EARLI SIG22: Neuroscience & Education Conference 2026

Partnering with IMBES | 3 -4 September | Leiden, The Netherlands

PROGRAM: DAY 1
Thursday, 3 Sept

PLNT
Langegracht 70
Leiden

8:30 - 9:15	EARLI Bird Networking + Registration	Midi
9:15 - 9:30	Welcoming & Opening Remarks	Spotlight
9:30 - 10:30	Keynote: Rogier Kievit	Spotlight
10:30 - 11:00	Coffee Break	Launch
11:00 - 12:15	Parallel session — **Symposium 1:** Shared and distinct pathways for words and numbers: Insights from preschool to primary school	Launch
	Parallel session — **Symposium 2:** The development of children's meta-cognitive regulation and its role in academic learning	Spotlight
12:15 - 13:30	Lunch	Launch
13:30 - 14:30	Flash Talks	Spotlight
14:30 - 15:00	Coffee Break	Launch
15:00 - 16:00	Keynote: Eveline Crone	Spotlight
16:00 - 18:00	Poster Session & Drinks	Launch
	Conference Dinner (19:00)	Waag, Leiden

ELSEVIER Earli

EARLI SIG22: Neuroscience & Education Conference 2026

Partnering with IMBES | 3 -4 September | Leiden, The Netherlands

PROGRAM: DAY 2
Friday, 4 Sept

PLNT
Langegracht 70
Leiden

8:30 - 9:30	EARLI Bird Networking + Registration	Midi
9:30 - 10:30	Keynote: Daphné Bavelier	Spotlight
10:30 - 11:00	Coffee Break	Launch
11:00 - 12:15	Parallel session — **Symposium 3:** Intergenerational correlates of academic achievement	Launch
	Parallel session — **Symposium 4:** Metacognition in educational context: From neural mechanisms to adaptive learning processes	Spotlight
12:15 - 13:30	Lunch — SIG22 Business Meeting (12:30)	Launch
	Lunch — Trainee Session (12:30)	Spotlight
13:30 - 14:30	Keynote: Daniel Ansari	Spotlight
14:30 - 15:00	Coffee Break	Launch
15:00 - 16:45	Panel Discussion & Keynote: Jason Yeatman	Spotlight
16:45 - 17:00	Poster Awards & Closing	Spotlight

SIG 22 Conference Team

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Leiden University

SIG 22 Coordinator & Local Organiser

Linda van Leijenhorst

Leiden University

Local Organiser

Anna Matejko

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Please get in touch with these members for emergencies or any other issues that may arise in relation to health and safety during the conference

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Keynotes Day 1

Rogier Kievit

Thursday 9:30
Spotlight

Professor, Developmental Neuroscience, Radboud University

Cognitive performance in the wild: Understanding cognitive fluctuations

Rogier Kievit is a Professor at the Donders Institute of Brain, Cognition and Behaviour at the Radboud University Medical Centre. He leads the Lifespan Cognitive Dynamics Lab, developing and applying statistical models in large longitudinal samples to investigate how cognitive abilities are interrelated, how change in the structure of the brain contributes to changes in cognitive abilities, and how cognitive functioning is associated with such factors as physical and mental health, social and intellectual engagement, and environmental factors. He is a member of De Jonge Akademie, and (co)chair of the Green Young Academy and the Radboud Ecological Momentary Assessment Centre (REMAC).

Eveline Crone

Thursday 15:00
Spotlight

Professor, Developmental Neuroscience in Society, Erasmus University & Professor, Neurocognitive Developmental Psychology, Leiden University

Self and Others in Adolescence: Understanding the adolescent brain to shape a better society.

Prof. Crone's Society, Youth and Neuroscience Connected (SYNC) lab examines the psychological and neural processes involved in self-regulation and social development from birth to adulthood, with a special focus on adolescence. Her research relies strongly on neuroscience and translational approaches, involving societal partners and youth in the full research cycle and with a direct link to youth policy. One of her special interests involves enrichment of cognitive and social experiences of children and adolescents using longitudinal, training and intervention designs. She currently leads the 10-year Growing Up Together in Society (GUTS) Gravitation program (2023-2033) a large-scale multi-site program on adolescent neural and social development. Prof. Crone is a member of the Royal Netherlands Academy of Arts and Sciences (KNAW), Corresponding Fellow of The British Academy, and Member of the USA National Academy of Sciences (NAS).

Keynotes Day 2

Daphné Bavelier

Friday 9:30
Spotlight

Professor, Department of Psychology and Education Sciences, University of Geneva

Learning and transfer: Lessons from action video games

Daphne Bavelier is an internationally-recognized expert on how humans learn. The Cognitive Neuroscience research team she heads at the University of Geneva, Switzerland investigates how new media, such as video games, can be leveraged to foster learning and brain plasticity. Bavelier has contributed as an expert for the World Economic Forum in domains as varied as Education (New Vision for Education: Unlocking the potential of technology) and Human Enhancement (World Economic Forum Global Future Council on Human Enhancement). In 2011 she co-founded Akili Interactive, a company whose goal was to develop clinically-validated cognitive therapeutics that exploit video games. Her scientific contribution has been recognized by several prizes over the years, including the John Merck Scholar Award (2000-2004), a finalist selection for the Blavatnik Awards for Young Scientists (2008), and more recently the 2019 Klaus J. Jacobs Awards, that honors outstanding research with social impact on children and youth.

Daniel Ansari

Friday 13:30
Spotlight

Professor, Developmental Cognitive Neuroscience & Learning, Western University

Attempting to traverse the research to application highway: Examples from numerical cognition research

Daniel Ansari is a Professor and Canada Research Chair in Developmental Cognitive Neuroscience & Learning at Western University. Ansari and his team in the Numerical Cognition Laboratory explore how children develop numerical and mathematical skills and why some children struggle to acquire mathematical skills and knowledge. Ansari and his team are committed to bridging between the Science of Learning and K-12 Classrooms. Ansari is a Fellow of the Canadian Institute for Advanced Research (CIFAR) and the Canadian Academy of Health Sciences. In 2026 he won the Pickering Award for Distinguished Contributions to Developmental Psychology in Canada.

Panel Discussion & Keynote

Panel Discussion

Friday 15:00
Spotlight

This panel will bring together teachers and researchers to discuss how far the field of educational neuroscience has come and where it is going. We will examine the two-way translation between neuroscience and education: How research findings move into practice and how classroom needs should shape research. Topics of discussion will include where educational neuroscience has succeeded and where it has fallen short, methodological obstacles and how we might overcome them, and how we can better align research with the realities of the classroom.

Moderator:
Dietsje Jolles - Leiden University

Panel Members:
Tracey Tokuhama-Espinosa - *Harvard University Extention School*
Gaia Scerif - *University of Oxford*
Milene Bonte - *Maastricht University*
Chantal Keijzer - *Aeresteijn Primary school*
Lizélle Pretorius - *Cape Peninsula University of Technology*

Jason Yeatman

Friday 16:00
Spotlight

Associate Professor, Graduate School of Education & Division of Developmental and Behavioral Pediatrics, Stanford University

From the lab to the classroom and back: The virtuous cycle between education and neuroscience

Dr. Jason Yeatman is an Associate Professor in the Graduate School of Education and Department of Psychology at Stanford University and the Division of Developmental and Behavioral Pediatrics at Stanford University School of Medicine. Dr. Yeatman completed his PhD in Psychology at Stanford where he studied the neurobiology of literacy and developed new brain imaging methods for studying the relationship between brain plasticity and learning. After finishing his PhD, he took a faculty position at the University of Washington's Institute for Learning and Brain Sciences before returning to Stanford. As the director of the Brain Development and Education Lab, Reading & Dyslexia Research Program, and Rapid Online Assessment of Reading, the overarching goal of his research is to understand the mechanisms that underlie the process of learning to read, how these mechanisms differ in children with dyslexia, and to design literacy intervention programs that are effective across the wide spectrum of learning differences. His lab employs a collection of structural and functional neuroimaging measurements to study how a child's experience with reading instruction shapes the development of brain circuits that are specialized for this unique cognitive function.

Parallel session: Day 1

Symposium #1

Thursday 11:00
Launch

Chair: Anna Matejko

Discussant: Lien Peters

Shared and distinct pathways for words and numbers: Insights from preschool to primary school

How do children come to understand words and numbers – two of the most fundamental skills underpinning literacy and numeracy? This symposium addresses that question across three levels of analysis (neural, cognitive, and developmental) and across the preschool-to-primary transition. Since the symbolic systems for both words and numbers emerge during the preschool and early primary school years, this period is particularly important for understanding their development and interrelationships. The talks will use complementary approaches to examine how children's representations of words and numbers emerge and change over time, including fNIRS, fMRI, and longitudinal behavioural methods.

The first talk by Ms. Nina Jost (Durham University, UK) explores the neural bases of early number word learning in preschoolers and how it differs from other types of words. The second talk by Prof. Bert de Smedt (KU Leuven, Belgium) will examine how formal schooling reshapes the brain's representations of words and numbers. The third talk by Dr. Anne van Hoogmoed (Radboud University, Netherlands) explores the longitudinal relationships between reading and arithmetic from preschool to early primary school. These talks will provide insights into the shared and distinct pathways in the development of words and numbers and what this means for educational practice.

Thursday 11:00
Launch

Shared and distinct pathways for words and numbers: Insights from preschool to primary school

1. Neural mechanisms of number word learning in preschoolers

Nina Jost[1]*

Stephanie Bugden[2], Mary Hanley[1], Samuel Forbes[1], Anna Matejko[1]

[1] Durham University, United Kingdom, [2] University of Winnipeg, Canada

Early number word learning is a key milestone in children's mathematical development and school readiness(Geary et al., 2018). While children use number words from around age 2 and can recite the count sequence, mapping number words onto exact quantities emerges by age 5, when children become Cardinality Principle Knowers (CP-knowers; Geary et al., 2018; Wynn, 1990). Although behavioural trajectories of number word learning are well established, the neural mechanisms supporting this transition are poorly understood. This study investigates the neural bases of early number word learning and how it differs from other types of words. Specifically, we ask whether the emergence of cardinality is supported by quantity-related brain systems, language-related systems used for other categories of words, or a combination of the two. Children were classified as CP-knowers or non-CP knowers using the Give-a-Number Task (e.g., Wynn, 1992). We then examined differences in brain activation between CP-Knowers and non-CP-Knowers during a number- and colour-word task using functional near-infrared spectroscopy (fNIRS). In the number word task, children evaluated whether a spoken number word matched the number of items on a screen. A closely matched colour word task was used as a comparison condition to assess brain activity during other categories of words. Preliminary data from 32 children (Mean age=3.75) showed that CP-Knowers were more accurate and faster across both tasks than Non-CP-Knowers. fNIRS analyses revealed greater activation in the right inferior parietal lobule (IPL) in non-CP-Knowers compared to CP-Knowers during the number word task, indicating this region is sensitive to early number word knowledge. In the colour word task, CP-Knowers showed greater activation in the left IPL than non-CP-Knowers, which may reflect broader developmental changes in language or domain-general systems. Data collection is ongoing and a sample of 60 children will be collected prior to September 2026.

Thursday 11:00
Launch

Shared and distinct pathways for words and numbers: Insights from preschool to primary school

2. Schooling shapes the brain: neural specialization for numbers and words in early childhood

Bert De Smedt[1]*

Floor Vandecruys[1], Maaike Vandermosten[1]

[1] KU Leuven, Belgium

Experience-dependent neuroplasticity refers to the brain's ability to reorganize in response to experience. An intriguing example occurs when children begin formal schooling, acquiring skills such as symbolic number processing or reading. Because the human brain is not evolutionarily predestined for these skills, it must adapt by recycling pre-existing cortical systems. Longitudinal fMRI studies have documented substantial functional changes during the ages 5 to 7, including increasing specialization of the intraparietal sulcus (IPS) for symbolic numbers and the left fusiform gyrus for words. However, because these changes coincide with formal school entry, it remains unclear whether these changes are driven by schooling or age. The present study addressed this question using a quasi-experimental school cut-off design to disentangle the effects of schooling from those of age. Specifically, we compared children who entered formal primary education with similarly aged peers who remained in preschool. The school cut-off design has been put forward as a clever quasi-experimental approach to disentangle the effects of schooling and maturational processes, but it has never been used in the context of neural specialization for numbers and words. Sixty-four children (36 schooling, 28 non-schooling) were scanned twice, one year apart, while they performed a passive fMRI task involving visually presented digit sequences and words. Mixed-effects models in 57 children revealed schooling-driven increases in neural activation. Children who attended first grade showed increased activation for numbers in the right inferior parietal cortex. They also showed increased activation for words in the left fusiform gyrus and left supplementary motor area. These effects were absent in similar-aged peers, who remained in preschool. Our findings support the notion that schooling acts as a key driver of functional specialization for numbers and words, above and beyond age-related maturation – providing an intriguing example of experience-dependent neuroplasticity and the neuronal recycling hypothesis.

Shared and distinct pathways for words and numbers: Insights from preschool to primary school

3. How early reading, math and cognitive skills support each other in kindergarden through second grade

Anne van Hoogmoed[1]*

Bob Kapteijns[2], Marco van de Ven[1], Evelyn Kroesbergen[1], Roger Kievit[1]

[1] Radboud University, Netherlands; [2] Maastricht University, Netherlands

Early literacy and numeracy are strongly related across development, but the mechanisms underlying their association remain debated. We adopted a mutualism-based framework, focusing on longitudinal couplings between domains including word reading, mathematics, and various cognitive skills in 205 Dutch children followed across five waves from kindergarten (mean age: 5.43 years) to Grade 2 (mean age: 7.41 years). Ten domains were assessed, including phonological skills, vocabulary, symbolic comparisons, applied math, verbal and visuospatial working memory, fluid reasoning, RAN, word reading fluency, and arithmetic fluency. Growth curve analyses revealed that higher initial skill levels in several domains, including phonological skills and RAN, were associated with steeper growth rates in word reading and arithmetic. Moreover, we found positive, albeit small associations between growth rates across various domains, providing partial support for what we introduce as the 'developmental manifold': the notion that the rate of growth (slope) in one cognitive/academic domain is positively associated with slopes in other domains, across kindergarten and early primary education. Notably, age and parental education levels were associated with initial skill levels in various domains, but generally not with rate of growth. Finally, regression analyses indicated that word reading fluency in Grade 2 was predicted by initial levels (but not growth) in phonological skills, arithmetic and RAN, beyond the autoregressive effects of prior word reading development, highlighting longitudinal cross-domain interrelations. Conversely, arithmetic fluency in Grade 2 was only predicted by autoregressive effects of prior arithmetic. Together, our findings demonstrate the crucial importance of longitudinal, multi-domain measurements to understand the developmental interplay between domains more commonly studied in isolation.

Parallel session: Day 1

Symposium #2

Thursday 11:00
Spotlight

Chair: Léa Chrétien

Discussant: Arnaud Viarouge

The development of children's metacognitive regulation and its role in academic learning

Metacognitive regulation, a key predictor of academic learning, refers to the real-time processes through which individuals monitor and control their cognition and learning. Key questions about the development of metacognitive regulation remain unresolved. First, there is ongoing debate about the emergence of domain-general versus domain-specific metacognitive regulation processes. Second, the relative contribution of metacognitive regulation to academic learning compared to other cognitive factors, such as executive functions, remains unclear. Third, findings on the association between metacognitive regulation and academic performance are inconsistent, raising questions about when metacognitive regulation meaningfully supports learning. Finally, conclusions may be strongly influenced by methodological choices, including the tasks used and how metacognitive regulation is measured, as each developmental stage poses its own conceptual and measurement challenges.

To address these issues, this symposium brings together three complementary studies that examine metacognitive regulation across childhood using diverse tasks, domains, and methodological approaches. The first contribution focuses on early childhood and mathematics, investigating metacognitive monitoring and executive functions using both domain-general and domain-specific tasks, to clarify their respective contributions to mathematical performance. The second contribution examines metacognitive monitoring in primary school across multiple domains using bias-aware measurement approaches to test domain-generality and assess links with academic performance. The final contribution extends this work by focusing on the development of metacognitive control in late childhood, assessing behavioural adjustments such as post-error slowing in arithmetic and task switching to investigate domain-generality and the role of methodological design.

Together, these studies provide a nuanced account of the developmental trajectories of metacognitive regulation in mathematics and broader academic learning, highlighting domain-specific versus domain-general metacognitive regulation and its importance for academic learning in connection to children's developing executive function skills. This symposium advances theory and methodology while informing educational interventions tailored to different stages of development.

The development of children's metacognitive regulation and its role in academic learning

1. Contributions of executive functions and metacognition to mathematics achievement in children

Yasmina Rahmani[1]*

Margot Rémeau[1], Grégoire Borst[1], Arnaud Viarouge[1]

[1] Paris Cité University, France

While children's mathematics achievement has been associated with specific components such as numerical comparison, arithmetic operations, and transcoding, research also points to the role of broader general cognitive skills, including executive functions and metacognition. However, these processes have often been studied in isolation, potentially overestimating their unique contributions to mathematics achievement. In this context, the association between executive functions and mathematics achievement appears to be quite consistent across studies, whereas findings on metacognition remain mixed. Depending on the choice of metacognitive measures, some studies reported significant associations, whereas others did not. Additionally, both executive functions and metacognition appear to be domain-specific at first but gradually generalize across time, suggesting stronger links with mathematics when measured using numerical rather than non-numerical content, even when assessed with isomorphic tasks differing only in domain. Therefore, the present study aimed to examine the unique and joint contributions of these processes when measured with numerical content (domain-specific) versus non-numerical content (domain-general) at different ages. In a cross-sectional study, 418 children from kindergarten to third grade completed mathematics tasks (numerical comparison, arithmetic operations, transcoding), executive functions tasks (working memory, inhibition) and metacognitive monitoring tasks. Executive functions and metacognitive monitoring were assessed using both domain-general and domain-specific tasks. Consistent with prior findings, executive functions were significantly associated with mathematics performance. More specifically, domain-specific measures were consistently associated with mathematics, whereas domain-general measures were not. In contrast, metacognition, regardless of domain, was not associated with mathematics tasks. These findings clarify the distinct contributions of metacognition and executive functions to mathematics achievement, indicating that executive functions, particularly when assessed in domain-specific contexts, constitute the primary factor underlying this association.

The development of children's metacognitive regulation and its role in academic learning

2. The development of metacognitive monitoring in academic learning during primary school

Suzanne Rotsaert[1]*

Elien Bellon[1], Jacob Paul[2], Iroise Dumontheil[2], Bert De Smedt[1]

[1] KU Leuven, Belgium; [2] The University of Melbourne, Australia

Metacognitive monitoring, or the subjective self-assessment of performance, is a critical component of self-regulation. While this metacognitive monitoring predicts academic achievement, its development remains unclear. Debate persists over whether monitoring processes are domain-specific or domain-general, with evidence suggesting increasing domain-generality across primary school. Prior research on children examined domain-generality primarily within academic domains, often within limited age ranges, making the timing and extent of this shift toward domain-general monitoring uncertain. Moreover, frequently used measures of monitoring are confounded with task performance, making it difficult to disentangle metacognitive ability from academic achievement and underscoring the need for bias-aware assessment. Therefore, this study examines the presence and timing of a shift towards domain-general metacognitive monitoring in academic and non-academic domains during primary school using a hierarchical Bayesian signal detection theory framework, HMeta-d'. Children from second (7-8 years old) and fourth (9-10 years old) grade completed computerized arithmetic, spelling, and abstract reasoning tasks with trial-by-trial confidence ratings, assessing their metacognitive monitoring. General performance in these domains was assessed using standardized pen-and-paper tests. Primary analyses used HMeta-d' to estimate group-level metacognitive monitoring. We observed correlations in monitoring across domains in both grades, suggesting metacognitive monitoring is domain-general by age 7-8. Unlike earlier studies, we found no association between monitoring and performance, and there was no difference in monitoring from second to fourth grade. This suggests that monitoring skills may not yet be sufficiently developed to shape performance at this age. Our use of bias-aware measures reveals that prior associations between monitoring and performance may have reflected task performance rather than true metacognitive ability. This integration between bias-aware measures and ecologically valid classroom tasks provides precise, contextually relevant insights into metacognitive monitoring in primary school, informing interventions to foster self-regulation.

The development of children's metacognitive regulation and its role in academic learning

3. Development of metacognitive regulation in arithmetic and dimension sorting switching tasks

Aastha Sarraf[1]*

Jacob Paul[1], Elien Bellon[2], Bert De Smedt[2], Iroise Dumontheil[1]

[1] The University of Melbourne, Australia; [2] KU Leuven, Belgium

Metacognitive regulation is a higher order thinking process that enables individuals to monitor and control their behaviour during a task, by adjusting cognitive control when performance is not optimal. After making an error, individuals usually slow down, a phenomenon called post-error slowing (PES). Research suggests that PES during slow, high conflict, or difficult tasks, in which participants can improve their performance, is an indicator of metacognitive regulation. Moreover, recent studies have proposed a shift from domain-specific to domain-general metacognition around the age of 8-9 years, but there is little evidence to support this claim. This study measures adaptive behavioural adjustments, including PES, in arithmetic and dimension sorting switching tasks to investigate the development of metacognition. Children aged 7 to 13 years old from three countries completed two blocks of each switching task, with differing instructions – one emphasising accuracy, the other both speed and accuracy. We hypothesised that greater PES and accuracy would be observed in the blocks emphasising accuracy and that there would be developmental differences in block-level and trial-level adaptive behavioural adjustments. Preliminary analyses indicate that reaction times and accuracy are greater on blocks where participants are asked to focus on accuracy across both tasks. PES is also observed in both tasks. In contrast, switch costs and post-switch slowing differ between arithmetic and dimension sorting switching tasks. Analyses in the complete dataset will compare behavioural adjustments in the two tasks to investigate whether there is evidence of the development of domain general metacognitive processes in late childhood and early adolescence. These findings will help to understand how adaptive adjustments in behaviour, such as PES, moderated by task and difficulty level, may reflect the engagement of adaptive metacognitive monitoring and control.

Parallel session: Day 2

Symposium #3

Friday 11:00
Launch

Chair: Lien Peters

Discussant: Tuire Koponen

Intergenerational correlates of academic achievement

The ability to read and to solve arithmetic problems are relatively novel cultural inventions that children must acquire through formal education. These skills are supported by factors at all levels of analysis, from genetic influences, through neural and cognitive correlates, to factors in the (home) environment of children (see e.g., van Bergen et al., 2014). In this symposium, we will specifically focus on intergenerational, parent-child correlates of academic achievement. How do parental abilities relate to children's skills? To what extent do parents' abilities influence the home learning environment they shape for children (see e.g., Hart et al., 2021)?

This symposium will comprise three contributions. First, dr. Heide Korpipää (University of Jyväskylä, Finland) will discuss the extent to which parents and children share similar patterns of covariation between reading and arithmetic. Second, dr. Tonje Amland (University of Oslo, Norway) will present a study examining to what extent the home learning environment of a child predicts their arithmetic development while accounting for parental skills. Finally, dr. Lien Peters (Ghent University) will review how the associations between subcomponents of reading and arithmetic differ between parents and children, and how intergenerational correlates for academic abilities are reflected at the neural level.

The theoretical, methodological and broader implications of these contributions for the broader field will be discussed.

Intergenerational correlates of academic achievement

1. The association of reading and arithmetic fluency profiles between parent and child

Heidi Korpipää[1]*

Lien Peters[2], Minna Torppa[1], Pilvi Peura[1], Jenni Salminen[1], Tuire Koponen[13]

[1] University of Jyväskylä, Finland; [2] Ghent University, Belgium; [3] University of Stavanger, Finland

Children's reading and arithmetic skills are central tools for learning, and dysfluency in both domains is a central feature of learning difficulties—namely, reading and math difficulties. These skills show substantial overlap, and co-occurring difficulties markedly increase the risk that children will not benefit from learning support. Learning difficulties run in families through both genetic inheritance and environmental transmission, yet the extent to which parents and children share similar patterns of covariation between reading and arithmetic fluency remains insufficiently understood. The present study examines which kinds of reading-arithmetic fluency profiles can be identified among 3rd graders and their parents and to what extent the overlap in arithmetic and reading skills is shared between parents and children. The study utilized data from 703 3rd grade children and 296 parents participating in the VUOKKO longitudinal study. First, Latent Profile Analysis was conducted to identify distinct arithmetic and reading fluency profiles among children and their parents. Second, the similarities between children's and parents' skill profiles will be examined, focusing especially on low performers. Using LPA, a total of six distinct arithmetic and reading fluency profiles were identified for children and four for parents. The results revealed two distinct profiles of low performers among the children: those with weaknesses in both domains, and those with weak arithmetic skills but average reading skills. No profile emerged in which reading alone was clearly weak. The same pattern was observed among the parents. The results support the idea that weak reading fluency indicates arithmetic dysfluency, but weak arithmetic fluency does not necessarily indicate dysfluency in reading. This suggests that the background of arithmetic difficulties is heterogeneous, and contributing factors are partially shared with reading difficulties. Similarities between children and parents will be analyzed later and findings will be presented and discussed at the conference.

Intergenerational correlates of academic achievement

2. Parent-child associations and the home numeracy environment

Tonje Amland[1]*

Germán Grande[2], Elsje van Bergen[3], Monica Melby-Lervåg[1], Arne Lervåg[1]

[1] University of Oslo, Norway; [2] OsloMet, Norway, [3] Vrije Universiteit, Netherlands

Studies on the home numeracy environment (HNE) show mixed evidence of its link with children's mathematical skills (Daucourt et al., 2021; Hart et al., 2016; Skwarchuk et al., 2014). A rarely considered aspect is parents' dual role as providers of the home environment and transmitters of genetic predispositions relevant for learning. Parents' maths abilities may serve as a proxy for the genetic transmission that confounds the home-child association (Grande et al., 2025; Torppa et al., 2025; van Bergen et al., 2014). The aim of this work was to examine whether numeracy activities at home predict children's arithmetic development, while accounting for parents' arithmetic ability and children's initial skill level. We analysed data from 244 Norwegian children, 201 mothers, and 146 fathers. Children's arithmetic fluency was assessed in Grades 1, 3, 4, 5 and 6. Parents completed an HNE questionnaire and an arithmetic assessment when children were in Grade 2. Relations among HNE, parental arithmetic, and children's arithmetic development were tested using structural equation modelling. Results show that both formal and informal HNE predicted Grade 3 arithmetic. After controlling for parental arithmetic, only mothers' informal HNE remained associated with Grade 3 performance. When Grade 1 arithmetic was included, only fathers' formal activities were related to Grade 3 skills, while both parents' arithmetic still predicted Grade 3 performance. Only Grade 1 arithmetic predicted Grade 3 as well as subsequent growth. The finding that parental arithmetic predicted children's arithmetic beyond family activities underscores the importance of addressing familial confounding in research on the home environment. Furthermore, future research should consider parents' skills, children's early skills and HNE as a dynamic process. For the present symposium contribution, findings will be discussed in light of similar studies of the home numeracy environment, and a parallel investigation of reading skills in the same sample.

Friday 11:00
Launch

Intergenerational correlates of academic achievement

3. Intergenerational neurocognitive influences on reading and arithmetic

Lien Peters[1]*

Aymee Alvarez Rivero[2], Marc Joanisse[2], Daniel Ansari[2]

[1] Ghent University, Belgium; [2] University of Western Ontario, Canada

Arithmetic and reading are critical skills that shape individual's academic trajectories, as well as more distal life outcomes such as employment opportunities, societal participation and health. Although these are culturally acquired abilities, reading and arithmetic are highly heritable. However, the mechanisms through which the interactions between genetic and environmental factors translate into complex behaviors such as arithmetic or reading remain unclear. Data from the PACMAN-project will be presented. Within this project, 47 mother-child dyads (children ranged between 10 and 14 years old) completed the same broad behavioral testing battery. This battery includes measures of reading and arithmetic ability, and domain-specific (e.g., phonological processing, number processing) and domain-general predictors (e.g., working memory, non-verbal reasoning) of academic skills. In 34 dyads, neuroimaging data (functional and structural MRI) were also collected. Participants completed a single-digit arithmetic verification and a rhyming task inside an MRI scanner. Finally, participating families filled out a home learning environment questionnaire. Two sets of analyses will be presented and discussed. First, we will review how the associations between behavioral measures of reading and arithmetic differ between mothers and children. Is the underlying structure of reading, arithmetic and their covariation similar within mother-child dyads? Second, we will discuss to what extent the neural correlates of reading and arithmetic are similar between mother-child dyads. Are similar regions recruited in a similar way when children and mothers perform the same task? The broader implications of these findings will be discussed during the symposium. Profile emerged in which reading alone was clearly weak. The same pattern was observed among the parents. The results support the idea that weak reading fluency indicates arithmetic dysfluency, but weak arithmetic fluency does not necessarily indicate dysfluency in reading. This suggests that the background of arithmetic difficulties is heterogeneous, and contributing factors are partially shared with reading difficulties. Similarities between children and parents will be analyzed later and findings will be presented and discussed in the conference.

Parallel session: Day 2

Symposium #4

Friday 11:00
Spotlight

Chair: Shiva Taghizadeh

Discussant: Ian Lyons

Metacognition in Educational Context: From Neural Mechanisms to Adaptive Learning Processes

Metacognition—the ability to evaluate one's own cognitive processes (monitoring), and to regulate behavior to improve performance (control)—plays a central role in academic achievement. Yet a key challenge remains in linking lab-based conceptual research to how learners monitor and regulate their performance in real educational contexts. This symposium brings together three contributions examining metacognitive monitoring and control as an online process (trial-by-trial) during educational problem-solving, on neural and behavioral levels. United by a shared concern: How can findings and measurements from conceptual experiments be extended to capture the complexity of real-world learning?

First, Shiva Taghizadeh presents neurophysiological evidence from children solving arithmetic problems, showing that metacognitive monitoring is associated with a neurophysiological signal (Pe) elicited 250-350 ms after response—known as an aware error-detection signal—rather than early automatic error detection, suggesting that confidence judgments might emerge from a post-decisional evaluation. Second, Eveline Jacobs presents a behavioral study in 8-9 year-old children using a novel arithmetic learning paradigm, demonstrating that implicit trial-by-trial adjustments, such as post-error strategy changes, are critical indicators of metacognitive control and uniquely predict learning gains, whereas other metacognitive measures (e.g., post-error slowing or explicit restudy choices) do not. Extending this perspective, Damien S. Fleur presents neuroimaging findings from adults across two cognitive domains, visual memory tasks (using words) and the visual perception (dot-comparison task), showing that metacognition measured in educational contexts partially overlaps with domain-specific mechanisms identified in conceptual tasks, while also engaging additional brain regions, suggesting broader, context-sensitive processes.

Drawing on multiple methods and measures, these contributions collectively advance a more nuanced understanding of metacognition as a dynamic system underpinning learning in educational settings—and help build a bridge between educational and cognitive neuroscience.

Metacognition in Educational Context: From Neural Mechanisms to Adaptive Learning Processes

1. Neurocognitive mechanisms of metacognitive monitoring during children's arithmetic problem-solving

Shiva Taghizadeh[1]*

Eveline Jacobs[2], Stephan Vogel[1], Elien Bellon[2], Paul Sedlmayr[1], Clemens Brunner[1], Roland H. Grabner[1], Bert De Smedt[2]

[1] University of Graz, Austria; [2] KU Leuven, Belgium

How children evaluate the correctness of their own arithmetic decisions in real time—and which neural mechanisms underlie this capacity—remains among the least- examined questions in developmental metacognition research. Metacognitive monitoring, operationalized here as trial-by- trial alignment (i.e., calibration) between subjective confidence and objective performance, is central to adaptive learning, yet its neurocognitive basis during ongoing task execution in children is poorly understood. Based on our previous work with adults, we hypothesized an association between error processing electroencephalographic (EEG) components and metacognitive processing. To address this, we examined behavioral and EEG correlates of on-task metacognitive monitoring in 10–12-year-old children (preliminary sample: n = 32, mean age = 10. 84, female = 20). Participants completed a two-alternative forced-choice multiplication verification task (single- to double- digit problems), followed by retrospective confidence ratings (How confident are you in your response?) on a six-point scale (1 = not sure, 6 = sure). EEG was recorded using a 64-channel system. Drawing on a comparable paradigm from our adult data, analyses targeted Ne amplitude (0–100 ms post-response) at fronto-central sites and Pe amplitude (250–350 ms post-response) at centro-parietal sites, with calibration and arithmetic performance, accuracy and reaction time, as behavioral indices. Behavioral analyses revealed a strong positive association between calibration and accuracy ($r = .81$, $p < .001$), with no significant relationship between calibration and reaction time. Preliminary analysis at the neural level showed no confidence-related modulation of Ne amplitude, whereas Pe amplitude was systematically larger for low- relative to high-confidence responses ($b = - .44$, $p < .001$) at Cz. These findings replicate the association between metacognitive monitoring, Pe amplitude, and arithmetic performance in children, mirroring our adult data, and extend confidence-monitoring models of post-response evaluation to academic contexts, highlighting the role of metacognition in arithmetic problem solving.

Metacognition in Educational Context: From Neural Mechanisms to Adaptive Learning Processes

2. Post-error adjustments as indicators of metacognitive control support children's arithmetic learning

Eveline Jacobs[1]*

Bert De Smedt[1], Shiva Taghizadeh[2], Stephan Vogel[2], Elien Bellon[1]

[1] KU Leuven, Belgium; [2] University of Graz, Austria

Metacognitive control is widely recognized as a predictor of learning and academic success. However, most evidence comes from studies examining the outcomes of learning, leaving its role during the learning process itself unclear. In addition, metacognitive control is typically assessed using explicit methods, such as questionnaires or forced metacognitive decisions, which may not accurately reflect children's spontaneous behavior. To address these gaps, the current study assessed metacognitive control using implicit trial-by-trial markers of metacognitive control, namely post-error adjustments, in combination with an explicit measure within an arithmetic learning paradigm. A total of 150 children aged 8-9 practised a novel task, namely alphabet arithmetic, across three consecutive days. Metacognitive control was captured through three indices. Two implicit trial-level measures captured post-error adjustments: post-error slowing (PES), reflecting whether children slowed their response times after committing an error, and post-error strategy change, indexing the proportion of trials in which children reverted to a procedural back-up strategy after a retrieval error. Additionally, an explicit measure assessed children's restudy decisions about whether to practice specific problems more or less. Results showed that children engaged in all three forms of metacognitive control. However, the measures were not positively correlated with one another and in some cases were negatively related, suggesting that they capture distinct aspects of metacognitive regulation. Importantly, while PES was linked to initial performance at the start of training, post-error strategy changes were a predictor for learning gains in terms of accuracy throughout the training, even after controlling for intellectual ability. In contrast, explicit restudy choices were not related to either overall performance or learning gains. Together, these findings demonstrate the value of implicit, trial-level measures of metacognitive control and highlight the adaptive role of post-error adjustments in supporting arithmetic learning.

Metacognition in Educational Context: From Neural Mechanisms to Adaptive Learning Processes

3. The Impact of Time-Pressure on Math Learning and Math Anxiety

Ian Lyons[1]*

Erika Ikeda[1]

[1] Georgetown University, USA

Time-pressure is a common feature of mathematics education, and it is believed to reduce resources available for metacognitive processes, such as strategy selection, emotion regulation, and feedback evaluation. As such, strong claims have been made about the deleterious impact of time-pressure – namely, that it reduces math-learning and increases math-anxiety. To our knowledge, however, these claims have been made largely in the absence of direct empirical evidence. We test them here. We examined the impact of time pressure during arithmetic fluency practice on learning and anxiety. Fluency practice was integrated into the existing 4^{th}- and 5^{th}-grade math curricula (mid-SES rural U.S. school district). Classrooms were randomly assigned to complete fluency practice with or without time pressure for two weeks. Timed practice significantly reduced math-learning (i.e., smaller fluency gains, d=-.42) and increased math-anxiety at the trait-level (d=.54). Reductions in math-learning were strongest for more challenging problems (d=-.58), for which metacognitive processes are expected to be most relevant. Increases in math-anxiety were primarily driven by anxiety about practicing math (d=.78), which is susceptible to metacognitive breakdowns such as procrastination and avoidance. We also found evidence that the impacts of time-pressure practice on reductions in math-learning and increases in math-anxiety were bi-directionally co-dependent: reduced math-learning ($^{\downarrow}$ML) explained 21.9% of the relation between practice under time-pressure (TP_{Prac}) and increases in math-anxiety ($^{\uparrow}$MA): TP_{Prac} → $^{\downarrow}$ML → $^{\uparrow}$MA; and increases in math-anxiety explained 24.6% of the relation between practice under time-pressure reduced math-learning: TP_{Prac} → $^{\uparrow}$MA → $^{\downarrow}$ML. In sum, our results provide empirical support for the claim that time-pressure reduces math-learning and increases math-anxiety. More specific effects and the co-dependent nature of these effects point toward the potential role of metacognitive processes. Future work might probe these processes more directly, and examine the impact of learning more conceptual knowledge under time-pressure.

Flash talks

Thursday 13:30
Spotlight

#2 Auditory Selective Attention Across Development: Evidence from a Diverse, Museum-Based fNIRS Study — Gavkhar Abdurokhmonova

#3 Thinking Together: Transactivity and Inter-Brain Synchrony in Peer Collaboration — Reem Al Najjar

#7 Language, attention and brain functional activity in children with neurodevelopmental disorders — Anna Banaszkiewicz

#8 The neural basis of metacognitive monitoring: specific or shared across spelling and arithmetic? — Brent Pitchford

#14 Reading and audiovisual speech perception in noise in adults with different reading skills — Melis Çetinçelik

#32 Supporting Early Childhood Educators to Foster Self-Regulation and Executive Function — Rosalyn Muir

Trainee Workshop

Navigating Publication and Peer Review as a Trainee

Friday 12:30
Spotlight

Presenters: Gracia Edwards (Elsevier), Marta Baena Jurado (Elsevier), Dietsje Jolles (Leiden University), Linda van Leijenhorst (Leiden University)

Overview:

This session offers practical guidance on publishing in peer-reviewed journals for students and early-career researchers. The workshop will draw on frontline experience in academic publishing and the perspectives of active peer reviewers.

The workshop will also provide guidance on preparing manuscripts for peer review, what peer reviewers look for when evaluating submissions, how to understand and respond to reviewer feedback, and how to make decisions about where to publish. The session will also address the use of AI tools in publications and how to use these resources responsibly. Overall, the workshop will provide current perspectives on academic publishing and demystify the manuscript preparation and peer review process.

Poster presentation #1

A randomised trial examining the effect of sports on executive functions - Aishah Abdul Rahman[1]*, Wei-Peng Teo[1]

[1] National Institute of Education/Nanyang Technological University, Singapore

Background: Executive functions (EF) are cognitive processes that support goal-directed behaviours. They are associated with multiple life outcomes, including education (Fuhs et al. 2014). Physical activity has been found to be beneficial to EF. However, the qualitative characteristics of physical activity that are pivotal for the benefits on EF are not clear (Pesce et al. 2012). It has been suggested that physical activity in the context of sports may carry more benefits than physical activity that is repetitive, with minimal cognitive demands (Diamond & Ling, 2020). The goal of this study was to examine the effects of cognitively-engaging physical activities on EF in adolescents. Methodology: A total of 90 students aged 13 – 15 years participated in this study. In the pre-training phase and post-training phases, students completed computerised EF tasks while we measured their scalp brain ERP. In the six week training phase, students were randomly assigned to one of three groups: (1) sports, (2) aerobic physical activity, (3) active control. Findings: A repeated measures ANOVA was carried out to assess the effects of physical activity on executive functions. For accuracy, there was a main effect of flanker condition ($p < .001$). Flanker accuracy did not differ between pre- and post intervention conditions, nor was there an interaction between flanker condition and time. For RT, there was a main effect of flanker condition ($p < .001$) and main effect of time ($p < .05$). However, for both accuracy and RT, there was no interaction between group and time. Hence, our data does not support our hypotheses that sports would have a more enhanced benefit on executive functions than more repetitive type of physical activities. This is probably limited by the small sample size and short training duration. Future studies should aim to enhance the evidence base on this subject through more robust sample sizes and longer training duration.

Poster presentation #2

Auditory Selective Attention Across Development: Evidence from a Diverse, Museum-Based fNIRS Study

- Gavkhar Abdurokhmonova[1]*, Alicia Mortimer[1], Rachel Romeo[1]

[1] University of Maryland, United States

Understanding speech in noisy classrooms requires auditory selective attention — the ability to focus on a target voice while suppressing competing input. This skill is foundational for learning and academic achievement, yet its neural underpinnings and how they vary across development and language background remain poorly understood. Bilingual children, who routinely manage two languages, may develop enhanced selective attention through this experience (Bialystok & Martin, 2012; Poulin-Dubois et al., 2011), though findings are inconsistent and likely depend on individual differences in age of exposure, proficiency, and multilingual history. Understanding these differences has direct implications for how educators support linguistically diverse learners in increasingly multilingual classrooms. A diverse community sample of 260 English speakers (ages 4–85) was recruited at a language-themed museum. Participants reported language background (languages known, proficiency across understanding, speaking, and reading modalities, and age of acquisition) and completed a dichotic listening task while functional near-infrared spectroscopy (fNIRS) recorded activation from bilateral inferior frontal gyrus (IFG) and superior temporal gyrus (STG). Three conditions (binaural, backward, and dichotic) systematically isolated speech comprehension and selective attention demands, with comprehension questions indexing behavioral performance trial-by-trial. Behavioral results from 60 children (ages 4–14; M=9.63, SD=2.62) showed greater accuracy (B=0.06, p=0.047) and faster responses (B=-0.42, p=0.008) on dichotic relative to binaural trials, with older children outperforming younger peers in both accuracy (B=0.05, p< 0.001) and response speed (B=-0.17, p=0.034). Bilinguals showed a marginal accuracy advantage (B=0.08, p=0.08). These findings suggest that classroom-relevant selective attention is developmentally sensitive and potentially shaped by bilingual language experience. Ongoing fNIRS analyses examining IFG and STG activation will clarify the neural mechanisms underlying these individual differences, with implications for neuroscience-informed, inclusive, and language-responsive educational practice.

Poster presentation #3

Thinking Together: Transactivity and Inter-Brain Synchrony in Peer Collaboration - Reem Al Najjar[1]* Justine Cassell[1], Pierre Dillenbourg[2]

[1] National Institute for Research in Digital Science and Technology (INRIA), France
[2] Swiss Federal Institute of Technology in Lausanne (EPFL), Switzerland

Collaborative learning depends not on co-presence alone, but on how participants engage with one another's reasoning (Dillenbourg, 1999). One key mechanism is transactivity, defined as discourse moves that operate on a partner's ideas (Berkowitz & Gibbs, 1983; Weinberger & Fischer, 2006). In parallel, hyperscanning research has identified inter-brain synchrony (IBS), the coherence of neural activity across individuals, as a marker of interpersonal coordination (Hasson et al., 2012). However, the interactional processes that give rise to IBS remain insufficiently specified. This raises a critical question: Is IBS associated with how much participants talk, or how they engage with each other's reasoning? We therefore hypothesize that higher levels of transactivity, i.e., actively building on a partner's ideas, are associated with increased IBS.fNIRS hyperscanning data were collected from 13 dyads of 9–10-year-old children in a four-week computer-mediated collaborative protocol. Transactivity was coded in 30-second windows (high, moderate, low; meta-talk, off-task), and IBS was computed using wavelet transform coherence and averaged over corresponding windows. Linear mixed-effects models tested these relationships, with dyad as a random effect. Results show that IBS is associated with interaction quality rather than quantity. Specifically, the ILR (isometric log-ratio) contrast capturing high versus lower (moderate and low) transactivity significantly predicts IBS ($z = 3.37$, $p = 0.0008$), whereas total task-related talk does not ($z = -0.99$, $p = 0.322$). Although no main effect of week was observed, a significant interaction between time (week 1 to week 4) and high transactivity ($z = -2.75$, $p = 0.0059$) indicates that dyads with higher initial transactivity exhibit a steeper decrease in IBS across weeks than those with lower transactivity, leading to both groups converging on low IBS by the final week. Taken together, these findings suggest that IBS reflects the microstructure of collaborative reasoning and changes in neural alignment across repeated collaboration.

Poster presentation #4

Psychometric Evaluation of the Arabic ASQ-3 for Developmental Screening in Early Childhood

- Roaa Alsulaiman[1*], Fahad Alnemary[2], Haifa Alroqi[3], Aisha Alfadhala[4], Luis Anunciacao[5]

[1] King Saud University, Saudi Arabia
[2] Ynmo, Saudi Arabia
[3] King AbdulAziz University, Saudi Arabia
[4] Private Practice, Kuwait
[5] University of Oregon, United States

Early identification of developmental delays is a central component of preventive child health and early education systems. Research consistently demonstrates that children with developmental disabilities who access structured early learning environments show significantly better outcomes in language, cognition, social-emotional functioning, and adaptive behavior than those who do not (McGlade et al., 2023; Nelson et al., 2024). In Saudi Arabia, the expansion of early childhood services has increased the demand for systematic developmental screening. Several internationally recognized parent-completed tools exist for this purpose, such as the Ages and Stages Questionnaire, Third Edition (ASQ-3), which includes five domains, including communication, gross and fine motor skills. While an Arabic translation of the ASQ-3 is available, its utility in the Saudi population is constrained by several factors. This study examined the psychometric properties of the ASQ-3, evaluating its reliability, and score distributions across age-specific forms. The sample comprised 42,680 caregiver-completed ASQ-3 assessments of children aged 2 to 60 months, representing all age-specific ASQ-3 intervals. Internal consistency reliability was estimated using ordinal Cronbach's alpha. The internal structure of the ASQ-3 was evaluated using confirmatory factor analysis with a diagonally weighted least squares estimator appropriate for ordered categorical data. Domain scores showed adequate dispersion across age-specific forms, with no evidence of floor or ceiling effects. Reliability estimates were within acceptable ranges across domains. Confirmatory factor analyses supported the proposed five-domain structure, with model fit indices indicating satisfactory fit according to conventional psychometric criteria. This study provides evidence supporting the psychometric soundness of the Arabic version of the ASQ-3. The findings address a critical gap by offering large-scale validation of a widely used developmental screening tool. The results support the use of the Arabic ASQ-3 as a practical tool for early identification of developmental risk and contribute to ongoing efforts to strengthen early childhood screening systems.

Poster presentation #5

The Bilingual Paradox: Ear Dominance and Phonological Skills in Pre-reader Children

Eneko Anton[1]*, Katya Martin-Requejo[1], Marie Lallier[2], Hadeel Ershaid[2]

[1] Mondragon University, Spain
[2] The Basque Center on Cognition, Brain and Language, Spain

Reduced hemispheric dominance in the syllable dichotic listening paradigm presents a paradox: it is associated with poorer phonological skills, as in dyslexia, but with enhanced abilities in bilinguals. This suggests distinct underlying mechanisms for literacy outcomes. We addressed this paradox by examining whether ear dominance in 88 bilingual pre-readers is modulated by overall task performance or linguistic context (mostly monolingual vs. mostly bilingual), and how these factors relate to phonological development. Mixed-model ANOVAs revealed that ear dominance was significantly modulated by overall task performance: higher performers exhibited stronger "typical" right-ear dominance (RED). Crucially, Pearson correlation analyses uncovered a double dissociation in phonological outcomes. While better phonological skills were predicted by stronger RED in low performers, they were predicted by reduced dominance in high performers. Despite these divergent neural patterns, the two groups did not differ in absolute phonological ability. Furthermore, ANOVA results indicated that linguistic context (monolingual vs. bilingual) did not significantly influence these effects. In line with the callosal dichotic listening model, these findings suggest that bilingual children employ different neural strategies to achieve successful phonological outcomes. Reduced dominance in high performers may reflect enhanced interhemispheric connectivity and bilateral integration. Conversely, reliance on a more lateralized, left-hemisphere strategy in low performers may occur when interhemispheric integration is not yet optimally engaged. These results highlight the neurocognitive plasticity of the pre-reading brain in bilingual environments.

Poster presentation #6

Musical Foundations of Literacy: A Longitudinal Study from Kindergarten to Primary School - Katya Martin-Requejo[1]*, Marie Lallier[2], Hadeel Ershaid[2], Eneko Anton[1]

[1] Mondragon University, Spain
[2] The Basque Center on Cognition, Brain and Language, Spain

This study presents baseline data from a three-year longitudinal project tracking a cohort from Kindergarten to second-year Primary Education. It examines the predictive value of early musical skills and home environments on the transition from pre-literacy foundations to formal reading acquisition. Educational neuroscience suggests that music and language share neurocognitive mechanisms for auditory processing. While rhythmic and melodic perception are considered precursors to phonological awareness, longitudinal evidence remains limited on how these skills and the home environment facilitate the transition into formal reading. The baseline phase involved 64 Kindergarteners assessed on melodic and rhythmic proficiency, musical memory, and non-verbal intelligence (K-BIT). Pre-literacy markers included phonological awareness (first-syllable deletion), letter naming, phonological memory, non-word reading, and rapid naming (RAN). A family questionnaire quantified the home musical environment. Preliminary analyses showed significant correlations between musical skills and pre-literacy markers. Crucially, hierarchical regression analysis revealed that musical skills are robust predictors of phonological awareness beyond the influence of general intelligence. While non-verbal intelligence explained only 8.1% of the variance, adding melodic and rhythmic skills increased the explained variance to 35.5% (R^2 change = .274, $p < .001$). In the final model, both melody ($\beta = .351$, $p = .002$) and rhythm ($\beta = .335$, $p = .004$) emerged as unique predictors, while intelligence became non-significant ($p = .175$). Additionally, children with higher musical proficiency outperformed peers in letter naming ($p = .009$). The home environment showed no significant association ($p > .05$), likely due to the limited formal musical training and similar exposure levels within the cohort at this age. These results underline that individual musical skills provide a neurocognitive advantage for phonological readiness, independent of general intelligence. This ongoing longitudinal tracking will clarify if early musical advantages act as a protective factor for reading fluency, supporting the integration of music in early childhood curricula.

Poster presentation #7

Language, Attention and Brain Functional Activity in Children with Neurodevelopmental Disorders

- Anna Banaszkiewicz[1]*, Karolina Zielińska[1], Hanna Górecka[1], Anna Redeł[1], Anna Szukało[1], Katarzyna Jednoróg[1]

[1] Nencki Institute of Experimental Biology, Polish Academy of Sciences, Poland

Approximately 15% of children have one or more neurodevelopmental disorders (NDDs) affecting their communication, attention and cognition (Gidziela et al., 2023). These heterogeneous difficulties characterize autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD) and developmental language disorder (DLD). Our preregistered study (https://osf.io/vmxnf) aims at investigating a relationship between language, attention and brain activity in 5-7 year-old children with ASD (N=77; 34 girls), ADHD (N=75; 34 girls), DLD (N=19; 7 girls) and a control group (N=74, 40 girls) – all Polish monolingual speakers with typical IQ. We used a Language Development Test (Smoczynska et al., 2015) to assess vocabulary, grammar and discourse. Attention was measured using a go/no-go (GNG) task (accuracy, reaction times of correct responses and d-prime) and the Attention Network Task (executive control, alerting and orienting; Rueda et al., 2004). One-way ANOVAs were computed to test group differences (without DLD due to small N) in language and attention measures. During fMRI, children performed a language localizer task listening to passages from Alice in Wonderland (intact condition) and acoustically distorted control condition (Malik-Modaleda et al., 2022). Besides whole-brain analyses comparing intact > distorted within- and between-groups beta values were extracted in the entire sample (N=245) from independent left-hemispheric regions of interest: inferior frontal, superior temporal and middle frontal gyri (IFG, STG, MFG), and correlated with behavioral measures. There were no group differences in language and attention skills. The localizer activated language regions, including bilateral STG in all groups and the left IFG in ASD, ADHD and controls, but not DLD (FWE corrected); however, group differences were not significant. We found positive associations between all language scores, IFG and STG, and between grammar and the MFG. Vocabulary and grammar correlated positively with GNG d-prime scores. This study may expand understanding of neurodivergent development, evaluating links between language and attention and informing early interventions.

Poster presentation #8

The Neural Basis of Metacognitive Monitoring: Specific or Shared Across Spelling and Arithmetic?

- Brent Pitchford[1]*, Elien Bellon[1], Andrea Costantino[1], Eveline Jacobs[1], Suzanne Rotsaert[1], Floor Vandecruys[1], Hans op de Beeck[1], Bert De Smedt[1]

[1] KU Leuven, Belgium

Academic abilities are fundamental for success in everyday life. The ongoing evaluation of one's own knowledge and performance, metacognitive monitoring, is thought to play a vital role in the learning of these skills across the lifespan. Whether it is due to underlying domain-specific or domain-general neural processes remains to be answered. To address this, we examined metacognitive monitoring in two related but distinct academic domains: spelling and arithmetic. Thirty adult participants completed a paradigm including a calibration phase and a scanning phase. In the calibration phase, participants were presented with spelling and arithmetic problems ranging in difficulty. Easy and hard problems for each individual were selected based on performance during the calibration phase and then presented within the MRI scanner during the scanning phase. They were asked to report their confidence following their responses. Overall, performance was better (i.e., higher accuracy and faster responses) during easy versus hard trials, for both spelling and arithmetic problems. Participants reported very high confidence on the majority of trials, while confidence was lower following inaccurate responses. We applied multivoxel pattern analysis (MVPA) to the fMRI data, including the task-related activity and activity when engaging in metacognitive monitoring. Preliminary findings suggest that both the domain and difficulty of the problems were represented across many regions of the cortex, from lower-level visual to higher-level frontal regions. An MVPA cross-decoding analysis reveals varying degrees of domain specificity in the representation of difficulty and its metacognitive monitoring. These results provide important insights into how metacognitive monitoring in academic contexts involves both domain-specific and shared neural processes, with implications for future avenues to better understand how these skills are acquired and supported across the lifespan. Funding: This work was supported by the Methusalem Fund, KU Leuven (Grant No. METH/24/003)

Poster presentation #9

Evaluation Study of EF Development Programs in Different Settings

- Zuzana Štefánková[1]*, Zuzana Bílková[1], Kateřina Habrdová[1], Sára Šestáková[1]

[1] University of South Bohemia, Czech Republic

Executive functions are essential prerequisites for effective learning and adaptation to life. The conditions for effective EF development include the opportunity to repeatedly use these functions in a supportive environment, with choices and a gradual increase in difficulty. A key element here is the absence of stress. The reflective and metacognitive components are also important (Zelazo et al., 2024; Carlson, 2023). In the Czech Republic, there is a limited number of individual programs for developing specific areas of EF, and most are designed for use with younger children in a home setting or with adult patients with acquired executive deficits. We present the results of an evaluation of two long-term programs implemented with two distinct groups of children with EF deficits. One consisted of clients of an institutional care facility aged 12–14 with diagnosed behavioral disorders and associated EF deficits. The second consisted of 12-year-old children from mainstream schools with functional family backgrounds. The aim of the project was to create a three-month EF development program emphasizing the practical application of skills in everyday life and schoolwork. Methodologically, the study was conducted as action research, involving the gradual evaluation of the practical applicability of individual activities and the monitoring of results in practice sessions. The poster presents the lessons' content structure analysis and an analysis of the program based on data from participating students and their parents. The second part of the analysis evaluates the project's methodological aspects and offers recommendations for implementing similar programs. The results show that suitable forms of activities differ between the two groups, in terms of appropriate situations and activities (level of specificity, number of repetitions), as well as participants' opportunities to reflect on the trained skills outside of lessons. The study demonstrates that EF training is feasible in small groups, enabling an individualized approach.

Poster presentation #10

Neurobehavioral Learning of Letter-sound Pairs in (Pre-)Readers with and without (Risk for) Dyslexia - Fiona Borska[1*], Jurgen Tijms[2], Chiara Turri[1], Marjolein Tool[1], Bob Kapteijns[1], Rogier Kievit[3], Milene Bonte[1]

[1] Maastricht University, Netherlands
[2] University of Amsterdam, Netherlands
[3] Radboud University, Netherlands

Children's reading development is shaped by a complex interplay of genetic, neurocognitive, motivational, and environmental factors, and would therefore benefit from improved tools for earlier prediction and support. Pre-readers with a familial risk for dyslexia (FR), for example, have a 40-50% likelihood of developing dyslexia and often exhibit difficulties with reading precursor skills. Compared to current static reading precursor tests, letter/symbol-speech sound (LSS) learning, as a dynamic assessment, may be more informative of children's actual reading potential. Aiming towards a neurobehavioral predictive model of reading development, we investigate neurobehavioral LSS learning trajectories in pre-readers with/without FR and as a benchmark also in readers with/without dyslexia. We combined an LSS learning task for an artificial font with EEG to capture short-term behavioral and neural learning dynamics in Dutch-speaking pre-readers with and without FR (5-6 yrs; currently N=73). We characterized individual learning trajectories with latent growth-curve modelling and assessed reading precursors. As a benchmark for LSS learning with already-existing reading proficiency differences, we are currently analyzing detailed learning curves in different regions of the brain's reading network in older readers with and without dyslexia (8-12 yrs; currently N=20) using 3T fMRI. Preliminary EEG findings indicate a gradual decrease in audiovisual brain activity with learning, suggesting that it requires gradually less effort to recognize the novel letter-sound pairs. Interestingly, this decrease is smaller in children with FR despite their learning performance being similar to that of children without FR, suggesting possible differences in audiovisual learning strategies. As expected, children with FR scored significantly lower on static phonological tests. Taken together with the absence of a systematic difference in letter-sound learning performance between the two groups, this suggests that our dynamic assessment measure taps into distinct processes compared to traditional static tests.

Poster presentation #11

Improving Early Prediction of Reading Problems: a Dynamic Assessment Tool across Two Cohort Studies

Bob Kapteijns[1*], Leandra Zinke[1], Jurgen Tijms[2], Chiara Turri[1], Fiona Borska[1], Marjolein Tool[1], Rogier Kievit[3], Nienke van Atteveldt[4], Milene Bonte[1]

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[2] University of Amsterdam, Netherlands
[3] Radboud University, Netherlands
[4] Vrije Universiteit Amsterdam, Netherlands

Reading problems (e.g., dyslexia) are currently diagnosed and treated after a child has failed to respond adequately to reading instruction, i.e., around 8-9 years. A lack of reliable prospective tools for later reading problems remains a major bottleneck for early detection and preventive intervention (Bonte & Brem, 2024; Ozernov-Palchik & Gaab, 2016). In two longitudinal cohorts (the first starting in April 2025, the second in March 2026; combined N=500), we developed a novel digital dynamic assessment (DA) tool (i.e., 'game'), in close collaboration with children, teachers, and game developers. This DA tool (called "Wikki's Wondertaal") features a letter/symbol-sound learning (LSSL) task in which children learn the symbol-sound associations of an artificial language. At the first time point in both cohorts, this DA tool was used to characterize short-term behavioral LSS learning trajectories in 5-6-year-old prereaders, to effectively differentiate kindergartners based on their reading potential. By also administering traditional static tests of reading precursors (phonological awareness, letter knowledge, rapid automatized naming), we ultimately aim to examine the DA tool's predictive value for children's reading development in comparison to (or in combination with) these traditional static measures. The data collection for both cohort studies is still ongoing. In the first cohort, latent growth curve modelling of the moment-to-moment learning progress within the DA tool revealed significant variability in both the intercept and slope of prereaders' LSS learning curves. Moreover, cross-sectional analyses indicated that DA tool performance was positively associated with prereaders' phonological awareness and letter knowledge. In planned longitudinal analyses, we will investigate how the DA tool and static measures predict reading development across the early primary school years. Based on these longitudinal results, we will further develop our DA tool to predict who will learn to read fluently and who will need extra support to prevent reading problems.

Poster presentation #12

Policy Inference for Supporting Multi-Dimensional Category Learning - André Brechmann[1]

[1] Leibniz Institute for Neurobiology, Germany

Supporting a learner in complex problem solving without premature interruption of the learning process requires knowledge about the learner's underlying policy. In multidimensional environments, however, it is difficult to interpret overt behavior alone due to the curse of dimensionality of state space. Since decision making is the result of internal brain processes, additional observations of brain activity may help to disambiguate observable behavior and apply well grounded learning support. We developed an experimental setup that simultaneously measures whole brain fMRI, EEG, psychophysiological and detailed behavioral data while participants perform a multidimensional auditory category learning task. A large set of sounds with five different features of two possible values each is presented in 180 trials: duration (short/long), pitch direction (rising/falling), loudness (low/high), frequency range (low/high), and speed of pitch change (slow/fast). Participants were not informed that the target category is defined by the features duration and direction (e.g., long, rising), but had to learn from verbal feedback about the correctness of the button press. Analysis of fMRI data identified brain regions with learning-dependent activation for target vs non-target trials, i.e. ACC, MFC, anterior insula, auditory cortex, caudate, dorsomedial thalamus, subthalamic nucleus, and dopaminergic midbrain. Analysis of learning performance revealed a subset of participants who persistently stick to a one-feature policy while ignoring the second categorization rule. Activation of the identified brain network reflects the different policies, suggesting that patterns of fMRI activation can be used to support policy inference. In a 2nd fMRI study, we used explicit feedback-intervention for subjects following a one-feature policy. Subsequent learning success and subjective rating of the intervention were highly individual, possibly depending on motivational factors or implicit vs explicit problem solving modes. Current studies use real-time fMRI for optimized intervention that hinders wrong learning strategies and to understand the neural basis of feedback intervention.

Poster presentation #13

Associations Between Kindergardeners' Early Reading and Arithmetic Performance - Fien Callebaut[1]*, Petra Warreyn[1], Lien Peters[1]

[1] Ghent University, Belgium

Early literacy and numeracy skills are strong predictors of later academic achievement[1], and the two domains appear to be strongly related in school-aged children[2]. Prior research suggests that these skills already show cross-domain associations before formal schooling begins[3]. Furthermore, children's home literacy environment (HLE) has been linked to literacy and reading outcomes[4], and the home numeracy environment (HNE) to early arithmetic skills[4], while cross-domain associations are also reported[5]. Yet evidence remains unclear whether these domains already share common foundations or develop independently prior to formal schooling, and how home learning environments contribute to this. This study addresses two questions in a sample of Flemish kindergarteners (n=118; mean age=5;6 years old). First, this study examines the extent to which early literacy and numeracy skills show within and cross-domain associations prior to formal schooling. We expect that both within and cross-domain associations will be observed. Exploratory factor analysis (EFA) will uncover the within-domain structure of these child skills. Correlations will quantify associations between the two skill domains. Second, this study investigates whether the HLE and HNE show domain-specific and/or cross-domain associations with children's early skills. We hypothesise that both domain-specific and cross-domain associations will emerge. EFA will establish the within-domain structure of the HLE and HNE. Finally, the domain-specific and cross-domain home environmental predictors of children's early cognitive skills will also be examined. Data have been collected, the data analysis plan has been registered (see osf.io/t9h56), and the results of these analyses will be presented and discussed at the conference. Understanding the within and cross-domain nature of early literacy and numeracy skills, and the environmental factors that shape them, will help advance our knowledge of how these academic competencies unfold before formal school entry and hold implications for early educational intervention. References are listed in a separate file.

Poster presentation #14

Reading and Audiovisual Speech Perception in Noise in Adults with different Reading Skills - Melis Çetinçelik[1]*, Milene Bonte[1]

[1] Maastricht University, Netherlands

Developmental dyslexia is typically characterized by persistent difficulties in reading fluency, yet dyslexia may also be associated with broader challenges in speech processing, multisensory integration, and susceptibility to distraction in noisy environments. For example, individuals with dyslexia may have diminished speech-in-noise processing skills and benefit less from visual articulatory cues. In typically reading adults and children, background noise has been shown to negatively affect reading speed and comprehension. The latter effect was found to be modulated by individual differences in auditory attention in children. However, these lines of research have not been examined within a single framework, particularly in adults with different reading skills, including dyslexia. The current study investigates how reading-in-noise and audiovisual speech recognition in noise performance independently and jointly relate to individual differences in reading skills and attention in adults with and without dyslexia. In the speech-in-noise task, participants are tested on their recognition of spoken words, presented at different background noise levels either audiovisually (with congruent visual articulatory information) or auditory-only. In the reading-in-noise task, participants silently read under background speech conditions, manipulating intelligibility (native/non-native) and intensity (low/moderate loudness) of the background speech, while reading speed and comprehension are measured. Measures of auditory attention and standard tests of reading fluency are included to explore individual differences in susceptibility to auditory distraction and audiovisual benefit. Data collection is ongoing, and results will be presented at the conference. In the next phase, we will develop a child-appropriate version of this paradigm to examine developmental trajectories of audiovisual speech processing and reading-in-noise performance in children with and without dyslexia. These findings have implications for reading in real-world noisy environments, such as classrooms, and inform how background speech and attention affect reading in individuals with and without dyslexia.

Poster presentation #15

Understanding the Neural Basis of Reflection to Enhance Coaching in Higher Education - Mahshad Fadaeimoghadam Heydarabadi[1]*, Niels van der Baan[1]

[1] Maastricht University, Netherlands

Understanding the Neural Basis of Reflection to Enhance Coaching in Higher Education. Students often struggle to engage in deep, effective reflection, which limits their ability to learn from experience. Previous research has shown that coaching can support reflection by creating a safe learning environment, providing autonomy support, guiding goal setting, and encouraging students to reflect on their experience (Nuis et al., 2024; van der Baan et al., 2022, 2024). However, it remains unclear why reflective practices are effective and how coaching interventions can be optimally designed. This poster presents a project aiming to bridge educational and neuroscientific perspectives by investigating the neurocognitive mechanisms underlying reflection and exploring how coaching may support these processes. The following research question is presented: What are the neurocognitive mechanisms underlying reflection, and how can this inform coaching practices that support student learning and development? Reflection emerges from three interacting brain networks: the Default Mode Network, supporting introspective thought and autobiographical memory; the Executive Control Network, enabling deliberate evaluation and goal-directed analysis; and the Salience Network, directing attention toward meaningful internal signals (Menon, 2011).To identify the neural mechanisms involved and how these networks can be activated using coaching is being explored using a scoping review. A systematic search is conducted in several neuroscience and educational databases using carefully identified keywords. Specific coaching behaviors may recruit these systems: reflective questioning may engage self-referential and evaluative processing; goal setting may activate executive planning; autonomy support may strengthen self-directed agency; and psychological safety may reduce defensive responding, enabling deeper reflection. Our results offer a foundation for designing evidence-informed coaching interventions in higher education that can activate neural networks of reflection.

Poster presentation #16

Language Profiles and Early Literacy Outcomes in Children at Risk for DLD and/or Dyslexia

- Corriat Clémence[1]*, Jolijn Vanderauwera[1], Elise de Bree[2], Ding Chenyi[3]

[1] UCLouvain, Belgium
[2] University of Amsterdam, Netherlands
[3] KU Leuven, Belgium

It is well established that language difficulties in preschool years are a key risk factor for later reading difficulties. Indeed, Children with Developmental Language Disorder (DLD) run a substantial risk of reading comprehension difficulties. Furthermore, a substantial proportion of children also display word-level literacy difficulties. The mechanisms underlying these word-level literacy outcomes remain poorly understood and the body of evidence so far has typically not included French-speaking children. The present longitudinal study investigates the relationship between oral language abilities in kindergarten and early literacy precursors in a cohort of 192 Wallonian (French-speaking) children. The sample includes both children with a family history of oral and/or written language difficulties and typically developing peers. Interactions with parental and environmental home literacy characteristics are integrated into our model. More specifically, the study examines how individual differences in children's oral language profiles identified using latent profile analysis are associated with key emergent literacy skills, parental and environmental characteristics, and family history of oral and/or written language difficulties. By linking oral language profiles to early literacy precursors, this study contributes to a better understanding of the developmental pathways leading to reading acquisition. Ultimately, this approach allows us to determine which DLD profiles are most at risk for developing dyslexia.

Poster presentation #17

Pathways to Language and Literacy in Children at familial Risk: The Role of Rise Time Detection - Jolijn Vanderauwera[1*], Clémence Corriat[1], Jan Wouters[2]

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[2] KU Leuven, Belgium

Rise time detection, the ability to perceive rapid changes in the amplitude envelope of auditory signals, is a key aspect of temporal auditory processing that supports speech perception. While rise time sensitivity has been linked to phonological processing and reading development, its relationship with broader oral language abilities remains less well understood. This raises the question whether rise time detection primarily underpins phonological skills relevant for reading, or whether it also contributes to wider oral language development, particularly in children at risk of language disorders. The present longitudinal study investigates the role of rise time detection in a cohort of 192 children aged 6–7 years at the early stages of reading acquisition. The sample is characterized by the inclusion of children with a family history of oral and/or written language difficulties, alongside typically developing peers. Rise time detection sensitivity will be linked to longitudinal measures of oral language abilities as well as to early reading skills. This study allows us to examine whether rise time detection is differentially associated with oral language abilities and reading development, and whether these relationships vary across familial risk profiles.

Poster presentation #18

The Mediating Role of Child Vocabulary in Theory of Mind Development

- Joanne Gosselain[1]*, Jolijn Vanderauwera[1], Nathalie Nader-Grosbois[1]

[1] UCLouvain, Belgium

This study demonstrates the role of language, and more specifically vocabulary and syntax, in the development of Theory of Mind (ToM). The exact role of language in constructing an understanding and an ability to express mental states needs to be better understood. The first part of the study involved direct individual assessments of receptive vocabulary (EVIP) and ToM (ToM Task Battery-vf) with 74 French-speaking children of (pre)school age. Non-verbal reasoning was controlled. In the second part of the study, syntax was assessed by a composite score (receptive and expressive EVALO 2-6 subtests) with 50 of the children. Results on mediation analyses revealed that receptive general vocabulary mediates the relation between age and ToM (indirect effect: b =0.076 [IC 95%: 0.005-0.154]. However, syntax does not mediate the effect of age on ToM. The indirect effect is not significant (b=0.005 [IC 95%: --0.027-0.054]). In French-speaking (pre)schoolers, general vocabulary must be considered in the development of ToM. These findings highlight a clear contribution of receptive vocabulary in ToM development.

Poster presentation #19

Caregiver-child Interactions and Their Relationship with Language and Reading Development

- Amandine Piret[1], Jolijn Vanderauwera[1]*, Maaike Vandermosten[2], Marie Van Reybroeck[1], Klara Spooren[2], Marie Kolenberg[2], Olivier Ratenon[3], Stephane Dupont[3]

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The development of reading relies in part on early oral language abilities. Yet, the mechanisms linking early language input and later literacy outcomes remain insufficiently understood. This project aims to investigate longitudinal pathways from early language environments to the emergence of written language skills, with particular attention to the role of quality language interactions. Data will be presented on a subsample of 45 children aged 5 to 6 years old, out of a larger longitudinal study including 185 children, using a multi-method approach combining semi-structured language assessments in the home environment and standardized assessments of language and reading precursors. Parental responsiveness and turn-taking in a semi-open setting are coded using standardized frameworks. Responsiveness is analyzed within a “serve and return” framework, based on topic-related exchanges and proportions of responsive parental and child behaviors. Conversational turns are identified using temporal contingency criteria, expressed as rates. The relationship between these semi-naturalistic measures and language and reading precursors will be presented. This project contributes to the understanding of predictors of written language development by investigating the relationship between caregiver-child dynamics, oral language development and reading precursors. This work aims to refine theoretical models of language development and support earlier, more effective interventions.

Poster presentation #20

Stories in Small Hands: A Child-Led Interactive Storytelling with Preschoolers in Nurseries

Billie Dale[1]*, Sam Wass[1], Gemma Goldenberg[1], Rose Tsui[2], Gregory Lane[3], Melany Rose[4]

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[4] Discover Children's Storytelling Centre, United Kingdom

Co-reading with preschoolers develops their speech and language skills (Davy et al., 2025); and using a dialogic approach, whereby the adult asks questions and provides prompts, leads to higher language and narrative skill development compared to non-interactive co-reading (Grolig et al., 2020; Pillinger & Vardy, 2022). One key skill is narrative macrostructure complexity, the child's ability to organise story elements into causal and temporal sequences (Kirby et al., 2021; Stein & Glenn, 1979). Narrative macrostructure complexity increases with age (Muñoz et al., 2003; Stadler & Ward, 2005), with higher scores in preschool predicting later literacy outcomes (Wellman et al., 2011). The current study aims to explore the importance of interactivity and storytelling, focusing on developing preschoolers' comprehension of stories' hierarchical organisation. Most preschoolers in England attend formal childcare settings (DfE, 2024), highlighting the need for data collection in naturalistic settings. Delivered across nurseries in East London, this intervention involves weekly group storybuilding sessions with 2-5-year-olds for 12 weeks, followed by nine monthly sessions. A trained adult storybuilder will deliver the intervention, following a semi-structured script involving repetition and songs. Their role is to scaffold the children's ideas into a coherent and hierarchically complex narrative. Four control nurseries will receive a non-interactive video-based storytelling condition. Data will be collected using child-friendly head-mounted cameras. Pre- and post-intervention measures will assess narrative micro- and macro-structural complexity and sequential reasoning skills – ability to organize story elements into a temporal sequence (Gouldthorp et al., 2018). Narrative macrostructure will be analysed using a trained BERT machine-learning model. We hypothesise that, relative to the control, the intervention group will demonstrate significantly greater improvements across all outcome measures at two post-intervention timepoints: after 12 weeks and after 3 further monthly sessions. Findings are expected to have direct implications for nursery practitioner training, parental guidance, and early years policy.

Poster presentation #21

Effects of Feedback and Short Intervention on Biology Students' Metacognitive Monitoring

- Joseph Dauer[1]*, Carrie Clark[2], Nathan Faivre[3], Mei Grace Behrendt[4]

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While metacognitive skills are important for how university students learn and develop expertise within science, little is known about how metacognitive monitoring occurs and how to improve it in authentic learning contexts. In science education, existing research has primarily focused on planning and evaluating learning strategies rather than metacognitive monitoring. To understand metacognition in ecologically relevant tasks, we manipulated the type of feedback (performance or performance and confidence) and the type of training video that participants watched (attention or metacognition). University biology students (n=116) completed both a visual discrimination task and a semantic knowledge of biology task, watched the training video and completed both tasks again a day later. We assessed metacognitive monitoring using measures of how well students' confidence matched their accuracy (metacognitive sensitivity) and how efficient this monitoring was relative to performance (metacognitive efficiency), both before and after the training videos. Accuracy was higher in the visual discrimination task (~77%) than in the semantic knowledge task (range: 59%-62%) and increased modestly 3-5% by timepoint 2. There was no significant effect of either feedback condition or training on metacognition during the visual discrimination task. In the semantic knowledge task in biology, feedback on performance resulted in a significant ($p < .02$) positive change in metacognitive sensitivity and efficiency. There was no effect of additional confidence feedback or a short training video on metacognition. Together, our results show that metacognitive monitoring regarding knowledge in biology can be improved through trial-by-trial performance feedback. For researchers, our results suggest short term metacognitive training videos had no effect on metacognition, and there was no conclusive evidence for a domain-general metacognitive control process. For instructors, providing feedback about students' scientific accuracy may allow them to reflect on whether they know or don't know concepts.

Poster presentation #22

Neural and Behavioural Dynamics Underpinning Attention State - Tom Deadman[1*], Ira Marriot-Haresign[1], Tessel Bazelmans[2], Luke Mason[3], Sam Wass[1], Emily Jones[3]

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Visual attention during naturalistic viewing unfolds as sequences of fixations, raising the question of whether moment-to-moment allocation of attention shows temporal structure (persistence) rather than independent sampling across events. Attention can be indexed with complementary measures: fixation duration as a behavioural proxy of attentional engagement (Papageorgiou et al. 2014) and the fixation-locked Nc as a neural index of attention-related processing in infancy (Jones et al. 2018). During a naturalistic screen-viewing paradigm, 24-month-old infants watched a cartoon clip while eye tracking, EEG (to quantify fixation-locked Nc), and ECG (to classify HR deceleration during looks) were recorded. Infants were recruited from the STAARS cohort, who could be in 1 of 3 likelihood groups: autism-likelihood, ADHD-likelihood, or typical-likelihood. We hypothesised that Nc amplitude would show above-chance autocorrelation, and fixation duration would show above-chance temporal autocorrelation. Fixations were temporally sorted and pooled within blocks; fixation duration and Nc amplitude were analysed as event series, and Spearman autocorrelations (lags 1–5) were computed and tested against shuffled surrogates using cluster-based permutation correction. A linear mixed-effects model was fitted at each lag to check for the effects of likelihood group, task block, and age. To check if the effect was driven by session-wide monotonic drift in fixation duration or EEG power, the cluster-based permutation test was repeated after the fitting and subtraction of a linear polynomial. Nc amplitude showed significant differences from chance across lags 1-4, and fixation duration across lags 1-2. These differences were not driven by likelihood group, age, or experiment block. Clusters survived after linear detrending of both datasets. In conclusion, Nc amplitude and fixation duration were autocorrelated in a naturalistic paradigm. This suggests that attention-related signals are shaped by processing demands from 1 fixation to the next, suggesting the formation of an attentional state.

Poster presentation #23

Educational Context and Structural Maturation of the Social Brain in Childhood

- Solange Denervaud[1]*, Yasser Aleman-Gomez[2], Berna Güroglu[3], David Romascano[4], Coline Grasset[2]

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[4] University of Bern, Switzerland

Children's social cognition develops within a distributed "social brain" network, including the medial prefrontal cortex, temporoparietal junction (TPJ), posterior superior temporal sulcus (pSTS), anterior temporal cortex (ATC), and precuneus, which show prolonged structural maturation across childhood and adolescence (Frith & Frith, 2007; Mills et al., 2014; Becht et al., 2021). Because schooling constitutes one of the most sustained and socially structured developmental contexts, the present study examined whether educational pedagogy is associated with structural variation in these regions. A total of 100 typically developing children aged 4-15 years (47 Montessori-schooled, 53 traditionally schooled) underwent high-resolution structural MRI. We quantified cortical thickness, local gyrification index (LGI), and regional volume in a priori social brain regions. Linear models tested the effects of age, pedagogy, sex, and their interactions, while controlling for socioeconomic status; volume analyses additionally controlled for estimated total intracranial volume. While the two groups were comparable in age, sex distribution, socioeconomic status, fluid intelligence, anxiety, and home educational environment, effects emerged for LGI. In the precuneus, we observed both an Age × Pedagogy interaction ($F = 6.98$, $p_{corr} = .049$) and an Age × Pedagogy × Sex interaction ($F = 12.20$, $p_{corr} = .004$), suggesting that age-related trajectories of cortical folding differed by educational context and sex. Main effects of pedagogy also emerged in pSTS (pSTS; $F = 5.68$, $p_{corr} = .049$) and TPJ (TPJp; $F = 5.65$, $p_{corr} = .049$). For cortical thickness, Pedagogy × Sex interactions were found in ATC (ATC; $F = 5.82$, $p_{corr} = .045$) and TPJ ($F = 5.98$, $p_{corr} = .045$), along with a main effect of sex in ATC ($F = 7.13$, $p_{corr} = .045$). No pedagogy-related volume effects survived correction. These findings suggest that variation in classroom social ecology may be associated with the structural maturation of cortical regions supporting mentalizing and social cognition. More broadly, education is positioned as a developmental environment that shapes experience-dependent brain plasticity, going beyond its traditional role as merely a setting for learning.

Poster presentation #24

How Social Context Shapes Reward Representations Across Adolescence -

Lonneke Elzinga[1]*, Yvette Grootjans[2], Simone Dobbelaar[1], Taylor Guthrie[1], Nienke van Atteveldt[3], Eveline Crone[2], Anna van Duijvenvoorde[1]

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Adolescence is a period marked by increased reward sensitivity and a heightened focus on peers (Crone & Dahl, 2012; Crone et al., 2022; Van Duijvenvoorde et al., 2016). Yet, parents remain central figures and adolescents increasingly seek meaning through societal contribution (Dahl et al., 2024), suggesting that reward sensitivity may vary depending on who stands to benefit. Crucially, reward processing comprises of several components, including valence, value and salience (Kahnt, 2018). Within vicarious reward processing, representations of social distance and group membership can be distinguished. This study examines how these components of (vicarious) reward processing are represented within the brain across adolescence. 217 adolescents aged 10-20 from diverse socioeconomic backgrounds completed an fMRI vicarious reward task in which they selected one of three cups per trial, after which an outcome (−8, −6, 0, +6, +8 points) was displayed. Each trial indicated whether the beneficiary was themselves, their parent or an unfamiliar adult. Preliminary whole-brain analyses showed increased activation during reward receipt and value modulation in the bilateral ventral striatum, while loss receipt was associated with activation in the bilateral orbitofrontal cortex and insula. Ongoing analyses include a multiple regression representational similarity analysis examining the unique and shared variance of valence, value and salience and social distance and group membership within the whole-brain. Regions of interest include the ventral striatum, ventromedial prefrontal cortex, dorsomedial prefrontal cortex, anterior insula and anterior cingulate cortex. All analyses incorporate age-related effects as an individual-difference variable, enabling examination of how developmental stage shapes reward sensitivity. The current model-based approach allows for the disentangling of computational processes underlying vicarious reward processing across adolescence.

Poster presentation #25

Dynamical Aspects of the Effect of Curiosity, Reward Incentives and Their Interaction on Memory

- Nehai Farraj[1]*, Miriam Reiner[2]

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Motor memory serves many functions in everyday life, primarily for recognizing objects. The memorization of touched objects, whether seen or unseen before, and their recall depend on the brain's motor memory systems. Motor memory involves multiple neurocognitive subsystems that work together, much like vision and hearing. It has been suggested that the processing of sensory information, whether visual, auditory, or motor, is interrelated through multisensory information-processing systems. The current study explores differences in motor memory among learners, examines the accuracy of motor recall for touched objects, and identifies patterns in motor recall. We conducted a pilot study with 24 participants (ages 14-18) who touched the outer edge of wooden maid shapes and then drew them on paper with their eyes closed. The participants were divided into three groups that differed in the number of times they touched the edges of the objects: group 1 touched the objects in one complete pass to the edge; group 2 touched the edges by going around twice, and group 3 was instructed to explore the objects by touching the edges in three rounds. The recalled drawings were qualitatively examined, yielding three main results: group 1 students were able to recall the shapes with much more accurate detail; group 2 drawings were much smaller in size compared to the other groups and included sharp edges; group 3, however, were the least accurate, amorphic, and varied in size. We believe motor recall differences relate to the number of rounds learners touch the object. More rounds activate multiple motor programs, thereby gathering more details that may interfere with the recall of the original shape. The added value of the study is twofold: examining motor memory capacity in learners and identifying those with superior and weak capacity; and second, designing appropriate interventions to improve learners' motor memory.

Poster presentation #26

Beyond a Single "Aha!": Distinct Neurocognitive states of insight - Thomas Frøsig[1]*, Margarida Romero[2]

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In creative problem solving, solutions reached through sudden insight have been shown to be more accurate than those derived through incremental, analytical processing (Salvi et al., 2016). Such moments of sudden insight are characterised as a form of cognition in which a solution emerges following a restructuring of the problem representation (Carpenter, 2020). These changes in cognitive state, commonly referred to as "Aha!" moments, are usually investigated as a single event. However, treating insight as a single homogeneous phenomenon may restrict our understanding of different ways insight contributes to the problem solving process. In the EEG literature, such an event is found to have a neural pattern of alpha waves moving from the right side pre-frontal cortex via the central lobe and into the parietal lobe, culminating in a gamma wave burst in the temporal lobe (Huang et al., 2020; Stevens & Zabelina, 2019). The Eye Gaze literature found that Eye Aspect Ratio (EAR) occurring simultaneously with a Pupil Spike by more than 10%, compared to the 5-second rolling average, confirms the transition from concentration to discovery as a marker of surprise (Guo et al., 2022; Spee et al., 2024). Building on these two modalities (EEG and Eye Gaze), our pilot study introduced the third modality based on Behavioural Learning Analytics (BLA) rooted in video coding to capture moments of insight during a creative problem-solving task. Through the alignment and comparison of the three modalities, we found that "Aha!" moments seem to be more than a single phenomenon, as commonly described in the literature. In our findings three distinct types emerged. One connected to affordances. Another to non-successful task completion and a third connected to successful task completion. Each displays different neural patterns corresponding to three different cognitive states.

Poster presentation #27

Student Learning: A Qualitative Pilot-Study Involving Students as Co-creators - Anita Lill Hansen[1]*, Kristian Paulsrud[1], Elisabeth Norman[1]

[1] University of Bergen, Norway

How do undergraduate psychology students experience their own learning process? It is already established that learning in higher education is influenced by a variety of cognitive and social factors (e.g., Biggs, 2011; Zimmermann, 2002). However, large introductory courses in higher education (HE) are not necessarily designed in ways to promote active, student-centered learning. With increased financial pressure in the sector, in combination with the introduction of AI tools, it is timely to ask how undergraduate students currently experience their own learning. How do they approach learning, what challenges do they encounter, how do they use AI tools and what do they think can promote learning? This pilot study is a precursor to a larger survey about learning in Norwegian undergraduate students. In total, 14 students who had completed a cognitive psychology course were interviewed. First, four students participated in a non-structured interview about learning. Furthermore, two focus group interviews were conducted with a total of 10 students. These interviews followed a semi-structured guide covering social environment, learning strategies, motivation, and the use of AI tools. The interview guide and the focus-group interviews were conducted collaboratively by researchers and the four students from the first interview as they were acting as "student co-creators." Preliminary findings from this qualitative descriptive study indicate a low sense of social belonging and limited formation of academic peer networks. Many described cognitive psychology as difficult and relied on AI tools instead of reading the assigned English textbook. Discussions with other students were perceived primarily as a means of clarifying unclear course material rather than as a context for learning. Implications for research on learning, AI use, sense of belonging in HE, course design and curriculum development will be discussed.

Poster presentation #28

Reading Comprehension in Developing Readers: ERP Indicators of Word-to-text Integration Processes

Anne Helder[1]*, Charles Perfetti[2]

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This study examines how elementary-school children integrate word meanings into an evolving text representation during reading, a process central to reading comprehension. Although word-to-text integration processes are well documented in adults, it remains unclear under what conditions children engage in these processes and how individual differences in decoding skill modulate it. Prior research has established that successful reading comprehension depends on readers' ability to link incoming words to prior text context, forming a coherent mental representation of the text. In adults, these word-to-text integration processes have been measured by the N400, an event-related potential (ERP) component indexing a word's fit within its semantic context. Evidence for these processes in children is limited, and the role of decoding skill in shaping integration has not been directly examined. Children aged 8–12 read two-sentence passages while EEG was recorded. Target words appeared in one of three conditions: explicit-referent integration, in which the target (e.g., "apple") matched a referent named earlier in the passage (e.g., Pim eats his apple during the break. The apple…); categorical-referent integration, in which the target matched a categorically related referent (e.g., Pim eats his fruit during the break. The apple….); and a baseline condition without a prior referent (e.g., Pim sits next to his friend during the break. The apple…). ERPs time-locked to target words were compared across conditions. Preliminary analyses (N = 16) show an N400 reduction for explicit integration relative to baseline and to categorical integration. An N400 reduction was visible for categorical relative to baseline, but did not reach significance. Data collection will be finalized before the summer. The results will advance our understanding of reading comprehension development by establishing the conditions under which children engage in word-to-text integration, a process central to successful comprehension and a promising target for reading instruction.

Poster presentation #29

Neural Correlates of Coherence Monitoring

Laura Verhoef[1]*, Anne Helder[1], Linda van Leijenhorst[1], Dietsje Jolles[1], Paul van den Broek[1]

[1] Leiden University, Netherlands

Mastering reading comprehension is a key developmental goal for primary school pupils. Reading comprehension is among the most complex cognitive activities that many children struggle with. To comprehend a text, readers need to construct a coherent mental representation of its meaning. This requires them to go beyond the literal meaning of the text and to make inferences to fill in information that is not explicitly stated. Crucially, readers should continuously monitor the coherence of the resulting mental representation. Here we examined the neurocognitive mechanisms underlying coherence monitoring and explored differences between children and young adult readers. Participants performed a coherence break detection task while in the MRI scanner. We collected fMRI data while participants read 32 six-sentence narratives that were presented sentence-by-sentence in a slow self-paced event-related design. Half of the narratives contained a break in coherence. Behavioral data show that, even though overall accuracy was high, children are more likely to miss coherence breaks compared to adults. Preliminary analyses show that coherence break detection was associated with activation of a large bilateral network of brain regions, encompassing language and comprehension areas, that was similar for children and adults. Despite this overlap, meaningful differences emerged across age groups. Most notably, the anterior cingulate gyrus showed a diverging pattern between age groups, with coherence break detection-related activation observed in young adults but not in children. These findings suggest that while the automatic detection of inconsistencies may be functional in children, the recruitment of higher-order monitoring continues to mature into adulthood.

Poster presentation #30

Does Visuospatial Working Memory Directly Support Early Arithmetic? An fNIRS Study

- Yi Ting Leong[1]*, Pavitraa Samasundaram[1], Divij Ramesh Nalge[1], Chiao-Yi Wu[1], Beth Ann O'Brien[1], Annabel S.H. Chen[1], Darren Yeo[1]

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Visuospatial working memory (VSWM) is reliably associated with arithmetic competence, yet neuroimaging evidence for shared neural substrates is scarce. Matejko and Ansari (2021) found right-parietal overlap using equation-based arithmetic in school-going children, but whether this extends to early non-equation-based arithmetic is unknown. Using functional near-infrared spectroscopy with a functional channel-of-interest (fCOI) approach, we investigated whether individually localised frontoparietal VSWM regions are also engaged during a number-pair task in 5- to 7-year-olds, and whether math achievement is associated with VSWM engagement during arithmetic. Children (N = 46; 19 female) completed a dot-matrix VSWM task (2- and 4-load working memory vs. control), and a number-pair task requiring children to verbally identify the missing element ('?') in a part-part-whole display – conditions included small number pairs (3-and-5 make '?'), plus-minus-one pairs (6-and-'?' make 7), and control letter-pairs. Channels most responsive to the VSWM contrast were identified within parietal and frontal regions per hemisphere and probed for number-pair-related activation. Across four fCOIs, no significant differential VSWM engagement was found for small-number-pairs vs plus-minus-one, and either arithmetic condition vs. control. Bayesian analyses indicated moderate evidence favouring the null for the latter in left-frontal and right-parietal fCOIs (BF01 = 4.75–5.20). Compared with fixation-baseline, all conditions also lent moderate support for the null in the frontal fCOIs (BF01 = 3.14.–5.81), but inconclusive evidence in parietal fCOIs. Furthermore, small-number-pairs-specific VSWM engagement and math achievement were not significantly correlated, with moderate evidence for the null in left fCOIs (BF01 = 4.18–4.64), but inconclusive evidence in right fCOIs. These findings suggest that non-equation-based arithmetic does not differentially engage frontoparietal VSWM beyond that of a matched letter-pair task in early learners. However, inconclusive right-parietal evidence leaves open the possibility of partial VSWM–arithmetic overlap that the sample is underpowered to detect, but that may emerge with growing arithmetic fluency.

Poster presentation #31

Understanding the Factors that Make Math Word Problems Difficult for Adolescents -

Amanda Chambers[1] , Anna Matejko[1]*

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Math word problems are a crucial component of the curriculum, yet many students struggle with them due to their complex nature. These difficulties may stem from cognitive factors such as weaknesses in math knowledge, reading comprehension, or working memory (Fuchs et al., 2017; Hegarty et al., 1995), as well as affective factors including math anxiety and reading anxiety (Passolunghi et al., 2018; Tal et al., 2025). The present study examines how individual differences in cognitive and affective factors influence word problem performance in adolescents, and whether varying problem formats can improve performance. Further, we investigate whether these individual differences shape how students respond to different problem formats. We are collecting data from 50-60 Year 9 students aged 13-14. Students are randomly assigned to either a standard Year 9 word problem condition or a scaffolded equivalent condition in which the same information is presented in a stepwise format requiring students to parse each element sequentially. These problems were co-created with teachers to ensure the materials were educationally relevant and reflected scaffolding strategies that could realistically be implemented in classrooms. Other cognitive (math knowledge, reading comprehension, working memory) and affective factors (math anxiety, reading anxiety) are also measured for all students. Data collection will be completed by July 2026. Firstly, we expect individual differences in both cognitive and affective factors will predict word problem solving performance. Second, we expect students will perform better on the scaffolded problems compared to the standard problems. Finally, students with lower performance on the cognitive measures or who have higher anxiety may benefit more from the scaffolded problems. Overall, this study aims to clarify the cognitive and affective factors associated with mathematics word problem solving in adolescents, while also identifying pedagogical approaches that may better support students' performance and learning.

Poster presentation #32

Supporting Early Childhood Educators to Foster Self-Regulation and Executive Function - Rosalyn Muir[1]

[1] Woolongong University, Australia

This study examined the effect of professional learning for early childhood educators on children's self-regulation (SR) and executive functioning (EF) outcomes. Specifically, it investigated whether children taught by educators who completed a purpose-designed professional learning program (SOWATT) demonstrated greater gains in SR and EF than children in control (usual practice) conditions. SR and EF are strong predictors of academic, social-emotional, and cognitive outcomes in early childhood. While prior research demonstrates that direct child-focused SR/EF interventions can improve developmental outcomes, fewer studies have explored educator professional learning as a mechanism for improving SR/EF. Educator knowledge, intentionality, and language are key drivers of supportive learning environments. A mixed-methods quasi-experimental study was conducted with 14 early childhood educators who completed the SOWATT program and 106 children aged 4–5 years across four Melbourne centres. The study involved a six-month structured professional learning program, pre- and post-assessment of SR and EF using task-based measures and behaviour ratings, educator surveys and semi-structured interviews, and multiple regression analyses comparing intervention and control groups. Quantitative findings indicated that children in the intervention group demonstrated significantly greater gains in SR and EF than children in the control group. Qualitative findings showed high usability of the program and strong practice change, including increased intentional teaching of SR/EF, more explicit use of SR/EF language, and greater integration of SR/EF into daily interactions. Overall, the findings suggest that professional learning strengthened educator capacity and improved children's self-regulation and executive functioning. Professional learning can build educator intentionality and support sustainable integration of SR/EF into everyday pedagogy. The evidence supports investment in structured, evidence-based professional learning to improve school readiness outcomes. Future research should examine which professional learning features, including coaching, duration, and reflection, most strongly influence outcomes and long-term classroom impact.

Poster presentation #33

Naïve Physics Theories of Rotation: Evidence from Gear, Screw, and Elevator Tasks -

Ayşenur Mumcuoğlu[1]*, Feyza Erden[1]

[1] Middle East Technical University, Türkiye

Understanding how children construct naïve physics theories about rotational phenomena remains limited, despite extensive work on early causal reasoning and conceptual change (Carey, 1985; Gopnik & Meltzoff, 1997; Wellman & Gelman, 1998). Research shows that children actively generate reasonings to explain physical events; however, most studies focus on linear motion or balance, leaving rotational action underexplored in childhood (diSessa, 1993; Lehrer & Schauble, 2006). This study investigates the naïve physics theories children construct about rotational action across different mechanical contexts. Specifically, it asks: How are children's patterns of reasoning about resistance, transmission, and directional outcomes of rotation structured across mechanical systems, and how do they change over predict-observe-explain cycles? The researchers developed three materials representing distinct rotational systems: a gear, an elevator, and a screw system. Data were collected from 49 children aged 48-72 months. Individual sessions were video-recorded with consent. Children's predictions, observations, and explanations were analyzed using a task-based, dimension-driven analytic framework, with systematic coding across three aspects of rotational reasoning (Braun & Clarke, 2021). Preliminary findings indicate that children's reasoning about rotation is organized across related dimensions. For rotational transmission, children produced physically appropriate explanations even at the prediction stage, often using embodied metaphors. In explaining factors that make rotation easier or harder, children linked object properties to perceived strength, suggesting that longer-handled tools are easier to turn because they have more "muscle." Reasoning about directional outcomes varied across systems: in the gear task, many children initially predicted that connected gears would rotate in the same direction but revised their explanations after direct interaction. These findings provide one of the first explicit accounts of naïve physics theories of rotation in children, showing that these theories are structured, partly accurate, and vary across dimensions.

Poster presentation #34

Teachers' Judgments of Preschool Children's Performance in Rotational Tasks

- Ayşenur Mumcuoğlu[1]*, Feyza Erden[1]

[1] Middle East Technical University, Türkiye

Understanding how teachers interpret young children's thinking is essential for recognizing learning processes in early childhood. Prior research shows that teachers' judgments are often shaped by prior beliefs and contextual cues and may not fully align with children's actual competencies (Hoge & Coladarci, 1989; Ready & Wright, 2011). In domains such as physical reasoning, children's thinking may remain largely invisible without structured elicitation (Lehrer & Schauble, 2006). This study examines the alignment between teachers' predictions and preschool children's actual performance in rotational tasks. Herein, current research asks: To what extent do teachers accurately predict children's reasoning about rotation, and how are these predictions shaped by contextual factors? Children (N=49, aged 48-72 months) completed three individually administered tasks involving gear, screw, and elevator systems. Teachers were not present during task implementation. After data collection, teachers watched video recordings of each task and rated children's expected performance. Ratings were based on predefined performance criteria capturing children's predictions, explanations, and task success across rotational dimensions. In addition, semi-structured interviews were conducted to gather information on teachers' demographic characteristics, classroom materials, including science-related resources, and instructional practices. Preliminary analyses, currently ongoing, compare teachers' ratings with children's observed performance across tasks. Initial findings suggest that teachers' predictions do not always align with children's actual reasoning and are often guided by general impressions, such as assumptions about children's home environment or overall competence. These patterns indicate that teachers may rely on heuristic judgments rather than task-specific evidence when evaluating children's performance. Overall, the findings point to a gap between children's demonstrated reasoning in structured tasks and teachers' perceptions of their abilities, highlighting the importance of making children's thinking more visible in early learning contexts.

Poster presentation #35

Human vs. AI-generated Instructors: Neural and Behavioral Indicators of Engagement and Learning

- Marei Narr[1]*, Emely Hoch[2], Yushuang Liu[3], Ulrich Trautwein[1], Peter Gerjets[4], Ido Davidesco[3], Tim Fütterer[1], Xiaobin Chen[1]

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[3] Boston College, United States
[4] Leibniz-Institut für Wissensmedien (IWM), Germany

In this study, we examined whether learners show comparable engagement and learning outcomes when watching learning videos featuring an AI-generated instructor versus a human instructor. Previous research suggests that AI-generated instructors simulating human-recorded videos may be less engaging than videos featuring human instructors, whereas learning outcomes seem to be unaffected by instructor type (Arkün-Kocadere & Çağlar-Özhan, 2024; Leiker et al., 2023). To go beyond behavioral measures, we collected EEG data as continuous indicators of engagement and learning-related processes. Specifically, we focused on EEG alpha-band activity, which has been linked to self-reported engagement (Davidesco, Glaser, et al., 2023) and student-to-group brain-to-brain synchrony (BBS), which reflects similar neural responses across individuals processing the same stimuli and has been linked to successful learning (Davidesco, Laurent, et al., 2023). This multimodal approach allowed us to assess whether engagement and learning differ between human and AI-generated videos. Using a within-subjects design, N = 72 participants watched two parts of an instructional video, one with each instructor type (human vs. AI-generated), with instructor type per video part counterbalanced across participants. We compared EEG alpha-band power and BBS as neural indicators, and self-reported engagement and post-test performance as behavioral measures across videos using equivalence tests (TOST, SESOI: d = 0.35) to assess whether any differences fell within a predefined equivalence bound. Additionally, we tested whether established neural-behavioral relationships (alpha-band power and self-reported engagement; BBS and learning outcomes) generalize across instructor types. Hypotheses, experimental, and analytical procedures were preregistered. Preliminary results show similar levels of EEG alpha-band power, BBS, self-reported engagement, and post-test performance across human and AI-generated instructors. Furthermore, neural-behavioral relationships were stable across conditions. These findings suggest that AI-generated instructional videos are comparable to human-recorded videos in neural and behavioral indicators of engagement and learning.

Poster presentation #36

Exploring Curiosity Appraisal with fNIRS - Tessa Portier[1]

[1] ETH Zurich, Switzerland

Curiosity is a key intrinsic motivator for learning, yet the neural basis of how individuals appraise whether or not to engage in information seeking has received little direct investigation. This study investigates the neural correlates of appraisal (as a component of curiosity) in the prefrontal cortex (PFC) using functional near-infrared spectroscopy (fNIRS) and examines the role of working memory (WM) in the appraisal process. Gruber and Ranganath (2019) propose the Prediction, Appraisal, Curiosity, and Exploration (PACE) framework, which describes how appraisal of information gaps can either drive exploration and information-seeking (curiosity) or behavioral inhibition (anxiety). Appraisal, according to this framework, includes determining whether one has sufficient resources to close the information gap. WM is a potential resource constraining curiosity, as prior research suggests that WM capacity influences the extent to which individuals engage in information seeking. The PACE framework situates this appraisal process in the PFC, and while PFC involvement is well-established in working memory and emotional appraisal, its role in curiosity, specifically, remains unclear. Our participants complete a curiosity appraisal task, involving conditions that either load or do not load WM (a 2x2 design). On a trial-by-trial basis, they indicate whether they want to learn trivia information, while we record cortical activation. This design allows us to isolate appraisal-and working-memory-related cortical activity. We hypothesize that taxing WM will reduce information-seeking; an effect expected to be less pronounced in individuals with higher WM capacity, who have greater cognitive resources available for appraisal. Further, we predict that conditions requiring appraisal will engage the lateral PFC more than conditions not requiring appraisal. These findings would provide insights into the neural correlates of the appraisal mechanism and shed light on the cognitive resources that support curiosity, with broader implications for research on how to foster curiosity as a driver of learning.

Poster presentation #37

Locating the ‘Brain’ in Pre-Service Teacher Education: A Scoping Review - Lizélle Pretorius[1]

[1] Cape Peninsula University of Technology, South Africa

Neuroscience literacy is often lacking in teacher preparation, a gap noted by several scholars as a barrier to quality and inclusive education. To date, much of the existing research has focused on neuroscience-informed professional development for in-service teachers, with comparatively limited attention given to the pre-service teacher population. Greater engagement with neuroeducation, mind-brain education, brain-based learning and related fields during initial teacher education may support future teachers in recognising individual learning differences, promoting equal opportunities, and reducing exclusion, particularly for learners whose cognitive or learning profiles diverge from dominant norms. Against this backdrop, this scoping review investigates how neuroscience-informed concepts are currently represented within pre-service teacher education programs. Guided by the PRISMA-ScR framework for scoping reviews (Tricco et al., 2018), peer-reviewed journal articles, conference papers, books, reports, and theses published between 2000 and 2025 were identified through database searches conducted by a qualified librarian. The search strategy included ERIC, EBSCOhost, ProQuest, Web of Science, and Scopus, yielding 3,888 records. Following the removal of duplicates, 2,275 titles and abstracts are being screened for relevance, after which eligible sources will undergo full-text review. During the initial screening phase, the Population-Concept-Context (PCC) framework guides inclusion decisions. In this review, the population comprises pre-service teachers, the concept is neuroeducation (including related constructs), and the context is pre-service teacher education. The ongoing analysis is expected to reveal the extent to which explicit neuroeducation content is embedded in pre-service teacher education programs and to identify conceptual and curricular gaps. Initial patterns in the literature suggest limited exposure to neuropedagogy or brain-based learning strategies. The synthesis of these patterns will clarify which neuroscience-informed concepts are currently foregrounded and which remain underexplored, thereby contributing to future curriculum development.

Poster presentation #38

Dynamical Aspects of the Effect of Curiosity, Reward Incentives and Their Interaction on Memory - Kevin Reniers[1]*, Lieke van Lieshout[1], Harold Bekkering[1], Isabelle Stikker[1]

[1] Radboud University, Netherlands

Curiosity and reward incentives, representing intrinsic and extrinsic motivations, have both been found to be effective motivators of memory formation and recall. However, previous findings on a potential interaction effect between the two have not agreed. For instance, Duan et al. (2020) and Meliss et al. (2024) found that curiosity and reward both independently and positively predict memory performance. However, other studies, such as Murayama & Kuhbandner (2011) and Swirsky et al. (2021), find that curiosity and reward interact: rewards only help recall for uninteresting questions. We used an adapted version of the trivia paradigm to understand the effects of curiosity and reward incentives on recall performance. We asked participants to rate their curiosity for a large set of trivia questions and later gave them the answer. Additionally, we gave participants reward incentives tied to their recall performance in either the first or second half of the experiment. On the same day (immediate test) and a week later (delayed test), we asked them to recall the answers to these questions to see how much they remembered. We found that curiosity was a strong predictor of recall in both tests. Surprisingly, we found that rewards do not predict recall in either test or interact with curiosity. Exploratory analyses, however, showed a strong interaction effect between curiosity and reward-order: when participants started with the non-rewarded block, curiosity was a clear predictor of recall. But, if participants started in the rewarded block, the effect of curiosity on recall became statistically zero. These results demonstrate that the effects of curiosity and reward on memory are strongly shaped by reward structure. For education, these results show how curiosity's positive effect can be unwillingly attenuated when rewards are improperly administered. Educators should be mindful of using reward incentives and not apply them as all-round effective motivators.

Poster presentation #39

How Do Children Solve Spatial Tasks? An Eye-Tracking and Think-Aloud Study of Strategy Use

- Shannon Rosbotham[1]*, Katie Giilligan-Lee[1], Michelle Downes[1]

[1] University College Dublin, Ireland

Spatial cognition and mathematics performance have been linked both correlationally (Atit et al., 2022) and causally (Hawes et al., 2022). Research suggests that spatial interventions particularly benefit children from a lower socioeconomic background (Bower et al., 2020; Schmitt et al., 2018). However, the underlying cognitive mechanisms driving this relation remain unclear. We address this gap by investigating whether children from different socio-economic backgrounds engage differently with spatial tasks and by identifying spatial strategies associated with mathematics performance. 30 participants (aged 8-12) performed three different spatial tasks: a 2D rotation task, a 3D rotation task, and a scaling task. Performance was assessed using accuracy and reaction time. Mathematical problem-solving and verbal ability were evaluated using the WIAT-III. A combination of think-aloud and eye-tracking procedures is used to identify cognitive strategies. Think-aloud data were coded using an existing scheme (McKee et al., 2025). Eye-tracking data will be analysed using the ratio approach (Tang et al., 2023), latent profile analysis, and change point analysis. The full pilot analysis (N=30, concluding July 2026) will be presented at the conference. Preliminary results (N = 21) reveal a moderate association between performance on 2D rotation (r = .52) and scaling tasks (r =.46) and mathematics performance. The correlation between 3D rotation and mathematics was not significant (r =.24). In line with previous research (Khooshabeh & Hegarty, 2010), children self-reported using either a piecemeal/analytic or holistic approach to solve tasks involving mental rotation and using either a zooming/shrinking strategy or proportional reasoning (Gilligan et al., 2018) to solve scaling tasks. Associations between SES and spatial strategy use will be examined in the full pilot. The findings will provide insight into how children from different SES backgrounds engage with spatial tasks and help inform classroom practices and activities aimed at reducing the SES attainment gap.

Poster presentation #40

How Do Toddlers' Brains Respond to Numbers? A Longitudinal fNIRS Hyperscanning Study

- Irem Melisa Sahiner[1], Alexandra Grandison[1], Yetta Wong[1], Mojtaba Soltanlou[2]

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How do neural responses to numerical information develop in toddlerhood, and how do parent–child interactions shape this process? Non-symbolic numerical knowledge emerges early in life and is thought to support later symbolic understanding, yet the neural mechanisms underlying this transition remain poorly understood. The intraparietal sulcus (IPS) within the frontoparietal network is implicated in both non-symbolic and symbolic number processing. Despite rapid changes in numerical experience, language, and executive function during toddlerhood, this developmental period remains understudied at the neural level. Crucially, early numerical learning unfolds in social contexts, yet no study has examined parent–child neural synchrony during number-related interactions using hyperscanning. We will use a longitudinal fNIRS hyperscanning design with parent–child dyads (target n = 70) at 15–21 months (T1) and 27–33 months (T2). At T1, dyads will engage in semi-structured grocery play to elicit non-symbolic processing, alongside a violation-of-expectation task. At T2, toddlers will additionally complete symbolic tasks (give-a-number, counting, number naming). Number talk will be coded from transcripts, and parents will complete developmental questionnaires. Data collection begins in May 2026. Planned analyses will examine toddlers' neural activation during number talk, longitudinal changes in neural specialisation, and inter-brain associations within parent–child dyads. We hypothesise that toddlers will show increasing right parietal activation from T1 to T2, with activation becoming more specialised within the IPS and superior parietal regions over time. Greater parental IPS activation during non-symbolic numerical tasks is expected to correlate positively with toddlers' neural activation and non-symbolic numerical performance. This study addresses a key gap by integrating longitudinal and dyadic neural measures. It provides insight into how early numerical representations develop and are shaped through parental social interaction.

Poster presentation #41

EEG Signatures of Magnitude Comparison in Four to Seven-year-old Children and Adults -

Gaia Scerif [1]*, Sophia Shatek[1], Bethan Grimes[1]

[1] University of Oxford, United Kingdom

Magnitude comparison, where one judges which of two numerals represents a larger quantity, is an important real-life mathematical skill and is predictive of both concurrent and longitudinal mathematical ability. Yet, we know little about the neural dynamics that support it, particularly in young children. Both children and adults are faster to decide which number is larger when the numbers are further apart (low ratio), compared to closer together (high ratio), but functional neuroimaging data have pointed to age-related differences in parietal and frontal recruitment during magnitude comparison. Temporally-sensitive and portable imaging methods, such as electroencephalography, can map the temporal dynamics of magnitude comparison in younger and more diverse children than those included thus far. We collected EEG data in the lab and at schools to contrast indices of temporal dynamics in magnitude comparison among 156 4–7-year-old children and 45 adults. Participants judged which of two simultaneously-presented Arabic digits (1-9) was larger. Both adults and children showed higher accuracy and faster reaction times at lower ratios, and children were also faster and more accurate as age increased. In contrast to previous work, ERP analyses found no evidence of ratio effects at N1 and P2 components, but did show ratio effects for both children and adults at the P3 component. Adults showed modulation of fronto-central theta oscillations by ratio. This modulation was more variable in children. Our larger sample reveals that neural dynamics are highly variable across children and reflect engagement of executive processes required to compare digits, for both children and adults. Our findings suggest that more representative, younger, and larger samples are needed to understand the dynamics of magnitude comparison development.

Poster presentation #42

Intergenerational Transfer of White Matter Integrity in Arithmetic and Reading Networks -

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Reading and arithmetic co-develop throughout childhood[1]. These skills correlate not only behaviourally but also share white matter (WM) pathways[2] and functional networks[3],[4], pointing to common neural architecture. Both skills are substantially heritable, with parent-child similarities documented behaviourally[5] and neurally[6]. Parental fractional anisotropy (FA, a measure of WM integrity) in the inferior fronto-occipital fasciculus (IFOF), for example, predicts child FA in that structure and explains 81% the parent-child similarity in reading development[7]. While intergenerational WM transfer has been documented in reading[7], it remains unknown whether this extends to arithmetic-linked structures and children's arithmetic performance. Key WM structures, including the arcuate fasciculus (AF), superior longitudinal fasciculus (SLF), IFOF, and inferior longitudinal fasciculus (ILF), that have been linked to arithmetic performance[8],[9] are shared with the WM network related to reading[2]. Diffusion MRI data from 36 biological mother-child dyads was collected[10] and analysed using anatomically constrained tractography[11]. Through a hierarchical regression analysis, we will investigate whether maternal and child FA in arithmetic-linked structures (SLF, AF, IFOF, ILF, corpus callosum, corona radiata) predict each generation's arithmetic performance, and whether maternal FA correlates with child FA. Cross-domain, we will apply a two-step regularised partial correlation network approach1[12] to first identify the associations between WM tracts shared between reading and arithmetic and behavioural measures of arithmetic in children and mothers separately. Additionally, we will test whether maternal WM network metrics in tracts shared between reading and arithmetic (AF, IFOF, ILF) predict child arithmetic performance over and above the child's own shared WM network metrics, controlling for socioeconomic status throughout. These findings will help understand how the domain-general WM infrastructure shared between reading and arithmetic is intergenerationally transmitted and supports the underlying co-development of these skills.

Poster presentation #43

Aperiodic feature harmonization across sessions: aperiodic features & attention in diverse learners - Ariane Tretow[1]

[1] University of Jyväskylä, Finland

Data pooling is becoming increasingly important in neuroscience but remains relatively underexplored in EEG research using harmonization tools such as NeuroCombat (see Jaramillo-Jimenez et al. 2024). This study examines the stability of aperiodic features derived from resting-state EEG across recording sessions and equipment using data harmonization (NeuroCombat) followed by test–retest reliability analysis (ICC(3,1), pingouin.intraclass_corr). The aperiodic signal reflects the slope of the power spectrum and has been linked to excitatory–inhibitory balance in neural networks (Wilkinson et al. 2024), leading to its investigation across patient populations (Donoghue 2025). A recent systematic review (Stanyard et al. 2024) identified developmental trends in EEG aperiodic features, highlighting the need for further research on E:I balance in brain and cognitive development. Here, aperiodic resting EEG activity is examined as a marker of neurodevelopment and cognition in relation to attention deficits, age, and range of learning difficulties. Neural features (alpha, exponent, offset) showed fair to good ICC3,1 values (alpha = 0.59, exponent = 0.61, offset = 0.71). Silhouette analysis suggested negligible separation for two clusters, and forced two-cluster solutions showed no significant associations with gender, learning difficulty risk, or parent-reported attention difficulties. Participants were a subsample (N = 135) of diverse learners aged 7–8 recruited in Finland through InterLearn; analyses were performed on the first of three EEG-ET time points. More information on the subsample and procedures is given in the metadata (Hämäläinen et al. 2026). This research outcome is set to contribute to the field on a methodological level for the harmonization of developmental datasets obtained with different EEG equipment, as well as a contribution to the recent literature on ADHD and aperiodic signals, expanding findings to transdiagnostic examination of learning difficulties.

Poster presentation #44

Beyond Noise: Is Cognitive Variability Linked to Switch Costs in Children Aged 5–12?

- Feline van Aagten[1*], Lucía López Sánchez[2], Beyza Ustun-Elayan[1], Carolina de Weerth[1], Rogier Kievit[1]

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Cognitive performance fluctuates based on a number of factors like sleep, mood, and time of day (Neubauer et al., 2019). Traditionally, such variability has been treated as measurement error or noise; however, recent work shows that intra-individual variability is distinct from mean performance and varies systematically across individuals (Judd et al., 2024). While higher variability has often been linked to distractibility, it may also reflect adaptive cognitive flexibility–the ability to shift efficiently between tasks and goals (Braem & Egner, 2018). In this study, we examine whether greater cognitive variability is associated with lower switch costs in children aged 5 to 12, indicating increased flexibility. Data are drawn from the Learning Variability Network Exchange (LEVANTE, n > 700, pilot data from sites in Canada, Colombia and Germany). Cognitive flexibility is assessed using a set-shifting task (Same & Different; Sulik et al., 2025) and a task-switching paradigm (Hearts & Flowers; Davidson et al., 2006). These tasks measure different levels of flexibility by switch costs (i.e., differences in response time and accuracy between trial types). Variability can be measured using a multitude of methods, including intraindividual standard deviation, Drift Diffusion Modelling and Dynamic Structural Equation Modelling. Combining exploratory approaches and independent cross validation we will determine the most appropriate method of quantifying variability. Analyses are ongoing. We hypothesize that higher variability is linked to lower switch costs. Findings will be presented and discussed during the poster session. If they confirm our hypothesis, variability may reflect relevant differences in cognitive functioning, rather than noise. Understanding variability as a meaningful signal may inform more nuanced models of learning and support the development of individualized educational strategies.

Poster presentation #45

Sounding Right but Playing Wrong: Disentangling Confident Misattributions in Guitar Playing

María Paula Villabona Orozco[1]*, Elisa Filevich[1], Michiko Sakaki[1]

[1] Eberhard Karls University of Tübingen, Germany

How do we monitor our movements during skilled action, and under which conditions can our evaluations become systematically biased? In a previous study, we measured the precision of metacognitive representations in an ecologically valid motor task. Guitarists played single notes on a guitar neck while making trial-by-trial discrimination and confidence judgements. We tested participants in two conditions: In the visual condition, participants identified manipulations of a virtual hand presented on the screen, relative to their (real) hand position. In the tonal condition, no visual cues were available; instead, participants identified manipulations to a pitch played, again relative to their real hand position. Participants were more accurate at monitoring their movements with visual compared to tonal feedback. Importantly, we observed misattribution errors: guitarists were sometimes confidently, yet incorrectly, attributing a correct outcome to their own performance, particularly in the tonal condition. This pattern aligns with sense-of-agency research showing that judgments of causation depend on the match between intended and observed outcomes, rather than actual causal contribution. Both sensory modality and feedback type play a role, with agency judgements typically showing greater sensitivity to discrete outcome feedback than to continuous movement-related signals, even across sensory domains. In a second study, we further investigated the factors driving these misattributions. using a 2×2 factorial study design crossing sensory modality (auditory vs visual) and feedback type (continuous vs discrete). This allowed us to disentangle the contribution of each factor to confident misattributions. These findings carry potential implications for music education: when musicians confidently misattribute correct outcomes to their performance, they miss critical information that could correct errors, impairing both immediate execution and long-term skill development. Identifying conditions under which feedback is misinterpreted may inform the design of learning environments that support more accurate monitoring.

Poster presentation #46

Finding the Positive Angle: Positive Emotions and Anxiety in Math and Spatial Performance

- Helene Vos[1]*, Mila Marinova[2]

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Worldwide, women remain substantially underrepresented in STEM education and careers compared to men. Mathematical and spatial skills are essential for success in STEM, and extensive research has examined factors underlying individual and sex differences in these abilities. Prior work has focused primarily on negative emotions, such as math and spatial anxiety, while considerably less attention has been given to positive emotions, which may also play an important role. Consequently, it remains unclear to what extent individual and sex differences in mathematical and spatial skills are explained by both positive and negative emotional factors. The present study investigated the extent to which mathematical and spatial skills are associated with positive and negative emotions, and whether sex differences in these abilities are mediated by such emotions. Participants (N = 137; 54 men, 83 women) completed questionnaires assessing math anxiety, spatial anxiety, and positive and negative emotions toward mathematics. They also performed a timed arithmetic test, a cognitive reflection test, and a mental rotation task. Results revealed sex differences in arithmetic performance, cognitive reflection, and mental rotation. Both anxiety and positive emotions were significantly associated with performance and contributed to observed sex differences. These findings suggest that positive emotions play an important role in mathematical performance and may help explain sex differences, complementing the traditionally emphasized role of negative emotions.

Poster presentation #47

The Pilot study of Standardization of Yellow Red Test in the Czech Republic - Zuzana Bílková[1]*, Zuzana Štefánková[1], Eliška Samcová[1]

[1] University of South Bohemia, Czech Republic

The poster presents the process of standardizing the Yellow Red test in the Czech Republic. In the Czech Republic, there is a limited number of up-to-date standardized tools available for diagnosing executive functions in children, and these consist primarily of questionnaire-based methods. The standardization of the Yellow Red tool addresses this situation. For counseling and educational practice, where we assess the impact of deficits in executive functions on a child's school performance, it is essential to have not only questionnaire-based tools but also performance tests available. Research literature indicates that these methods do not measure executive functions identically but rather complementarily; questionnaire-based tools capture a different segment of executive performance than performance-based tools.The aim of the study is to standardize the YR test in the Czech Republic. We will develop the norms based on data from 400 children aged 5–11 years. In addition to testing with the Yellow Red instrument, we also assess executive function in this same sample of children using instruments already established in the Czech Republic—the WISC-V subtests (coding, digit span) and CAS 2 (planned connections). In this paper, we analyze the results of a pilot study designed to validate the proposed methodology. The methods described were administered as part of the pilot study. The research sample consisted of 50 children in grades 1–5 (ages 6–11), with 10 per age group. The testing took place on a single day in a school setting. Half of the children first took the YR, and the other half took the standardized tests mentioned above. We compare the obtained data with data from the original Chilean study (Rosas et al., 2022). We discuss possible sources of differences, which may typically be related to differences in the school system.

Poster presentation #48

From Objects to Environments: Exploring Spatial Abilities in Children

- Jolien Moorkens[1*], Max Oldenburger[1], Marian Hickendorff[1], Ineke van der Ham[1], Dietsje Jolles[1]

[1] Leiden University, Netherlands

Spatial abilities play an important role in everyday functioning and are strongly linked to success in science, technology, engineering, and mathematics (Sorby et al., 2018). Spatial cognition encompasses multiple skills that operate at different scales. Small-scale spatial abilities involve the mental manipulation of objects that can be perceived from a single viewpoint (e.g., mental rotation and spatial visualization), whereas large-scale spatial abilities involve navigation and the representation of environments extending beyond the immediate perceptual field (Hegarty & Waller, 2004; Montello & Pick, 1993). Although both types of abilities are widely studied, their relationship remains unclear, particularly in children (Lasc et al., 2025). In addition, the study examines the role of spatial anxiety and gender. Spatial anxiety may hinder children's engagement with spatial tasks and is therefore expected to be related to spatial performance (Geer et al., 2024). Also, gender is investigated, as previous findings on gender differences are mixed, particularly in children (Nazareth et al., 2019). The present study examines how large-scale and small-scale spatial abilities are related to each other (grades 5 and 6). Large-scale spatial skills are assessed using a digital navigation task measuring multiple aspects of navigation within a virtual environment (van der Ham et al., 2020). In addition, the role of spatial anxiety is investigated. Importantly, this study distinguishes between anxiety related to small-scale tasks and large-scale navigation. Furthermore, potential gender differences in spatial skills and spatial anxiety are explored, as well as the role of gender in the associations between these constructs. Data will be analysed using structural equation modelling to examine associations between spatial abilities, spatial anxiety, and gender. By examining these factors simultaneously, this study aims to provide a more comprehensive understanding of how different types of spatial skills and spatial anxiety are related in primary school children.

Poster presentation #49

Gender Differences in Math Performance: Indirect Effects of Spatial Ability and Affective Factors

- Chloe Oi Ying Leung[1]*, Dietsje Jolles[1], Marian Hickendorff[1] Petra Jansen[2]

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Gender differences in mathematics performance have been partly attributed to both cognitive factors, such as spatial ability, and affective factors, including math anxiety and math self-competence. While spatial ability has been identified as a robust mediator of gender differences in math performance, findings regarding math-related affective factors are more mixed, particularly when considered alongside spatial ability. Moreover, although spatial affective factors have been shown to mediate gender differences in spatial performance, their role in explaining gender differences in math performance has not yet been comprehensively examined. The present study integrates these lines of research by examining how spatial ability, spatial affective factors, and math-related affective factors jointly contribute to gender differences in children's math performance.Participants were 412 children (ages 9–13 years) who completed measures of spatial ability (mental rotation and spatial reasoning), math performance (arithmetic and mathematical flexibility), math-related affect (math anxiety and math self-competence), and spatial-related affect (spatial anxiety related to navigation and mental manipulation, and spatial self-competence). Structural equation modeling was used to test mediation models examining direct and indirect pathways linking gender to spatial and math performance. Results showed that gender differences in math performance were fully mediated by spatial ability and math self-competence, whereas math anxiety did not uniquely predict math performance once spatial ability was included. Spatial affective factors significantly mediated gender differences in spatial ability, with both spatial anxiety and spatial self-competence contributing unique variance. Importantly, spatial affective factors were indirectly associated with math performance through their relations with spatial ability. In an integrative model including all constructs simultaneously, gender differences in math performance were fully mediated by spatial ability and math self-competence, with spatial affective factors exerting indirect effects via spatial ability. Together, these findings underscore spatial ability as a key mechanism linking gender, affective factors, and math performance.

Poster presentation #50

Bridging Science and Children's Inner Worlds: A Randomized Controlled Trial of a Co-Created Podcast

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Background: Children increasingly seek mental health information through accessible digital media, yet much of the available content lacks scientific quality. Educational podcasts may offer an evidence-based alternative, but research on their effectiveness in children is scarce and methodologically limited. We evaluated the impact of Expedition Inner World: The Podcast, a co-created science podcast designed to stimulate reflection on children's inner world.Methods: A randomized controlled trial was conducted among 147 children aged 10–13 years. Participants were randomly assigned to either a four-episode mental health podcast or an active control podcast covering general science topics. Outcomes were assessed before and after the intervention using validated measures of emotion awareness (EAQ-30NL) and self-reflection (SRIS-Y), alongside self-reported reflective capacity, communicative ability, and ease of talking about the inner world. Linear mixed-effects models examined changes over time and between groups. Participants also evaluated the perceived impact of the podcast.Results: No significant intervention effects were found on the primary pre-post outcome measures. However, children who listened to the intervention podcast consistently reported that it had helped them learn more about their inner world, reflect on their thoughts and feelings, and communicate more often and more effectively about their inner world than children in the control condition (all $p < .001$, large effect sizes: $d = 0.94–1.51$). Conclusions: Although a brief podcast intervention did not produce measurable short-term changes on validated psychological outcomes, children perceived substantial benefits for learning and reflection. These findings suggest that co-created science podcasts represent a promising, scalable approach for mental wellbeing education and science communication, while highlighting the need for longer interventions and outcome measures that are sensitive to educational and behavioral change.