

# The *Neo-PRISM-C* Final Conference

## Editorial Note

The Center for Applied Neuroscience and the Department of Psychology at the University of Cyprus, Cyprus, hosted on May 31 through June 3, 2023, the Final Conference of the 4-year Marie Skłodowska-Curie (MSCA) Innovative Training Network (ITN) project on ‘*Neurodevelopmental Optimal Predictors Risk Factors and Interventions from a Systems Approach for Maladjustment in Children*’, <https://neoprismc.org/final-conference/#101>. *Neo-PRISM-C* studied neurodevelopmental disorders (NDD), which emerge early in development and result in long-term disability, compromising the quality of life of millions of Europeans. The project focused on training 15 early-stage researchers (ESRs) – mental health researchers, clinicians, and entrepreneurs from diverse fields such as psychology, neuroscience, and data science (Grant Agreement No. 813546, coordinated by the University of Cyprus, 2018–2023). The program aimed to equip them with the necessary skills to investigate mechanisms of neurodevelopmental disorders (NDD) and ultimately develop and test effective treatments. As a result, *Neo-PRISM-C* has contributed to the understanding of NDD and improved the competitiveness of EU health professionals and scholars, providing the market with highly skilled researchers and clinicians. The Conference brought together researchers, scientists, clinicians, and policymakers from 17 countries, including the EU, USA, and Canada, studying neurodevelopmental disorders and presenting the latest findings, methodologies, and approaches to dealing with these complex conditions.

The conference abstracts included in the present article reflect the remarkable work carried out by the 15 ESRs under the guidance of our esteemed consortium colleagues. They also highlight a wide network of collaborations in the specific subject. Through this issue, we celebrate our collective achievements and the knowledge and discoveries we have acquired.

Over the past nearly five years, our project has embraced the conceptual shift that the Research Domain Criteria (RDoC) brings to mental health research, particularly emphasizing neurodevelopmental disorders (NDDs). We have acknowledged and addressed the challenges of transforming traditional research training in mental health. By integrating the expertise of various educational, research,

and non-academic institutions across the EU and elsewhere in the world, we have strived to promote this transformative perspective.

We have pursued several of the most important primary objectives, as evidenced by the material presented in this issue. First, we have aimed to educate the fellows and early-stage researchers in comprehending the etiological and maintenance mechanisms of childhood mental health problems. This includes understanding how these mechanisms transcend traditional diagnostic categories and elucidating the complexities of comorbidity and heterogeneity. Additionally, we have explored the brain-based dispositions that lead to impairments at the neuropsychological and behavioral levels. Furthermore, we have examined how these principles can be applied to evidence-based prevention and treatment strategies.

Another focal point of our training has been to equip ESRs with a comprehensive understanding of human behavior and functioning, focusing on domains such as learning, emotion, cognition, motivation, and social behavior. In addition, we have delved into the malfunctioning of these systems in neurodevelopmental disorders, including attention deficits, anxiety, autism, learning and language disorders, and their intricate interactions with contextual parameters such as family and school and sociodemographic variables like gender, age, and ethnicity.

In addition, we have aspired to uncover the underlying neurobehavioral systems that span multiple neurodevelopmental disorders by fostering a new generation of scholars and clinicians. By developing innovative analytical methods and utilizing cutting-edge experimental technologies, we have endeavored to advance our understanding and improve the lives of children facing mental health challenges. Our goal has been to effectively harness existing expertise and human resources to address societal challenges.

Overall, *Neo-PRISM-C*'s crucial aspect has been establishing the link between neurobiological, behavioral, experiential, and environmental components of childhood behavioral and learning problems and appropriate interventions. We have explored interventions encompassing psychological, systemic, and ICT-based approaches, all aimed at targeting fundamental processes, being transdiagnostic in nature, and promoting effectiveness, treatment adherence, and respect for the rights and dignity of children and families.

As evidenced by these abstracts, we aim to share our research results with researchers, practitioners, educators, companies, policymakers, and stakeholders. Through this effort, we aim to stimulate the growth of this new interdisciplinary field and ensure that mental health needs across the EU are continuously addressed beyond the conclusion of this project.

On a side note, given the breadth and depth of the work presented, we sincerely thank all the participants, our esteemed keynotes, speakers, and contributors for their invaluable insights and unwavering dedication. We are indebted to all of you. The *Neo-PRISM-C* Final Conference served as a testament to the remarkable achievements we have accomplished together. We hope that your reading of this set of abstracts will show how collaborating in mental health research and practice can be both memorable and fruitful.

*On behalf of the Neo-PRISM-C Consortium*

Prof. Timothy C. Papadopoulos, *Neo-PRISM-C*  
Project Coordinator  
Prof. Georgia Panayiotou, *Neo-PRISM-C*  
Vice-Coordinator

## Poster Sessions

### 1

#### Investigating Spelling Errors in Greek Using Eye-Tracking Methods

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#### Introduction

We aimed to model eye-movement outcomes of spelling errors in four groups of young learners, following a reading-level (RL) match design.

#### Methods

Fixations and saccades were recorded in a sample of Grades 3 and 6 children with reading difficulties (RD) and their chronological age (CA) controls during their performance on a spelling recognition task. Grade 3 typical readers were also used as reading age controls (RA) for the Grade 6 RD

group. In the spelling task, the participants had to identify the correct word in pairs of correctly spelled and phonologically homophones but misspelled words.

#### Results

MANOVA analyses showed that children with RD in both Grades produced more fixations and saccades than their controls. No differences were observed in eye movements between Grade 6 RD children and their RA controls.

#### Conclusion

The extended and longer fixations and saccades observed in the RD groups' incorrect responses indicate a deficiency in the poor readers' mental lexicon, specifically in establishing orthographic representations (Fella & Papadopoulos, 2018). Additionally, the absence of group differences between Grade 6 RD and RA controls validates that employing an RL match design is unsuitable for orthographically transparent languages (Parrilla et al., 2020).

### 2

#### Cognitive Predictors of Math Ability in School-Age Children

Sofia Gogoglou, Evgenia-Peristera Kouki, George C. Spanoudis, & Timothy C. Papadopoulos

*Department of Psychology & Center for Applied Neuroscience, University of Cyprus*

#### Introduction

Exploring the cognitive foundations of math ability, especially Executive Functions (EFs), remains a significant area of investigation. While attention has consistently been a significant predictor of math ability, findings are mixed on how other EFs, like Short-Term Memory (STM), Working Memory (WM), and Processing Speed (PS), predict math ability. This study examined how STM, WM, PS, and attention determine math performance in young learners.

#### Methods

A sample of 194 community-recruited children aged 6–12 years (Mean: 8.95, SD: 1.76) were administered a set of pertinent cognitive and math ability tasks from an array of standardized batteries in Greek.

#### Results

Regression analysis showed that attention, PS, and STM explained 71% of the variance of math ability, after controlling for age and verbal and non-verbal ability. Working Memory did not affect math performance.

## Conclusion

These findings partially confirmed previous research on the role of attention and PS in predicting math ability. They also challenge the idea that WM is a critical factor in math performance, indicating that retention of information is more crucial for optimal performance. Understanding the cognitive foundations of math skills can significantly contribute to devising remedial math programs.

## 3

### Cross-Linguistic Predictors of Academic Difficulties and Related Anxiety During School Age

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<sup>2</sup>Department of Psychology & Center for Applied Neuroscience, University of Cyprus, Nicosia, Cyprus

#### Introduction

This study explores reading and math difficulties' shared parental and individual performance predictors in two cohorts of Finnish- and Greek-speaking elementary school children.

#### Methods

260 Finnish- (ages 8–9, Mean: 8.75, SD: 0.30) and 220 Greek-speaking (ages 6–12, Mean: 8.92, SD: 1.78) children and their parents participated in the study. Children's reading and math skills were assessed, and information about parental (i.e., academic history and reading/math anxiety) and children's (i.e., motivation and task-related anxiety) variables were collected with questionnaires.

#### Results

Preliminary analysis indicated that similar parental and individual variables determine students' academic performance independent of the learning outcome measure. The analysis also examined cohorts' similarities and differences based on their cross-linguistic and cross-cultural backgrounds.

#### Conclusion

Although extensively examined, the underlying mechanisms of academic difficulties have yet to be fully understood. This work is one of the first attempts to illustrate

how academic anxiety, combined with parental predictors, might hinder academic performance.

## 4

### Predicting Reading Outcomes in School-Age Children

Savvina Banti, Evgenia-Peristera Kouki, George C. Spanoudis, & Timothy C. Papadopoulos

Department of Psychology & Center for Applied Neuroscience, University of Cyprus

#### Introduction

Predictors of reading outcomes have often been explored but rarely across several grades of elementary schooling. Thus, we investigated cognitive and linguistic reading fluency and comprehension predictors from Grades 1 to 6.

#### Methods

Fifty-three children aged 6–12 years were administered a set of cognitive (e.g., attention and planning), linguistic (e.g., phonological and grammatical abilities), and word reading fluency and comprehension tasks. A stepwise regression analysis was conducted to identify word reading and comprehension predictors.

#### Results

Results showed that phonological ability predicted word reading fluency ( $R^2=0.75$ ), and reading comprehension (RC) performance ( $R^2=0.80$  for sentence RC, and  $R^2=0.70$  for text RC), after controlling for age and verbal and non-verbal ability. From the cognitive predictors, processing speed and working memory predicted reading comprehension but not fluency.

#### Conclusion

Beginner and experienced readers are subjected to varying processing demands regarding different reading tests, indicating diverse skill requirements.

## 5

### Internalizing and Externalizing Psychopathology in Children: A Psychoneurometric Approach

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<sup>2</sup>Center for Applied Neuroscience, University of Cyprus

## Introduction

In this research we adopted a psychoneurometric approach to establish biobehavioral constructs.

## Methods

The sample consisted of 185 children. All families completed self-report measurements and participated in psychophysiological experiments. They also gave saliva for the extraction of genomic DNA.

## Results

A total of 68 polymorphisms across 52 genes previously associated with internalizing and externalizing psychopathology including Serotonin, Dopamine, Noradrenaline, Oxytocin, Vasopressin, Acetylcholine, Glutamate and GABA, HPA axis components, Potassium channel genes, and neurotrophic genes, were assessed. These polymorphisms can have great contribution on the establishment of endophenotypes, since they have been associated with brain indicators, such as frontal cortex oxygenation, physiological measurements, such as Heart Rate and Skin Conductance responses to affective stimuli, cognitive measurements of response inhibition (stop-signal task), and self-reports.

## Conclusion

Results suggested that the systematic development of neurobiologically based measures that have meaning both psychologically, physiologically and neurobiologically can help reconceptualize the notions of internalizing and externalizing psychopathology in children.

## 6

### Visual Expertise for Print: An Event-Related Potentials Study

Evgenia-Peristera Kouki<sup>1</sup>, Marios Agathangelou<sup>2</sup>, Evangelos Paraskevopoulos<sup>3</sup>, George Spanoudis<sup>1</sup>, & Timothy C. Papadopoulos<sup>1</sup>

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## Introduction

Experienced readers recognize and process word-like stimuli quicker and more accurately than unknown letter strings. This process becomes automatized as exposure to reading material increases, evidenced in event-related potential (ERP) paradigms. This study explored the N170 effect in school-age children associated with efficient visual expertise for print.

## Methods

Twenty-four poor readers (PR), and 17 age-matched controls (CAC), aged 9–11 years, were recruited. Participants performed a same-different paradigm, in which they were visually presented with pairs of Greek pseudowords and Armenian character strings.

## Results

Preliminary analysis indicated that differences between PR and CAC are reflected in different amplitudes of neural activity in the N170 component. Greek orthographic stimuli elicited greater, left-lateralized N170 mean amplitudes, and group differences were observed between PR and CAC. CAC demonstrated stronger N170 for Greek pseudowords than for unknown stimuli.

## Conclusion

Neurophysiological patterns reveal quick and accurate processing of orthographic stimuli in typical but not atypical readers. Therefore, attenuated N170 effects may be a marker of reading difficulties in school-age children.

## 7

### Methodological Approaches When Developing Item Bank Content for Computerized Adaptive Testing (CAT): The Instance of a Psychometric Reading and Spelling Tool

Leonidas Bourikas & George Sideridis

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## Introduction

The foundation of any psychometric tool lies in a well-designed item bank. However, most existing literature on the development of paper-and-pencil or computerized psychometric tests predominantly focuses on factors such as item quantity, factor analysis, content validity, and internal consistency.

## Methods

Within this research endeavor, we present the rationale and step-by-step process involved in creating items for a Computerized Adaptive Testing (CAT) battery specifically designed for reading and spelling assessments. To illustrate our item development methodologies, we utilize a subset of our data collected from 800 examinees, specifically 3rd graders.

## Results

Our preliminary findings are presented through visualizations of Test Information Functions (TIFs) and structural models of reading and spelling constructs.

## Conclusion

Moreover, we aim to initiate a discussion on methodological considerations for item pool development. This includes addressing item exposure concerns and ensuring content distributions align with the intended purpose of the test. We anticipate that our presentation will not only inform but also provide valuable guidance to future test developers working in educational and clinical settings, encouraging them to embrace modern, computerized algorithmic assessment methods.

## 8 Parenting Style and Children's Cognitive and Emotional Development: Preliminary Data

Antriani Tsagkaraki, Evgenia-Peristera Kouki, George C. Spanoudis, & Timothy C. Papadopoulos

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### Introduction

This work reports preliminary data from a study exploring the relationship between parenting styles and children's cognitive, learning and emotional outcomes.

### Methods

A sample of 13 community-recruited children aged 6–12 years (Mean: 8.95, SD: 1.76) were administered a set of cognitive, linguistic and math ability tasks. Additional measures included parental and children's reports on parenting style, personality characteristics, and likely psychopathology.

### Results

Participants were classified into three groups, children with learning ( $n=6$ ), cognitive ( $n=5$ ), and emotional deficits ( $n=2$ ). We examined the relationships between each group's parenting style, parental personality, and psychopathology using non-parametric analysis. Correlations showed that increased parental psychopathology is linked to increased poor supervision and decreased positive parenting.

### Conclusion

Although data collection is ongoing, these preliminary findings underscore the importance of considering parental factors in investigating children's cognitive and emotional difficulties.

## 9

### The Child ViReal Support Program: A Multi-modal Intervention Program for Children With Attention Deficits and Their Parents

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<sup>1</sup>*Department of Psychology, University of Crete*

<sup>2</sup>*Applied Psychology Laboratory, Center for Research and Studies, University of Crete*

### Introduction

Attention deficits in children lead to diverse impairments in their lives and families and call for specialized support services for them and their parents.

### Methods

The "Child ViReal Support Program" is a multi-level intervention program consisting of child and parent training sessions. The child training utilizes the potential of virtual reality (VR) technology for attention training and combines cognitive-behavioral techniques (CBT) to enhance behavioral and emotional self-regulation skills. During the parent training, parents are trained in techniques for behavior modification (BPT) and for the enhancement of their child's cognitive functions. A randomized controlled trial study using a cross-over design with 16 children aged 9–12 years old and their parents was implemented to evaluate the program's efficacy. The intervention was assessed four times using computerized cognitive assessments and questionnaires.

### Results

The study findings indicate improvements across various domains for children and their parents, highlighting positive changes resulting from the intervention.

### Conclusion

The 'Child ViReal Support Program' integrates the strengths of multiple approaches such as BPT, CBT, and VR technology aiming to address both children's and parents' needs in families affected by attention deficits and/or ADHD.

## 10

### Assessing the Psychometric Properties of the South Oaks Gambling Screen: A Systematic Review

Revekka Christodoulou & Georgia Panayiotou

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## Introduction

The SOGS is a widely recognized screening tool for detecting pathological gambling, translated into multiple languages. Objectives include assessing its validity and reliability, developing a valid and reliable Greek version, and enhancing understanding of its psychometric properties and cross-cultural adaptation.

## Methods

Psychometric properties of SOGS were assessed following PRISMA guidelines. Articles were extracted from Google Scholar and PubMed. After removing duplicates, exclusion of articles focused on irrelevant articles and non-original versions of SOGS. Then, with a careful review, 15 articles that provided insights into the reliability, validity, and factor analysis of SOGS were included.

## Results

High internal consistencies of the instrument have been reported in different studies. Significant correlations have been found between SOGS scores and DSM III-R, DSM-IV and DSM-V diagnostic criteria, indicating convergent validity. Factor analytic studies have revealed varying underlying factors, depending on population studied and a cutoff score of >5 is recommended.

## Conclusion

SOGS is a widely used tool for assessing gambling behavior, with extensive research on its reliability and validity. The psychometric findings overall support the reliability and validity of the SOGS as a measure of gambling behavior. However, factor analytic findings suggest that the underlying factors of the SOGS may vary across populations.

## Symposia

### A

#### Using Transdiagnostic Approaches to Explore the Interplay Between Genetic and Environmental Influences across Neurodevelopment (General Summary)

Chair: Prof. Kostas Fanti

Daria Khanolainen<sup>1</sup>, Georgia Gerike<sup>1,2</sup>,  
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## Introduction

Understanding the contribution of genes and environment in neurodevelopment is a salient, yet complex topic. Here, we overview three different approaches to disentangle how gene by environment interactions influence cognitive and psychological development.

## Methods

The first study examines how parental and child reading skills act as proxies for genetic predisposition for dyslexia. The second study employs a discordant monozygotic twins design. The third study applies a mechanistic approach to understand how the interaction between environmental factors and genetic factors interact to influence psychopathological outcomes.

## Results

The first study suggests that when parental skills are controlled for, the true effects of the home learning environment on children's reading development can be isolated. The second study highlights how environmental factors, such as school support and peer group selection, can be linked to reading difficulties when the home environment is shared. Lastly, the third study associates parenting style with acetylcholine, oxytocin, GABA and HPA axis neurobiological pathways.

## Conclusion

Using transdiagnostic approaches are needed to help progress understanding among genetic, environmental and behavioural models.

### A1

#### Reading Fluency Growth from Grade 2 to Age 23 and the Effects of Parental and Child Factors

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## Introduction

Even though reading can only develop in the presence of targeted instruction, children's trajectories of reading development to a large extent are pre-determined by their genes. In view of this, parental reading can act as a strong confounding factor in research evaluating the role of environmental factors in reading development.

## Methods

Approximately 200 Finnish families participated in the present study. Both parents and children completed reading assessments and different questionnaires. To analyze the data a latent growth curve model.

## Results

The developmental rate of reading fluency was predicted by rapid automatized naming (RAN), the formal home literacy environment (HLE) (both measured in kindergarten) and reading motivation (measured in elementary school). The adult outcome (fluency at age 23) was predicted by RAN, parental dyslexia, and the formal HLE. Additionally, those who had parents with resolving dyslexia were more likely to follow a resolving trajectory themselves compared to those whose parents had persistent dyslexia.

## Conclusion

Our findings offer novel insights into how reading fluency develops into adulthood and identify key areas for future research to better understand the mechanisms behind reading fluency development. The full study can be read as a preprint: <https://psyarxiv.com/fbvx8/>

## A2 Gene by Environment Interactions in Psychopathology

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## Introduction

The aim of this research is to examine the role of gene by environment (GxE) interactions in psychopathology for children aged 8–12 years old by adopting the Research Domain Criteria (RDoC) framework.

## Methods

The sample consisted of 364 individuals (N=179 parents, N=185 children) who completed self-report assessments, performed psychophysiological measurements in the lab, and offered saliva for the extraction of genomic DNA.

## Results

Bioinformatics analysis stresses out the contribution of neurobiological pathways such as serotonin, acetylcholine, oxytocin, GABA and HPA axis. Structural equation modeling pinpoints environmental factors like parenting style, empathy abilities, and child's sensitivity to environment that trigger the development of individual characteristics.

## Conclusion

Future work involves investigation of specific genetic variants associated with environmental stressors as well as the incorporation of the psychophysiological measurements towards the system-level approach that the RDoC framework advocates for better contribution to GxE research in psychopathology.

## Symposium B. Child Development: From Neural Substrates to Remediation (General Title)

Chair: Georgia Gerike

*Department of Teacher Education, University of Jyväskylä, Finland*

## Introduction

Recent research has reshaped our approach to neurodevelopmental disorders through the Research Domain Criteria (RDoC) framework, offering new insights into conditions like ADHD, dyslexia, and SLI. Meanwhile, interventions for children with chronic physical conditions (CPCs) have primarily focused on emotions, sidelining cognitive aspects. This summary explores the potential of the RDoC framework and the role of cognitive and emotional processes in CPC interventions.

## Methods

In the first study, we reviewed several studies within the RDoC Cognitive Systems domain from 2015 to 2022. In the second study, we systematically selected ten articles focusing on CPC interventions, registered in Prospero (CRD42021233505).

## Results

The first study reveals the RDoC framework's power in distinguishing deficits across neurodevelopmental disorders. However, it highlights a partial misalignment with traditional diagnoses, pinpointing Cognitive Control and Working Memory deficits as transdiagnostic markers. In the second study, cognitive interventions show promise but exhibit variable effects, while coping interventions have limited emotional impact and no advantage over alternatives, with none addressing both emotional and cognitive processes concurrently.

## Conclusion

These findings underscore the RDoC framework's potential in understanding neurodevelopmental disorders, despite misalignment with traditional categories.

Simultaneously, they emphasize the need for a holistic approach in CPC interventions to address both emotional and cognitive aspects, improving outcomes for children with chronic physical conditions.

## **B1**

### **Single Deficit, Comorbidity or Varying Degrees of Dysfunction? New Directions to the Study of Learning Disorders**

Evgenia-Peristera Kouki, Antriani Tsagkaraki, George Spanoudis, & Timothy C. Papadopoulos

*Department of Psychology and Center for Applied Neuroscience, University of Cyprus, Cyprus*

#### **Introduction**

Research on neurodevelopmental disorders has led us to refine our theoretical and methodological approaches. We explore whether new deficit clusters in line with the Research Domain Criteria (NIMH, 2013), a novel multifactorial framework, better explain known conditions such as ADHD, dyslexia and SLI.

#### **Methods**

We review relevant literature from 2015 to 2022 on the RDoC framework and the above conditions. We retrieved 2,471 studies on the RDoC Cognitive Systems domain from PubMed, PsycINFO, and Web of Science databases. Studies were processed with Ray.Yan software. Thirteen studies met all inclusion criteria.

#### **Results**

Findings show that RDoC-informed neural and cognitive phenotypes were only partially aligned with DSM-based diagnoses. Moreover, deficits in Cognitive Control and Working Memory cut across established diagnoses, thus serving as transdiagnostic markers.

#### **Conclusion**

The RDoC framework helps distinguish the neural, cognitive, linguistic, and behavioral deficits that cut across disorders such as ADHD, dyslexia and SLI.

## **B2**

### **Emotional and Cognitive Processes in Psychological Interventions for Children With Chronic Diseases – A Systematic Review**

Mareike Kaemmerer<sup>1</sup>, Celine Jeitani<sup>1</sup>, Cara Verwimp<sup>2</sup>, Magali Lahaye<sup>1</sup>, Olivier Luminet<sup>1</sup>

<sup>1</sup>IPSY – UCLouvain, Belgium

<sup>2</sup>University of Amsterdam, Netherlands

#### **Introduction**

Chronic physical conditions (CPC) in children can lead to emotional and cognitive difficulties but the latter have not been investigated in reviews on interventions for CPC. This review investigates the role of both processes in the efficacy of psychological interventions for children with CPCs.

#### **Methods**

Articles were selected according to participants' age (8–12 years), type of CPC (e.g., diabetes), intervention (e.g., Cogmed), control group (e.g., waiting list), and dependent variables (e.g., coping). Studies had to assess at least one emotional/cognitive process. The review is preregistered in Prospero (CRD42021233505).

#### **Results**

We included ten studies in the final synthesis. Cognitive interventions showed some improvements in cognitive processes, but effects were not homogeneous across studies despite similar methodologies. Coping interventions showed little effect on emotional processes and were not more beneficial than alternative interventions. No study trained or assessed both emotional and cognitive processes.

#### **Conclusion**

The results show limitations in the literature regarding the study of interventions' action mechanisms and the processes underlying the improvement or maintenance of psychosomatic health. This review is a first step towards improving the quality of studies and a better understanding of the needs of children with CPCs.

The unpublished manuscript is available as a preprint: <https://psyarxiv.com/xzcvh/>



## Symposium C: New Trends in Neurodevelopmental Research: The Role of Digital Technologies

Chair: Kleanthis Neokleous

Silversky3D Virtual Reality Technologies Ltd, Nicosia, Cyprus

### Introduction

Recent technological advancements in Virtual Reality (VR) and voice recognition software have opened new possibilities in the study of children's behavior, reading assessment, and addressing attention deficits. This Symposium explores their innovative applications.

### Methods

- VR offers a naturalistic approach to studying children's behavior, bridging the gap between controlled experiments and real-world complexities.
- Modern VR headsets with sensors enable comprehensive observations.
- Voice recognition software, utilizing deep learning, automates word decoding accuracy assessment, providing a reliable screening tool for reading evaluations.
- The 'Child ViReal Support Program' combines VR-based child training with parent training to enhance attention and self-regulation skills, yielding positive outcomes in a randomized trial.

### Results

These technological innovations enhance our understanding and support for children:

- VR enables realistic behavior studies.
- Voice recognition automates reading assessments.
- The 'Child ViReal Support Program' improves attention deficits.

### Conclusion

Cutting-edge technologies like VR and voice recognition hold promise for advancing research and interventions for children, offering more effective assessments and innovative support methods.

## C1 Advantages of Immersive Virtual Reality Developments for Perception and Cognition Research in Children

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### Introduction

Recent advancements in immersive Virtual Reality (VR) technology have unlocked new opportunities for studying children's behavior. The increasing availability of VR hardware and software facilitates a research paradigm shift, moving away from reductionist approaches (e.g., experiments on 2D screens) towards more naturalistic studies in 3D virtual environments. This shift has made VR a versatile platform for experimentation, whose use though, is not a panacea. Here, we argue that VR should be employed when conventional research methods are impractical, unsafe, or inadequate for studying the phenomenon at hand. In these cases, VR serves as a middle ground, bridging the gap between reductionist approaches and the complexity of real-world behavior.

### Methods

Using VR, researchers can observe behavior in realistic environments while maintaining the necessary experimental control. Furthermore, as modern VR headsets are equipped with sensors that measure different aspects of behavior (e.g., eye, head, and body movements), they can provide a more comprehensive understanding of how children perceive and process information in their surroundings.

### Results

Building on these advantages, we present our own research focusing on children's visuospatial information acquisition and retention as well as visual behavior in VR environments.

### Conclusion

We conclude by addressing specific challenges associated with employing VR in research protocols involving children.

## C2

## The Use of AI-Methodology for Automating Scoring of Oral Responses in the Assessment of Reading Abilities

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<sup>2</sup>Fi-tech, London

## Introduction

Assessment of reading abilities at early educational stages is critical for identifying reading-related learning difficulties. Regarding Greek reading test batteries, they particularly measure word decoding accuracy either by the presence of an examiner evaluating word articulation accuracy or with an MCQ format in computerized assessments, which is not the most reliable method. The problem-gap is how to measure decoding ability that doesn't require the presence of an examiner.

## Methods

Voice recognition software based on deep learning techniques could be a practical solution. One that can identify the probability of a sound segment containing a phonetic mistake, allowing for automated decoding ability measurement. During the presentation, we delve into the architecture of the voice recognition deep learning model and analyze voice-related data collected from a convenience sample of 3rd and 4th graders, amounting to 8.6 hours of recorded data. These efforts aim to establish the viability of our use-case.

## Results

The findings of our study demonstrate that the application can effectively identify phonetic errors, exhibiting an overall precision and recall measures exceeding .95.

## Conclusion

The proposed solution constitutes a paradigm of implementing cutting-edge technologies in psychological research, holding promise that in the future such applications will provide a minimum-effort screening tool with automated scoring and reports.

## C3

### A Novel Approach to Attention Training for Children With Attention Deficits: The Role of Virtual Reality in the Child ViReal Support Program

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## Introduction

Attention deficits significantly impact children's daily lives, making it vital for them to receive specialized support services. Recent advancements in virtual reality (VR) technol-

ogy allow it to be integrated into intervention programs for children with attention deficits.

## Methods

The 'Child ViReal Support Program' – a multi-level intervention program combining parent training and child training – was designed and implemented. The child training employs VR technology and cognitive-behavioral techniques to help children enhance their focused and sustained attention and self-regulation skills. A randomized controlled trial using a cross-over design was conducted with the participation of 16 children (9–12 years old) and their parents. Participants were assessed four times using computerized cognitive assessments and questionnaires.

## Results

The study findings suggest that the intervention yielded favorable outcomes for children, manifesting as significant enhancements in multiple domains. Moreover, children expressed positive evaluations regarding their engagement with VR technology and the tasks involved.

## Conclusion

The implementation of cutting-edge technologies, such as VR, creates new perspectives for psychological research and provides resources for novel experimental paradigms and interactive applications holding promise for addressing attention deficits in children and advanced interventions in this area.

## Oral Presentations

### 1

#### Multisensory Training Elicits Different Neuroplastic Changes in Young and Older Adults

Evangelos Paraskevopoulos<sup>1</sup>, Nikolas Chalas<sup>2</sup>, Alexandros Karagiorgis<sup>3</sup>, Panagiotis Bamidis<sup>3</sup>

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<sup>3</sup>Laboratory of Medical Physics and Digital Innovation, School of Medicine, Aristotle University of Thessaloniki, Greece

## Introduction

Some higher cognitive functionalities such as multisensory integration and musical training, retain the ability to generate neuroplastic changes even in older ages.

## Methods

To investigate the form of these changes, we performed an electroencephalographic evaluation of a novel computer-based music reading training protocol (MusicPlast). The data were analyzed on the level of cortical activation strength and the level of cortical network connectivity.

## Results

Results indicated that multisensory training induces significant neuroplastic changes in both age groups but via a different pattern: Young adults, in comparison to the older ones, exhibit increased re-organization of connectivity, while older adults, show increased neuroplasticity on the strength of each region, independently.

## Conclusion

Musical training, as a special case of multisensory learning, constitutes a strong driver of neuroplasticity, even in older age, allowing a re-organization at the level of cortical map formation and an increase in the functionality of the cortical correlates of multisensory integration.

## 2 A Multimodal Approach in the Search for Biomarkers for Transdiagnostic Factors

Markos Apostolakis<sup>1,2</sup>, Georgia Panayiotou<sup>1,2</sup>

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### Introduction

Objective markers of risk factors and vulnerabilities are commonly used in medicine, but in psychological research they have only recently started being implemented. Efforts to identify indicators of increased risk for the development of complex psychopathological conditions have proven to be futile, mainly due to the lack of a theoretical framework that considers the dimensionality of behavior and the multiplicity of systems involved.

### Methods

This project employs a variety of methods, such as psychophysiology, EEG, self- and other-reports to examine the development of emotion regulation (ER), as a transdiagnostic risk factor, in children between 8–12 years old.

### Results

Results are expected to confirm previously observed markers of ER such as heart rate variability (HRV), and present

novel indices from the domain themes of frustration, fear conditioning and resting state activity.

### Conclusion

This project follows a multilevel approach to identify candidate biomarkers of ER deficits serving as early signs of later psychopathology.

## Keynote Presentations

### 1 Population Neuroscience of the Growing Brain

Tomas Paus

*University of Montreal and Research Centre of the Centre Hospitalier Universitaire Sainte-Justine, Canada*

#### Introduction

In my lecture, I will focus on developmental processes underlying the growth of the human cerebral cortex.

#### Methods

I will begin by introducing the concept of population neuroscience as a cross-disciplinary endeavour aimed at identifying factors shaping the human from conception onwards. I will then touch briefly on our previous work on pregnancy and brain growth, followed by our genetic studies that used data obtained in large datasets to reveal molecular architecture underlying the tangential growth of cerebral cortex.

#### Results

I will discuss our findings obtained with “virtual ontogeny” that support a neurodevelopmental model of vulnerability to mental illness whereby prenatal risk factors acting through cell-specific processes lead to deviations from typical brain development during pregnancy.

#### Conclusion

I will conclude with the most recent work from my laboratory on the relationship between fetal growth and the tangential expansion of the human cerebral cortex in times of food scarcity and abundance.

## 2 Comorbidity of Learning Disorders: Associations and Dissociations of Reading, Spelling and Arithmetic Development

Karin Landerl

*University of Graz, Austria*

### Introduction

Neurodevelopmental disorders of reading, spelling, and arithmetic can occur in isolation (i.e. in the context of otherwise typical development), but prevalence studies clearly show that these problems frequently co-occur. Thus, comorbidity of neurodevelopmental disorders is the rule rather than the exception. As learning disorders are typically investigated in isolation, our understanding of the neurocognitive mechanisms underlying their comorbidity is still limited.

### Methods

I will discuss similarities and differences in developmental processes across learning domains.

### Results

Empirical evidence on domain-specific and domain-general predictors of each skill and their covariance will be presented.

### Conclusion

Multiple deficit models need to account for associations as well as dissociations of neurodevelopmental disorders.

## 3 From Cognitive Targets to Symptom Reduction: New Directions for Treatment Development

Yair Bar-Haim

*Adler Center for Development and Psychopathology,  
Center for Traumatic Stress and Resilience,  
Tel Aviv University, Israel*

### Introduction

Cognitive Bias Modification (CBM) is a novel class of interventions targeting aberrant cognitive processes considered key in the etiology and maintenance of various psychopathologies.

### Method

In this presentation, the basic assumptions of CBM will be described and a framework for CBM treatment development will be laid out.

### Results and Conclusion

An example of a novel CBM treatment for social anxiety disorder will be used to highlight how progress through the different stages of treatment development can be achieved.

## Panel Discussions

### 1 Understanding NDD: Atypicality vs. Neurodiversity

Valéria Csépe<sup>1</sup>, Timothy Papadopoulos<sup>2</sup>, George Spanoudis<sup>2</sup>, Georgia Gerike<sup>3</sup>, Kathleen Amora<sup>1</sup>

<sup>1</sup>*RCNS-BIC, Hungary*

<sup>2</sup>*University of Cyprus, Cyprus*

<sup>3</sup>*University of Jyväskylä, Finland*

### Introduction

Neurodiversity is key to understanding brain function and behavior, including conditions like ASD, ADHD, DRD, and DLD. This panel discussion emphasizes the importance of neurodiversity in education, workplaces, and society.

### Methods

Researchers use neuroscience, psychology, and genetics to explore neural patterns, genetics, and environmental factors contributing to these conditions. Techniques like brain imaging and genetic analysis play a vital role.

### Results

Recognizing neurodiversity is crucial for inclusive education and diverse workplaces. It shifts focus from deficits to talents and enables tailored support for individuals with neurodiverse conditions, promoting their success.

### Conclusion

Neurodiversity transforms how we view differences, emphasizing inclusion. While understanding genetic backgrounds and nature-nurture debates continues, acknowledging neurodiversity is vital for an inclusive and equitable society. Future steps involve translating insights into practical strategies for individuals with neurodiverse conditions to thrive in diverse settings.

## 2 Beyond Diagnosis and Treatment: What About Prevention of Emotional Dysfunction and Neurodevelopmental Disorders?

Georgia Panayiotou<sup>1</sup> & Panagiota Dimitropoulou<sup>2</sup>

<sup>1</sup>University of Cyprus, Cyprus

<sup>2</sup>University of Crete, Greece

### Introduction

This panel discussion aimed to raise questions about the need to invest in prevention of neurodevelopmental disorders through two main approaches, psychosocial skills training for children, and parent/school engagement and empowerment.

### Methods

The two facilitators of the Panel presented background information on primary prevention through multi-level skills training and its impact, as well as ways to empower families and children's context. In particular, an example of parents' effective support part of the *Child ViReal Support Program* was presented utilizing psychoeducation training. They also posed a number of questions to be discussed by the audience, including the following: Can we prevent neurodevelopmental disorders? Which aspects? Can we use a Research Domain Criteria (RDoC) framework, as used in the work of the Neoprism-C project, in prevention? Are we as scientifically rigorous in prevention and intervention in the real world as we are in our basic research? What can we do to make it so?

### Results

A fruitful discussion was held on the cost-value effectiveness of primary prevention, ways to make interventions accountable and rigorous, and issues of stigma and its effects on parent involvement and engagement. Furthermore, the necessity for system level skill training was highlighted including school context in close collaboration with family system.

### Conclusion

The Neoprism-C project produced important results regarding neurodevelopmental disorder etiological mechanisms and ways of intervention. Future directions could involve a more systemic approach to enlighten the role of all both individual risk factors, and environmental risk and protective factors in mental health prevention of groups at risk.

## 3 The Role of Cognitive Control Processes During the Acquisition of New Symbol-Speech Sound Mappings in Typical and Atypical Readers

Cara Verwimp<sup>1</sup>, Patrick Snellings<sup>1</sup>, Reinout Wiers<sup>1</sup>, Jurgen Tijms<sup>1</sup>, Milene Bonte<sup>2</sup>

<sup>1</sup>University of Amsterdam, Netherlands

<sup>2</sup>Maastricht University, Netherlands

### Introduction

It remains unclear how attentional processes impact the formation of the reading network, despite the high co-occurrence of dyslexia and ADHD.

### Methods

To fill this gap, we used an artificial symbol-speech sound (S-SS) learning paradigm in 71 school-aged children with dyslexia and 59 typical readers, to investigate how attentional processes affect mapping written onto spoken language and how these processes are related to reading within their native language. In this presentation, we discussed two correlates of cognitive control. First, we examined how instructions that directed children towards the goal of the task influenced their learning trajectory. Second, we examined feedback-related negativity (FRN) ERPs following positive and negative feedback stimuli as a neural correlate of cognitive control.

### Results

Most children were able to learn the new script, revealing no significant main effects of instruction or reading group (children with dyslexia vs. controls). However, we found considerable inter-individual variability. To better understand individual differences in learning outcomes, we explored the association between FRN and each child's behavioral outcome.

### Conclusion

Our findings have important implications for understanding the neurocognitive mechanisms contributing to early reading difficulties, particularly those related to audiovisual integration, and how these can be addressed in clinical and educational setting.

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