Down Syndrome, group 2 was composed of 18 children with Borderline Intellectual Functioning and group 3 was composed of 18 children with typical development. Gross motor skills were measured through the TGMD-Test.

Results: Children with Down Syndrome showed worse gross motor skills compared with children with Borderline Intellectual Functioning and typically developing childrenby underscoring both on all locomotion (walking, running, hopping, galloping, jumping, sliding and leaping) and all object control items (e.g. throwing, catching, striking, bouncing, kicking, pulling and pushing).

In DS group strengths were found on run and slide skills, in BIF group strengths were on run, long jump and slide skills and in TDC group strengths were on run and slide skills.

Conclusions: Findings suggest implications for further practice to develop evidence-based programs aimed to rehabilitate gross motor skills through the regular participation in structured exercise activities.

2. Focus on a co-construction process of contexts promoting self-determination and civic engagement of individuals having an intellectual disability (ID)

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While the effectiveness of a new system can be attributed to its validity, the procedures used to introduce and confirm it in practice should not be underestimated in order to ensure its success. Thus, in the context of the introduction of a training program on self-determination and active citizenship in a social care establishment, secondary data on vertical and horizontal collaboration throughout the project's implementation was gathered. The presentation aims to present the latter's results.

The main research was conducted over two years (2014-2016) within the framework of a partnership between the establishment concerned and academic researchers. 16 individuals with an ID, 13 educational care professionals, 4 members of the managerial staff and 4 research workers, were involved in the training and worked together to promote the adoption of principles of self-determination and civic engagement within the establishment. Analysis of the data shows that collaboration within the project followed all the recommended steps in the scientific literature on implementation, namely: information, persuasion, decision, implementation, and confirmation (Rogers, 2003). The success of the training shows that the care taken in implementing the program is a task per se. Effects are maximised when the whole system is involved (vertical level: executive management, board of trustees, etc. or horizontal: persons with an ID, professionals - Greenhalgh et al., 2004).

3. Are cognitive and affective special needs in autonomy enough compensated in learning and academic examination in pupils with mild intellectual disability and autism in French elementary schools?

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Many papers have illustrated how the capacities of persons with mild intellectual disabilities (MID) are not recognized for their real value, because of the bias of static evaluation to call up effectively their apprenticeship and their self-regulation/ executive processes (Büchel, Paour & coll., 1998, Magnin de Cagny, 2010, Nader-Grosbois, 2007, Gaumer & coll., 2015). This lack of valorization affects the professional integration of MID persons (83% of handicapped workers get a degree under or equal to a level "five", and less than 3% of French handicapped workers find a job, Nuss, 2008). A recent research (Gouzien-Desbiens & Mengue-Topio, 2018, in press) on 636 mild intellectual deficient pupils aged 6 to 20 attending special classes underscores academic examination should be better adapted to allow a most equitable approach, leading to uphold the needs in intellectual autonomy, especially on the long-term goal attribution criteria and the self-evaluation criteria, not compensated in one MID pupil on two, the same proportion of pupils failing to pass their internal and academic exams. To measure the weight of autonomy needs not compensated in other populations, we replicate this study with 82 MID children aged 7 to 11 and compare them to 15 autistic pupils with the same mental age, all evaluated on the same criteria, in the three fields of autonomy with an observation grid. We hypothesize a stronger difficulty to adapt or compensate the autonomy special needs in academic exams in autistic children than in MID children (both MID and ASD disorders are affected by dysregulations, Nader-Grosbois, 2007, but dysregulation is negatively bound to the IQ of autistic children, Blanc et al., 2005), although the autonomy needs could be well sustained by special teachers in internal evaluations, thanks to their knowledges and formation received about the special needs of their pupils. Results confirm the hypothesis.

4. Motor planning and manual dexterity in adults with intellectual disabilities

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This study was conducted to investigate the relation between problems of manual dexterity and anticipatory motor planning in adults with intellectual disability (ID). Participants were 22 adults with ID (36.8±11.9 years) free from severe sensory and motor problems. The anticipatory motor planning was assessed using the bar-transport task (BTT). Manual dexterity was assessed using the Purdue pegboard test. In the BTT, typical adults reportedly grasp an object with initial grasp posture that results in a comfortable and controllable position at the end of the movement (i.e., end-state comfort effect). Relations between these motor tasks and two aspects of intellectual abilities, i.e., verbal and nonverbal abilities, were investigated. The picture vocabulary test – revised (PVTR) and Raven color progressive matrices (RCPM) were administered for this purpose. Results demonstrated that adults with ID chose an inappropriate grip at the beginning of the BTT, resulting in an uncomfortable thumb-down end position. This tendency suggests difficulty with anticipatory motor planning and inhibitory function in adults with ID. The BTT performance was found to be related with manual dexterity in adults with ID. Moreover, partial correlation analyses suggest that nonverbal ability (the RCPM score) mediates this relation. The RCPM score can be used as an index of fluid intelligence. Consequently, it is reasonable to assume that fluid intelligence plays an important role in anticipatory motor planning in adults with ID. Nevertheless, the role of fluid intelligence in the Purdue pegboard task in adults with ID remains unclear. Kinematic analyses must be conducted to clarify features of manual dexterity and anticipatory motor planning.

5. The influence of ADHD symptoms on self-esteem and depression in young adolescents

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The influence of attention-deficit hyperactivity disorder (ADHD) symptoms on self-esteem is one of the interesting research and clinical topics in the research field of ADHD. A number of studies found that children with ADHD had lower self-esteem compared with healthy controls. However, relatively few studies have focused on adolescent ADHD. Actually, in adolescence, other clinical symptoms are also frequently comorbid with ADHD symptoms such as depressive and behavioral problems (i.e., oppositional defiant disorder). Thus, the present study aimed to reveal the influences of attention-deficit hyperactivity disorder (ADHD) and oppositional defiant disorder (ODD) symptoms on self-esteem and self-perception during early adolescence, and to clarify the spillover effect of self-esteem on depressive symptoms. ADHD symptoms in 564 early adolescents were evaluated via teacher-rating scales. Self-esteem and depressive symptoms were assessed via self-reported scales. We analyzed the relationships among these symptoms using structural equation modeling. Severe inattentive symptoms decreased self-esteem and self-perception in terms of scholastic and athletic competence, both of which are related to school activities and classes. On the other hand, hyperactive–impulsive symptoms affected self-perception for non-academic domains (i.e., behavioral conduct). Although these ADHD symptoms did not directly affect depressive symptoms, low self-esteem led to severe depression. ODD symptoms had a direct impact on depression without the mediating effects of self-esteem. These results indicated that ADHD symptoms had a negative impact on self-esteem and an indirect negative effect on depressive symptoms in adolescents, even if ADHD symptoms were subthreshold. Severe ODD symptoms can directly trigger depressive symptoms during early adolescence.

6. Temporal attention in atypical cognitive development: the case of Down Syndrome

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Recent studies suggest that both top-down and bottom-up temporal orienting (TO) of attention are established early and show stable trajectories in typical development. This suggests that the ability to direct attention over time is a domain-general cognitive function that may potentially constrain the build-up of domain-specific skills. Yet, no evidence is available about atypical development of TO. In the present study we provide first empirical evidence about the interplay between top-down and bottom-up temporal attention mechanisms in Down Syndrome (DS). To this purpose we compared the behavioural performance of a group of children and adolescents with DS (n=33; mean age 11.58 ± 3.78 years; range: 5-17) with that observed in typically developing individuals matched by either chronological (TD-CA; n=33) or mental age (TD-MA; n=31) when undergoing a simple cued reaction time purposely designed to assess top-down (endogenous TO) and bottom-up (foreperiod and sequential effect) temporal attention. In both DS and TD-MA groups, verbal and non-verbal ability were also assessed. The mean task accuracy was on average lower and more variable in DS group than controls. Furthermore it was predicted by both verbal and non-verbal ability. A subsample of "high-performing" children, showing comparable task speed and higher accuracy (≥ 65%), was then extracted from each group to test the presence of top-down and bottom-up temporal attention after ruling out the effect of individual variability in task compliance and RT speed. The results showed that while the control groups showed both top-down and bottom-up TO effects, only the latter were present in DS group. The dissociation between voluntary and automatic temporal attention mechanisms in DS is interpreted according to the neurocostructive account, implying a failure in the redescription of temporal knowledge from an implicit (bottom-up TO) to an explicit (top-down TO) representational format as a putative core deficit of atypical development.

7. The interpretation and production of grammatical gender by a Spanish-English bilingual with Prader-Willi Syndrome: an idiosyncratic cognitive divide?

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Code-switched structures provide insight into the representation of gender in the mind of the bilingual because they make it possible to determine whether bilinguals classify Nouns in the non gender-marked language according to the grammatical gender of their 'translation equivalents' in the gender-marked language, abiding by the so-called 'analogical criterion' in Concord as in (1) versus (2) and Agreement structures as in (3) versus (4).

—Concord:

(1) La $_{[theF]}$ house $_{[casaF]}$[FF matching]

(2) El [$_{theM]}$ house $_{[casaF]}$ [MF non-matching]

—Agreement:

(3) The house$_{[la\ casaF]}$ es roja$_{[is\ redF]}$ [FF matching]

(4) The house$_{[la\ casaF}$] es rojo$_{[is\ redM]}$ [FM non-matching]

However, while Spanish-dominant bilinguals abide by the 'analogical criterion' regardless of the experimental task and structure, English-dominant bilinguals (specifically Heritage Spanish speakers) and sequential L2 Spanish learners are significantly closer to Spanish-dominant bilinguals in the case of the agreement structures than in the case of concord structures when performing an acceptability judgement task, while the reverse pattern is found when performing a production task.

In this study we focus on a 34-year-old adult English (majority language)-Spanish (Heritage language) bilingual with Prader-Willi Syndrome (PWS), a genetic disorder that besides behavioral disturbances presents intellectual and linguistic disabilities. In order to contribute to the little linguistic research that has been carried out to date on the speech and language development of this population, we have administered an acceptability judgement task and a written production task to our participant with the aim of determining whether he abides by the 'analogical criterion' along the same lines as TD Heritage Spanish speakers do. The results show that for the PWS individual rather than a divide between the two different structures within the two tasks, it is the actual task, the acceptability judgement task, that is more problematic, since, in the production task, this PWS individual performs at ceiling, as TD Spanish dominant English-Spanish bilinguals do. These results constitute a first step to investigate which cognitive capacities may be compromised in the case of the PWS population and provide clear-cut evidence that bilingualism does not have a negative effect on the activation of formal features in their grammar.

8. Simultaneous and sequential visuospatial working memory and attentional control in individuals with intellectual disabilities

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Recently, researchers have examined visuospatial working memory in individuals with intellectual disabilities (ID), particularly addressing the distinction between simultaneous and sequential processes. Findings from those studies have shed light on characteristics of visuospatial working memory in individuals with ID, but it remains unclear how individuals with ID perform on visuospatial working memory tasks that demand high attentional control. This study investigated visuospatial working memory in individuals with non-specific ID by manipulating the degree and type of attentional control, in addition to the presentation format of information.

A total of 23 individuals with non-specific ID (11 female, 12 male; chronological age 29.4 ± 14.0 years; IQ 46.1 ± 14.8) and 23 typically developing children (9 female, 14 male; chronological age 6.0 ± 0.4 years) matched for nonverbal intelligence and gender were administered visuospatial working memory tasks of three types under simultaneous and sequential presentation. The tasks were the following: (1) the baseline task, requiring simple maintenance of locations presented simultaneously or sequentially; (2) the precue task, requiring additional attentional control during encoding; and (3) the retrocue task, requiring additional attentional control during retrieval.

Results show that individuals with non-specific ID performed equivalently to the control individuals on baseline tasks under both simultaneous and sequential presentation. However, the performance of individuals with non-specific ID was impaired on the precue task and the retrocue task only in cases of sequential presentation. These results suggest that visuospatial working memory in individuals with ID is preserved overall, but sequential visuospatial working memory becomes impaired when increased attentional control is required. Our findings augment our understanding of the characteristics of visuospatial working memory in individuals with ID and demonstrate possible differences between non-specific ID and ID of genetic origin.

9. Cognitive profiles in children with Down syndrome

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Looking at the literature, it is usually described a profile of Down Syndrome with nonverbal abilities stronger than verbal ones (review of Patterson et al., 2013). However, this is not always true: studies have shown how different subgroups can be present (e.g. Tsao & Kindelberger, 2009), that can have an opposite phenotype, with verbal abilities more preserved than the nonverbal. In this study we want to investigate cognitive profile of children with Down Syndrome using the Wechsler Preschool and Primary Scale of Intelligence-III (WPPSI-III), commonly used in Italy to measure cognitive functioning. To do this, we evaluated 18 children/adolescents from 7 to 21 years old at the University of Padua. Following a procedure previously used by Tsao and Kindelberger (2009) we used the WPPSI-III even with older participants to avoid a floor effect that could emerge from using the Wechsler Intelligence Scale for Children-IV (WISC-IV). Preliminary analyses a significant effect of subtests and that, with verbal scores were significantly higher than performance ones.

10. Do typically and atypically developing children learn and generalize novelrelational names similarly: the role of conceptual distance during learning and at test

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There is a large body of evidence showing that the opportunity to compare stimuli duringnovel word learning leads to better conceptualization and generalization than no-comparison settings in typically developing (TD) children (e.g., Gentner & Namy, 1999). So far, comparison situations have not been systematically studied with children with intellectual disabilities (ID) (Chapman & Kay-Raining Bird, 2012). In the present research we contrasted several comparison conditions in which we manipulated the conceptual distance between stimuli in the learning phase and between the learning phase stimuli and the generalization phase stimuli for relational nouns. In this study, we compared children with ID and TD children matched on mental age with the Raven's coloured progressive matrices RCPM (Raven, 1965). Results showed that overall both populations learned and generalized relational names. However, ID children's performance depended on their cognitive skills (high Raven group outperformed low Raven group) and ID children had more difficulties in distant generalization conditions. The discussion focuses on the role of conceptual distance on participants' conceptual generalization as a function of their intellectual abilities and cognitive functioning.

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