

IOCHI
2026
Conference

The 1st International Online Conference on Human Intelligence

25-26 March 2026 | Online

Program and Abstract Book

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The 1st International Online Conference on Human Intelligence

25–26 March 2026 | Online



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Prof. Dr. Con Stough

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Dr. Damian Patrick Birney
Dr. David Giofre
Dr. Jakob Pietschnig

Prof. Dr. Andreas Demetriou
Prof. Dr. Con Stough
Prof. Dr. Steven E. Stemler

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Organizing Team

Ms. Coco Hou
Ms. Nutthamon Subhaswasdikul

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Welcome from the Chair

Dear Researchers,

Human intelligence is central to modern society and is one of the oldest and most important constructs in psychology and related disciplines. Understanding the causes and influences of intelligence, how to measure and assess it, and ultimately how to improve it across the lifespan are key considerations for researchers and practitioners.

To bring researchers together on these topics, we will hold the 1st International Online Conference on Human Intelligence (IOCHI 2026), organized by MDPI—an open access journal publisher—and the *J. Intell. (Journal of Intelligence)* (ISSN: 2079-3200; Impact Factor: 3.4). The conference will be held from 25 to 26 March 2026.

The aim of this two-day conference is to explore new research, foster deeper understanding, and generate new ideas on the construct of human intelligence. We are planning several symposia, which will be broadly arranged in terms of the journal's current Sections:

- S1 Theoretical Contributions and Measurement of Intelligence
- S2 Cross-Temporal Within- and Between-Individual Intelligence Changes
- S3 Social and Emotional Intelligence
- S4 Approaches to Improving Intelligence
- S5 Studies on Cognitive Processes

Both oral presentations and a poster session, along with an online Q&A session, will be presented in this online conference, which can be freely accessed and joined from any part of the world. We also welcome novel symposium proposals and current perspectives on topics related to intelligence research.

We are also planning to present awards for outstanding presentations, including both poster and oral sessions. We warmly welcome abstract submissions from all interested participants – whether you are a student, academic researcher, or industry professional.

In addition, participants in this conference are cordially invited to contribute a full manuscript to the conference's Special Issue, in the *Journal of Intelligence*, with a 20% discount on the publication fee. Please note that the discount can solely be utilized in conjunction with the IOAP discount, and no additional discounts are applicable. All submitted papers will undergo MDPI's standard peer-review procedure. The abstracts should be cited and noted on the first page of the paper.

We look forward to receiving your engagement and contribution to this scientific event and hope that this conference will bring greater benefits to our human intelligence community.

Kind regards,

Prof. Dr. Con Stough

Chair of the 1st International Online Conference on Human Intelligence



Prof. Dr. Con Stough
Conference Chair

Centre for Human
Psychopharmacology, Swinburne
University of Technology,
Melbourne, Australia



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The *Journal of Intelligence* (ISSN 2079-3200) is a peer-reviewed scientific journal that publishes original empirical and theoretical articles, state-of-the-art articles and critical reviews, case studies, original short notes, commentaries, and letters. Our aim is to offer an open access journal that moves forward the study of human intelligence: the basis and development of intelligence, its nature in terms of structure and processes, and its correlates and consequences, also including the measurement and modeling of intelligence. Related topics, such as artificial intelligence, and animal intelligence are welcomed as far as they shed light on human intelligence. We encourage authors to document their results in as much detail as possible. The full experimental and data analysis details must be provided so that the results can be reproduced and so that other researchers can better build on earlier work. Detailed descriptions of the procedure, software code and output of analyses must be made available in order to be deposited as supplementary material, unless it is in contradiction with privacy or security regulations or intellectual property rights. The journal will not consider manuscripts that present results or conclusions with mixed language, with misleading wording or with insufficient supporting data that may therefore lead to or enhance political controversies; and the editors will judge whether that is the case.

Impact Factor: <https://www.mdpi.com/journal/jintelligence>

Session Chairs



Dr. Damian Patrick Birney

School of Psychology,
University of Sydney,
Sydney, Australia



Dr. Jakob Pietschnig

Department of Developmental
and Educational Psychology,
University of Vienna,
Vienna, Austria



Prof. Dr. Con Stough

Centre for Human
Psychopharmacology,
Swinburne University
of Technology,
Hawthorn, Australia



Dr. David Giofre

Department of Educational
Sciences, University of Genoa,
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Prof. Dr. Andreas Demetriou

Department of Psychology,
University of Nicosia,
Nicosia, Cyprus



Prof. Dr. Steven E. Stemler

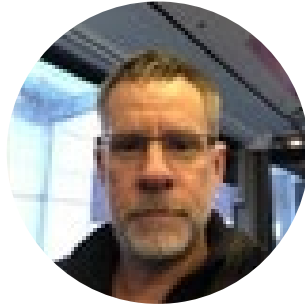
Psychology and
Education Studies,
Wesleyan University Middletown,
Middletown, CT, USA

Keynote Speakers



Prof. Dr. Andreas Demetriou

Department of Psychology,
University of Nicosia,
Nicosia, Cyprus



Dr. Damian Patrick Birney

School of Psychology, University
of Sydney,
Sydney, Australia



Dr. David Giofre

Department of Educational
Sciences, University of Genoa,
Italy



Dr. Jakob Pietschnig

Department of Developmental
and Educational Psychology,
University of Vienna, Austria



Dr. Richard D. Roberts

Research and Assessment
Design (RAD) Science Solution,
USA



Prof. Dr. Marc Brackett

Yale Center for Emotional
Intelligence, University of Yale,
USA; Co-Creator, RULER, USA

Invited Speakers



Prof. Dr. Florian Schmitz

Department of Psychology,
University of Duisburg-Essen,
Essen, Germany



Dr. Kristof Kovacs

Institute of Psychology, ELTE
Eotvos Lorand University,
Budapest, Hungary



**Prof. Dr. Timothy C.
Papadopoulos**

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



Dr. Gilles Gignac

School of Psychological
Science, University of Western
Australia, Perth, Australia



Prof. Dr. Steven E. Stemler

Psychology and
Education Studies,
Wesleyan University Middletown,
Middletown, CT, USA

Program Overview

IOCHI 2026	25 March 2026	26 March 2026
Morning	Session 5. Studies on Cognitive Processes	Session 1. Theoretical Contributions and Measurement of Intelligence
Afternoon	Session 4. Approaches to Improving Intelligence Session 3. Social and Emotional Intelligence	Session 2. Cross-Temporal Within- and Between-Individual Intelligence Changes

Conference Standard Time: **Basel Time (CET)**

Morning sessions start: **09:00**

Afternoon sessions start: **14:00**

IOCHI2026 Program

25th March 2026 (Wednesday)

Session 5. Studies on Cognitive Processes

Time: 09:00 (CET, Basel) | 04:00 (EST, New York) | 16:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
9:00–9:05	Prof. Dr. Con Stough Welcome from the Event Chair	
9:05–9:10	Prof. Dr. Andreas Demetriou Welcome from the Session Chair	
9:10–9:40	Prof. Dr. Andreas Demetriou Keynote Speaker	From Reflexes to Reasoning and AGI: A Developmental Theory of Intelligence
9:40–10:00	Prof. Dr. Timothy C. Papadopoulos Invited Speaker	Unraveling The Multifaceted Nature of Intelligence: A Correlated Factor Model Approach Grounded in PASS Theory
10:00–10:15	Jérémy Lamri Selected Speaker	The ATHENA Competency Framework: An Evaluation of its Validity According to Instructional Designers and Human Resource Development Professionals
10:15–10:30	Paula Denisa Saragea Selected Speaker	Neurobiological and Behavioral Signatures of Intelligence-Related Cognitive Processes: Evidence from a Transgenic Alzheimer Model and Modulation by <i>Rubus fruticosus</i> Bioactives
10:30–10:45	Florence Dejardin Selected Speaker	The Cross-Temporal Stability of Sex Differences in Piaget's Water Level Tasks: A Meta-Analytical Multiverse
10:45–11:00	Johanna Heller Selected Speaker	Spatial Ability across Nations: Measurement Invariance of the Three-Dimensional Cubes Test in Filipino and Austrian Undergraduates
11:00–11:15	Stefan Johannes Troche Selected Speaker	Reasoning Ability but Not the Item-Position Effect is Related to Implicit Learning
11:15–11:35	Dr. Gilles Gignac Invited Speaker	Beyond the Human Ceiling: A Psychometric Framework for Superintelligence

Session 4. Approaches to Improving Intelligence

Time: 14:00 (CET, Basel) | 09:00 (EST, New York) | 21:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
14:00–14:05	Dr. David Giofre Welcome from the Session Chair	
14:05–14:35	Dr. David Giofre Keynote Speaker	How Anxiety, Self-Beliefs, and Cognitive Abilities Shape Sex/Gender Differences in Achievement and STEM Choices in School
14:35–14:50	Loredana Adriana I. Patrascoiu Selected Speaker	School Opportunity for Developing Human Intelligence Potential—An Inclusive Case Study Model based on Organizational Needs Analysis
14:50–15:05	Francesca Granone Selected Speaker	Extending Mediation to Support Human Intelligence: Insights from Inclusive Research on Mathematics and Technology in Early Childhood Education
15:05–15:20	Benedikt Steininger Selected Speaker	The Decline Effect Permeates Not Only Intelligence Research, But Psychology as a Whole: Meta-Meta-Analytic Evidence From 648 Meta-Analyses
15:20–15:25	Marina Corrêa Freitas Flash Poster Presentation	Interventions to Enhance Human Intelligence Across the Lifespan: An Integrative Review of Cognitive Training and Neuroplasticity Studies
15:25–15:35	Break	

Session 3. Social and Emotional Intelligence

Time: 14:00 (CET, Basel) | 09:00 (EST, New York) | 21:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
15:35–15:40	Prof. Dr. Steven E. Stemler Welcome from the Session Co-Chair	
15:40–16:10	Dr. Richard D. Roberts Keynote Speaker	Trait Social and Emotional Intelligence: Not Much More Than Self-Reported Behavioral Skills?!
16:10–16:40	Prof. Dr. Marc Brackett Keynote Speaker	Emotional Intelligence: From Theory to Practice to Systemic Change
16:40–17:00	Prof. Dr. Steven E. Stemler Invited Speaker	Is Social Intelligence the Missing Link in the Evolution of AI?
17:00–17:15	Solvita Lodiņa Selected Speaker	Aspects of Social and Emotional Intelligence in The Context of The Personal Cultural Competence of Primary School Students in The Learning Process

26th March 2026 (Thursday)

Session 1. Theoretical Contributions and Measurement of Intelligence

Time: 09:00 (CET, Basel) | 04:00 (EST, New York) | 16:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
9:00–9:05	Dr. Damian Patrick Birney Welcome from the Session Chair	
9:10–9:35	Dr. Damian Patrick Birney Keynote Speaker	Adaptive Flexibility: A Theory of Intelligence for Learning and Innovation
9:35–9:55	Prof. Dr. Florian Schmitz Invited Speaker	Beyond Accuracy Scores: Response Time Modeling in Ability Assessment
9:55–10:10	J. F. Beckmann Selected Speaker	Prediction and Validity: Same sides of different coins
10:10–10:25	Corentin Gonthier Selected Speaker	Where are we at with national IQ databases? 12 key issues and one live experiment
10:25–10:40	Whisnu Yudiana Selected Speaker	Construct Validity of the Indonesian WISC-V (WISC-V-ID): Evidence from the 10 Primary Subtests and Ancillary Index Analyses
10:40–10:55	Rafli Sodiq Bagaskara Selected Speaker	Global Trends in Cognitive Measurement: A Bibliometric Analysis
10:55–11:10	Helene M. von Gugelberg Selected Speaker	Problem-Solving Behaviour in Reasoning Tests: Impact of Reasoning Ability, Item Difficulty and Item-Position
11:10–11:25	Asmaa Ali Mohamed Poster Presenter	Insightful Questioning: A New Paradigm for Understanding and Studying Human Intelligence
11:25–11:45	Flash Poster Presentation (5 mins for each Presenter)	Luke I. Rowe Collective Fluid and Crystallised Intelligence: Is there Evidence of a Double Disadvantage in Linguistically Diverse Groups? Rossina Gitto Reconceptualizing High-Potential Talent: A Multidimensional Intelligence Framework for Leadership in Global Organizations Cigdem Avci Context-Aware Adaptation as Intelligence: A Software-Inspired Perspective on Cognitive Offloading Amber Gogan Relations Between Sex, Cognitive Development and Executive Function in Early Childhood: Evidence from the Wechsler Scale and Head-Toes-Knees-Shoulders Task

Session 2. Cross-temporal within- and between-individuals intelligence changes

14:00 (CET, Basel) | 09:00 (EST, New York) | 21:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
14:00–14:05	Dr. Jakob Pietschnig Welcome from the Session Chair	
14:05–14:35	Dr. Jakob Pietschnig Keynote Speaker	Forty Years of Flynn Effect Research: More Questions than Answers about Generational Test Score Changes
14:35–14:50	Florian Dürlinger Selected Speaker	Does Religiosity Prevent Cognitive Declines? Cross-Sectional and Longitudinal Examinations of Religiosity and Intelligence Associations in Elderly Europeans
14:50–15:05	Jonas Lesigang Selected Speaker	Cross-Temporal Meta-Analysis of Trail Making Test Performance (1953–2024): A Flynn Effect for Executive Functioning

15:05–15:20	Sandra Oberleiter Selected Speaker	Domain-Specific Patterns of The Flynn Effect: A CHC-Based Meta-Analysis of More Than a Century of IQ Changes (1909–2025)
15:20–15:40	Dr. Kristof Kovacs Invited Speaker	The Garfield Effect: How Time of Day and Day of Week Influence Performance on Cognitive Ability Tests in Teenagers

Session 1. Theoretical Contributions and Measurement of Intelligence

sciforum-160239: Collective Fluid and Crystallised Intelligence: Is there Evidence of a Double Disadvantage in Linguistically Diverse Groups?

Luke I. Rowe¹, John Hattie², John Munro³

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Understanding how intelligence operates in groups is increasingly important as teamwork becomes foundational in education and work. This exploratory analysis pools secondary data from 190 unique groups (2–5 members) across four quasi-experiments investigating performance on multi-subtest group IQ batteries. These datasets included linguistic, cultural, visuospatial, reasoning, memory, and creative tasks. Across the pooled sample, exploratory and confirmatory factor analyses consistently yielded a robust two-factor structure corresponding to collective fluid intelligence (cFluid) and collective crystallised intelligence (cCrystal). This provides one of the first systematic tests of the Cattell fluid–crystal distinction at the group level, demonstrating that distributed cognitive systems may exhibit the same psychometric differentiation long established for individuals.

A second contribution emerges from examining group language composition and its interaction with the cFluid–cCrystal factors. Groups varied substantially in their proportion of members whose main language was English, enabling tests of how conversational and task-language alignment shape collective cognition. Across studies, the proportion of English-main-language members strongly predicted cCrystal performance, particularly on language and culturally loaded reasoning items. In contrast, language proportion showed only weak associations with cFluid, where tasks emphasised pattern recognition, spatial reasoning, and novel problem-solving. Moreover, English-main-language members more readily engaged in conversation compared to language-minority members, suggesting reduced involvement in communication that supports collective problem-solving. These findings indicate a double disadvantage for language-minority members in group assessments: (1) a task-language disadvantage, where culturally or linguistically loaded items reduce accessibility; and (2) a group-discourse disadvantage, where reduced conversational participation constrains the group's ability to pool distributed knowledge.

Implications are substantial for theories of intelligence, the measurement of collective cognition, and the design of multicultural teamwork and assessment environments. Results suggest that group intelligence is not merely a reflection of member ability, but an emergent property sensitive to linguistic alignment, communicative access, and task affordances.



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sciforum-159833: Construct Validity of the Indonesian WISC-V (WISC-V-ID): Evidence from the 10 Primary Subtests and Ancillary Index Analyses

Whisnu Yudiana ^{1,2,3}, **Marc P. H. Hendriks** ^{1,4,5}, **Christiany Suwartono** ⁵, **Roy P. C. Kessels** ^{1,6,7}

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² Department of Psychology, Faculty of Psychology, Universitas Padjadjaran, Bandung, Indonesia

³ Centre for Psychometrics Study, Faculty of Psychology, Universitas Padjadjaran, Bandung, Indonesia

⁴ Academic Centre for Epileptology, Kempenhaeghe, Heeze, The Netherlands

⁵ Faculty of Psychology, Atma Jaya Catholic University of Indonesia, Jakarta, Indonesia

⁶ Vincent van Gogh Institute for Psychiatry, Venray, The Netherlands

⁷ Radboudumc Alzheimer Center, Radboud University Medical Center, Nijmegen, The Netherlands

The Wechsler Intelligence Scale for Children–Fifth Edition (WISC-V) has been adapted for the Indonesian population becoming the WISC-V-ID. The original test comprises 16 subtests, 10 of which are used to estimate five primary indexes: Verbal Comprehension (VC), Visual Spatial (VS), Fluid Reasoning (FR), Working Memory (WM), and Processing Speed (PS) as well as three ancillary indices: the General Ability Index (GAI), the Cognitive Proficiency Index (CPI), and the Non-Verbal Index (NVI). This study examined the construct validity of both the primary and ancillary indices of the WISC-V-ID using a series of confirmatory factor analyses. The participants included were 1,508 children aged 6–16 years, who were drawn from the Indonesian normative sample. The results indicated that both the hypothesized four- and five-factor higher-order models demonstrated an excellent global fit (CFI = .976–.998; TLI = .965–.996; RMSEA = .016–.047; SRMR = .011–.025), although the correlated five-factor model provided the best representation of the data ($\chi^2 = 35.228$, df = 25, p = .084; CFI = .998; TLI = .996; RMSEA = .016; SRMR = .011). For the ancillary indices, a second-order oblique model best described the structure of GAI and CPI, which were strongly correlated. The NVI was optimally modeled by a higher-order configuration rather than a first-order model. These findings support the structural validity of the primary indexes WISC-V-ID and provide additional evidence regarding the factorial structure of ancillary indices, which have received limited empirical attention in the international literature.



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sciforum-164725: Prediction and Validity: Same sides of different coins

J. F. Beckmann¹, D. P. Birney²

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² School of Psychology, The University of Sydney, Sydney, Australia

Progress in conceptualising and measuring interindividual differences in intraindividual variability (e.g., cognitive flexibility) is stifled by uncritically assuming identity between construct validity and predictive utility of measurement outcomes. Construct validity is often claimed to be established via success in the statistical prediction of a criterion. However, a measurement outcome can be predictively useful but may not be indicative of construct validity of the instrument used. By contrast, a measurement outcome may be indicative of construct validity yet still lacks predictive utility. Predictive utility and construct validity overlap only if the criterion has 'real-life' relevance and represents a dimensionally clearly defined construct. This, however, is rarely the case. The real-life behaviours that we are interested in understanding (e.g., job performance) are usually multi-faceted, multi-componential, and multi-dimensional. Therefore, rather than using constructs such as abilities or personality traits to conceptualise these criteria, the concept of competency is used instead. The constituents of competency vary across individuals at any given time and situation. Success in predicting competency can therefore not be interpreted as an indication of construct validity of the instrument used. Conversely, predictions of construct-specific criteria (e.g., performance on an intelligence test) can serve as indication of construct validity of the instrument used. However, such perspectives run the risk of circularity (e.g., Test A correlates with Test B, therefore they are assumed to measure the same construct or something similar). Circumventing circularity requires a theory-based explication of the construct sensitivity of the criterion itself that cannot be delegated to a correlation coefficient. What should be called attempts of 'validation by association' is a rather weak foundation for claims of construct validity. To support our plea to refrain from conceptual hubris, we briefly discuss and contrast implications for common practices in applied educational research and psychological research.



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sciforum-164463: Talent Reimagined: A Multifactorial Intelligence Framework for High-Potential Leadership in Global Organizations

Rossina Gitto, Fabian Homberg

Department of Business & Management, LUISS Guido Carli University, Rome, 00197, Italy

The identification and development of high-potential talent constitutes a cornerstone of organizational success, yet evidence-based pathways for realizing this objective remain insufficiently articulated in the scientific literature. Traditional talent identification is often driven by biased assumptions, including the confusion of high performance with high potential (Chamorro-Premuzic, 2019; Kehoe, Collings, & Cascio, 2023; Mahadi, Thangaraj, Baskaran, & Mahadi, 2019; Schleu et al., 2024), the equation of confidence with competence (Anderson & Kilduff, 2009; Belotelova & Martin, 2025; Chamorro-Premuzic, 2019; Stewart et al., 2000), and the belief that dysfunctional personality traits are effective leadership qualities (Brunell et al., 2008; Diller et al., 2021). Corporate scandals (e.g., Weissner, 2024; Nossiter, 2019; Mollan, 2024) illustrate the severe consequences of inadequate leadership assessment and advancement, often revealing a critical lack of interrelational abilities among organizational leaders (McCallum & O'Connell, 2009). Existing frameworks frequently oversimplify cognitive abilities and fail to capture the complex nature of human potential due to conceptual limitations, for instance, the conflation of personality and intelligence (Church & Silzer, 2014; Hyde et al., 2020). This research aims to advance Talent Management by conceptualizing high-potential talent through a clear theoretical lens and offering a unique definition (Gallardo-Gallardo et al., 2013; Tansley, 2011). Building on Sternberg's (1985) Triarchic Theory of Intelligence, the proposed model introduces a two-tiered triarchic framework. It integrates Individual Cognitive Abilities (analytical, practical, and creative intelligence) with Interrelational Cognitive Abilities (social, emotional, and cultural intelligence) in the cognitive evaluation of employees with global leadership potential. This enhanced categorization highlights interrelational qualities, as effective leadership is inherently tied to followership (Stern, 2021). High-potential talent is thus defined as an individual within an organization who possesses the cognitive abilities, both individual and interrelational, to grow and succeed, particularly in leadership. This framework addresses shortcomings in Talent Management and lays the groundwork for subsequent scale development and empirical testing.



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sciforum-131840: Context-Aware Adaptation as Intelligence: A Software-Inspired Perspective on Cognitive Offloading

Cigdem Avci

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Conventional intelligence models typically assess performance based on isolated cognitive metrics such as memory, reasoning, or processing speed, often ignoring how individuals engineer their own strategies to function effectively in complex environments. In contrast, adaptive software systems are evaluated based on their ability to externalize state, restructure tasks, and respond dynamically to context.

This paper proposes that such abilities in humans, manifested through self-structured cognitive systems like color-coded organization, spatial grouping, and symbolic labelling, reflect a deliberate engineering reflex, not compensatory behavior. Individuals who may appear underperforming in conventional terms often exhibit high contextual intelligence, redesigning their environment and workflows to suit their cognitive style.

Furthermore, this framework also parallels the development of artificial intelligence systems, where increasing maturity is marked not only by computational power, but by enhanced contextual awareness and adaptive behavior. As in humans, the intelligence of a system may be better reflected in its capacity to restructure, externalize, and align with its environment rather than in isolated processing capabilities.

Drawing on principles from adaptive system design, we argue that intelligence should also encompass the ability to restructure one's context, just as intelligent systems reconfigure themselves to optimize performance. This reframing challenges traditional assessment models and provides a foundation for rethinking learning methods, intelligent interfaces, and adaptive systems that align with how people naturally optimize cognition.



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sciforum-155243: Creative Scientific Intelligence: A Cognitive Model of Human Epistemic and Structural Creativity

Bin Li

Research Department, Silicon Minds Inc., Clarksville, MD 21029, USA

Human intelligence is distinguished not merely by the capacity to solve problems, but by the ability to generate new explanatory structures – to create, test, and revise ideas about the world. This paper introduces **Creative Scientific Intelligence (CSI)** as a theoretical and computational model of this uniquely human capability. Building on insights from cognitive psychology, epistemology, and artificial intelligence, CSI formalizes creativity as a recursive process of *epistemic calibration*: agents generate hypotheses, perform interventions, and revise internal models to resolve tension between expectation and observation. Structurally, CSI integrates three mechanisms central to human creative reasoning – **recursive abstraction**, **analogical transfer**, and **epistemic tension regulation** – implemented through multi-timescale calibration loops that parallel human learning, development, and insight formation.

Empirical demonstrations in symbolic physics and ecosystem-simulation environments show how a CSI agent can autonomously discover hidden causal laws and generate novel structural models through self-directed exploration. These results suggest that *scientific creativity and cognitive intelligence share a common recursive architecture* grounded in explanation-driven learning. By modeling intelligence as the dynamic capacity to construct, test, and refine internal theories, CSI provides a formal account of how understanding – and not just performance – emerges from curiosity, surprise, and self-correction.

The framework offers a unified view of creative and scientific cognition, with implications for measuring and enhancing human intelligence across educational, artistic, and scientific domains.



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sciforum-159887: Global Trends in Cognitive Measurement: A Bibliometric Analysis

Rafli Sodik Bagaskara¹, Anisa Rima Fadhilah¹, Sani Rahma Azzahra²

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² Faculty of Psychology, Universitas Gadjah Mada, Sleman, Indonesia

Cognitive ability remains a core construct in psychology and education, yet debates persist regarding the most relevant construct, methodologically rigorous approaches, and its measurement implications. This study aims to conduct a bibliometric study of cognitive measurement published from 2011 to 2025, focusing on global research trends. Using the Dimensions.ai database and Bibliometrix R package, 1,083 journal articles were fit with inclusion criteria, retrieved, and analyzed. Performance analysis revealed a very small, yet not significant, annual growth of publications over fifteen years and a significantly decreased citation rate per document. The analysis also shows that current studies were predominantly published by correspondence authors from German and Anglophone countries. Schulte-Körne emerged as the most productive author, *Intelligence* as the most impactful journal, and Nisbett's paper, "Intelligence: New Findings and Theoretical Developments", as the most cited article. Meanwhile, science mapping based on keyword co-occurrence, multiple correspondence analysis, and thematic mapping showed psychology as the central hub connecting related fields. Research regarding cognitive ability measurement was conducted along the lifespan, with motor themes centered on humans and gender, basic themes related to cognition and adulthood, and niche themes including psychometrics and preschool assessment. Overall, cognitive measurement appears as a maturing, interconnected, yet concentrated research domain. Future research should continue to advance toward cross-cultural, cross-disciplinary, and interdisciplinary approaches that prioritize collaboration and the adoption of advanced technologies to foster continued innovation and scientific progress in this field.



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sciforum-160445: Insightful Questioning: A New Paradigm for Understanding and Studying Human Intelligence

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The methods used to assess intelligence, both historically and to date, have imposed limitations on the ability to fully capture the construct in ways that are consistent with key theoretical elements. Specifically, while most researchers in the field conceive of intelligence as the ability to adapt to an ever-changing environment, this ability has traditionally been measured using questions that present problems with a single, pre-determined answer that is fixed at the time of administration. In this paper, we present a case for reconsidering the traditional psychometric paradigm of intelligence testing. Rather than focusing on the nature of selected answers to fixed problems, we propose that the ability to ask insightful questions, particularly in the face of ambiguous or unknown information, fundamentally reflects the trait of intelligence in ways that are adaptive to emerging information. We refer to this approach as the Questioning Intelligence (QI) paradigm. Here, we present this new paradigm in four parts. First, we briefly outline the theoretical foundations for intelligence as adaptability and contrast this with current conceptualizations. Second, we review the common operationalizations of these conceptualizations and review the known limitations of different approaches. Third, we review the relevant literature on information acquisition and application. Finally, we conclude by presenting the QI paradigm and illustrate its conceptual and operational advances and limitations via the use of a case study and pilot data.



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sciforum-159560: Problem-Solving Behaviour in Reasoning Tests: Impact of Reasoning Ability, Item Difficulty and Item-Position.

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Performance on reasoning tests is a valid predictor for future success, yet what creates individual differences in problem-solving behaviour remains unclear. A systematic investigation of the problem matrix with fewer switches to and from response alternatives is linked to higher reasoning ability (e.g., Vigneau et al., 2006). Further evidence (Gonthier & Roulin, 2020) suggests that with increasing item difficulty, individuals switch more often. An analysis based on three eye-tracking metrics (von Gugelberg & Troche, 2025) indicated different direction of effects and a possible impact of item position. The present study examines the effects of reasoning ability, item difficulty, and item position on three eye-tracking metrics commonly used to assess problem-solving behaviour in reasoning tests: toggle rate (TR), proportional time on the problem matrix (PM), and proportional time to first fixation on response alternatives (PR). Complete data of 301 participants solving two different reasoning tests was obtained. For both tests a 30-minute time limit was set; this is standard procedure for the Figural Matrices (Kyllonen et al., 2019), but not the Advanced Raven Progressive Matrices (Raven et al., 1998). Correlations between ability scores and eye-tracking metrics in both tests align with other studies (e.g., Rivollier et al., 2021). Mixed-effects models revealed varying patterns of results across the eye-tracking metrics and the different reasoning tests. It seems likely that the different eye-tracking metrics capture distinct aspects of problem-solving behaviour. While TR and PM summarize behaviour over a whole item, PR only assesses one specific behaviour (i.e., when, during the problem-solving behaviour, one looks at the response alternatives for the first time). Interestingly, for all eye-tracking metrics and both reasoning tests, the effect of item position varied greatly across individuals (random slope) when added as a random effect, whereas item difficulty did not. Different possible explanations for this phenomenon are discussed.



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sciforum-160459: Relations Between Sex, Cognitive Development and Executive Function in Early Childhood: Evidence from the Wechsler Scale and Head-Toes-Knees-Shoulders Task

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Executive function skills, including cognitive flexibility, inhibitory control, and working memory, are foundational for children's learning, self-regulation, and engagement in complex tasks. Understanding how these capacities relate to broader cognitive development can shed light on the mechanisms that support school readiness. Also, there is a lack of recent research focusing on differences in young children's executive function and cognitive development by sex. This study examined the relationships between young children's sex, cognitive development, and executive function.

We analyzed data from 136 children aged 3–6 years who participated in two experimental studies conducted as part of a broader research program. Cognitive development was assessed using the Wechsler Preschool and Primary Scale of Intelligence–Fourth Edition (Canadian), capturing verbal reasoning, visual-spatial problem-solving, fluid reasoning, working memory, processing speed, and overall cognitive functioning. Executive function was measured with the Head-Toes-Knees-Shoulders Task (HTKS), which requires children to inhibit automatic responses and apply rule-based behaviour, thereby assessing cognitive flexibility, working memory, and inhibitory control. Parents provided demographic information and details about the home learning environment.

Spearman correlations indicated that HTKS performance was strongly associated with most Wechsler subcomponents, including verbal ($\rho = .33, p .001$), visual-spatial ($\rho = .45, p .001$), fluid reasoning ($\rho = .41, p .001$), and processing speed ($\rho = .38, p .001$), but showed a weaker association with working memory ($\rho = .29, p .001$). Gender differences were minimal, with only processing speed showing a modest effect ($\rho = -.22, p = .025$), favouring girls slightly. Overall cognitive functioning was strongly linked to all composite scores, particularly visual-spatial reasoning ($\rho = .60, p .001$) and HTKS performance ($\rho = .56, p .001$). These findings suggest that (1) executive function relates broadly to cognitive development but not strongly to working memory specifically, (2) visual-spatial abilities contribute substantially to general cognitive performance, and (3) sex differences in cognitive development are minimal. Thus, standardized measures of cognitive development and HTKS may capture distinct yet complementary aspects of cognitive processes.



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sciforum-160380: Rethinking intelligence as the emergent property of a complex system

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Higher-level cognitive abilities, such as intelligence or creativity, can be conceived as emergent properties arising from the combined functioning of a set of processes integrated within a complex system – rather than as constructs that reflect a realistic psychological reality and that would determine performance on the various tests supposedly measuring them. This perspective encourages the reconsideration of intellectual performance from a different angle: instead of treating inter-individual differences as inherently meaningful and attempting to measure and correlate them with other constructs, this instead leads to modeling the response processes through which performance emerges on a test, focusing on the multiplicity of variables that may help shape or influence that performance.

This presentation will summarize the theoretical proposal of intelligence as the emergent property of a complex system, and review the key arguments in favor of this view including models (e.g., Thomson, 1916; van der Maas et al., 2006; Kovacs & Conway, 2016) and results (e.g., McFarland, 2012 and the results from network analyses). The consequences of a systems view of intelligence will be highlighted through four consequences at the level of cognitive processes (implicative relationships, functional substitutions, cascade effects, and non-linear interactions). Lastly, we will briefly discuss the implications that follow from a systems view of intelligence in three domains: research, teaching, and clinical practice.



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sciforum-160307: Where are we at with national IQ databases? 12 key issues and one live experiment

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Since the publication of the first estimates of country-level intelligence by Richard Lynn in 1991, systematic databases of national IQs have been constituted and regularly updated (Lynn & Vanhanen, 2002; Lynn & Becker, 2019; Becker, 2023). These databases have made their way into public discourse, often in the form of "world maps of IQ"; for many non-specialists, this is the only point of entry into the scientific literature on intelligence. This means the robustness and validity of national IQ estimates provided by the databases are especially critical. We will provide an overview of 12 key aspects of the national IQ databases that merit closer scrutiny (predominant use of Wechsler scales and Raven's matrices; use of PISA-like assessments as proxy for IQ; possible contribution of non-intellectual individual differences between countries; effects of contextual differences in data collection on country scores; methods for sample selection and inclusion; representativeness of samples for their respective countries as a whole; methods for extracting IQ estimates; causal interpretation of correlations involving national IQs; interpretation of differences between countries as genetically driven; interpretation of differences between countries as evolved racial differences; policy recommendations based on national IQs; political use of national IQ estimates). We will also collect the audience's opinions through a live survey available at any point during the talk, and we will discuss the results as a conclusion.



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Session 2. Cross-Temporal Within- and Between-Individual Intelligence Changes

sciforum-153327: Cross-temporal meta-analysis of Trail Making Test performance (1953-2024): A Flynn effect for executive functioning

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Cross-temporal intelligence test score changes (the Flynn effect) exhibit domain- and country-specific change trajectories. Process overlap theory suggests that positive intelligence subtest intercorrelations—the positive manifold of intelligence—may be due to executive functioning playing an important role in the performance on all intelligence subdomains. This may mean that changes in executive functioning may be (partly) responsible for observed test score changes in the vein of the Flynn effect. However, change trajectories of executive functioning have so far remained largely unexplored. In a preregistered cross-temporal meta-analysis, we investigated general population changes of trail making test (TMT) performance, a well-established and widely-used test instrument for assessing executive functioning. We identified all available records reporting mean TMT performance from the available literature and predicted TMT outcome measures by data collection year in precision-weighted linear and multiple regressions. Analyzing a large dataset based on 8,000+ studies ($k = 16,000+$; $N = 1,000,000+$) published between 1946 and 2025, we show global TMT score increases. Gains in patient samples were more pronounced than gains in healthy samples. Change trajectories were generalized across different TMT outcome measures but were differentiated according to country of data collection. Our findings indicate that executive functioning changes may likely be linked to the Flynn effect in standard domains of cognitive task performance.



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sciforum-153753: Does religiosity prevent cognitive declines? Cross-sectional and longitudinal examinations of religiosity and intelligence associations in elderly Europeans

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Introduction: For almost a century, a considerable number of studies reporting associations between intelligence and religiosity have accumulated. However, reported effect size strengths vary substantially between primary studies. This heterogeneity has partly been attributed to measurement modalities. Associations with intelligence tend to be more pronounced for religious beliefs than for religious behaviors. Another factor potentially adding to the heterogeneity is participant age. Evidence suggests a protective effect of religiosity against cognitive declines in older ages. This indicates a decrease in the effect strength of the intelligence and religiosity link over a lifetime. However, these protective effects have been only observed in comparatively religious countries.

Methods: Here, we examine cross-sectional correlations of religiosity and cognitive functions as well as their cross-temporal changes across cohorts over a period of 10 years in European and Israeli participants aged 50+ years ($N = 30,424$) using the Survey of Health, Ageing, and Retirement in Europe.

Results: We observed meaningful negative associations of all measures of cognitive function and a composite score with religious beliefs ($r = -.107$). However, associations with religious behavior were negligible ($r = .014$). Effects appeared to generalize across age, thus contrasting the idea of age-related declines of effect strength in our data.

Conclusions: We presently demonstrate that intelligence is negatively associated with religiosity in elderly European samples. These associations remained stable over increasing participant ages and therefore do not support previous findings suggesting protective effects of religiosity against cognitive declines.



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sciforum-148896: Domain-specific patterns of the Flynn effect: A CHC-based meta-analysis of more than a century of IQ changes (1909–2025)

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Generational shifts in intelligence test performance, commonly referred to as the Flynn effect, have been the subject of intense empirical investigation. Whilst earlier studies generally had reported systematic gains for full-scale, fluid, and crystallized IQ, more recent findings increasingly indicate heterogeneous change patterns across distinct cognitive domains. Here, we present the first formal meta-analysis of the Flynn effect following the framework of the Cattell–Horn–Carroll (CHC) theory, currently the most widely accepted model of human intelligence. Our quantitative research synthesis integrates more than 3,000 test score changes (1909–2025), based on 2,000,000+ individuals, and including more than 30 CHC stratum I and II domains. Cross-temporal trends were differentiated in terms of sign and magnitude according to specific stratum I domains, with annual changes ranging from –0.11 to +0.30 IQ points. These shifts further varied across countries and were systematically related to national-level macro indicators, such as socioeconomic (in-)equality, education, and healthcare access. The direction and strength of these associations differed across CHC stratum I subdomains. We further show substantial influences of measurement non-invariance and disentangle genuine cognitive change from artifacts of evolving test constructs and psychometric models. In all, we provide the first systematic evidence that the Flynn effect is domain-specific, while limited measurement invariance restricts meaningful interpretation of cross-temporal (domain-specific) trends.



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Session 3. Social and Emotional Intelligence

sciforum-160436: Aspects of social and emotional intelligence in the context of the personal cultural competence of primary school students in the learning process

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The modern educational environment requires primary school students to acquire not only academic knowledge, but also the ability to understand themselves and others, to cooperate, make decisions, and build successful relationships. The educational environment emphasizes the development of socio-emotional intelligence, but the context of its development—the cultural environment and culture—is not emphasized. Personal cultural competence is based on five emotional intelligence skills: mindfulness, empathy, goal-setting, self-regulation, and communication. The aim of this study is to investigate the role of social-emotional intelligence in the development of personal cultural competence of primary school students in the learning process. The case study used a quantitative survey method of 246 students and 8 teachers, comparing the results in one Latvian and one Lithuanian general education school. Students in grades 4, 6, and 8 were surveyed. The questionnaires assessed the students' ability to be aware of their strengths and weaknesses, understand their emotions, and cooperate in situations of cultural understanding and expression in the learning process. Interviews with teachers allowed us to analyze the impact of their pedagogical methods and choices on the development of students' emotional intelligence skills in the context of cultural competence. Two different education systems from different countries were selected. The Lithuanian education system includes general cultural competence, with its content developed in detail, but that of Latvia does not. The results revealed that students with a higher level of awareness and greater involvement in cultural processes at school and outside it are also more empathetic, able to communicate better, and take responsibility for their decisions in organizing their self-expression. The conclusions confirm that social and emotional intelligence is an integral part of the cultural competence of a person. Students who develop these five emotional intelligence skills are also able to show better assessed academic learning results.



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Session 4. Approaches to Improving Intelligence

sciforum-156522: The Decline Effect Permeates Not Only Intelligence Research, But Psychology as a Whole: Meta-Meta-Analytic Evidence From 648 Meta-Analyses

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The term *decline effect* means that reported effect sizes tend to decrease in strength as evidence accumulates over time, suggesting that early published findings in scientific research are often inflated. Conceptually such declines have been attributed to publication bias, low study power, and questionable research practices. However, systematic empirical evidence of declining effects in psychological science has been limited. In the present meta-meta-analysis, we examined whether these systematic declines occur within intelligence research, other psychological disciplines, and psychological science in general. Across 670 meta-analyses published in six highly visible journals in psychology ($k = 62,542$, $N > 60$ million), we found that in intelligence research, declines occurred about twice as often as increases and were substantially larger in size (average misestimations of initial vs. meta-analytical summary effects $\Delta r = .18$ vs. $.08$). Furthermore, initial studies associated with declining effects exhibited somewhat lower average power to detect the summary effect compared to those linked to increases (Mdn power = 52.31% vs. 59.76%). When examining psychology studies in general, virtually identical results were observed. Effect declines outnumbered increases nearly two to one and were considerably larger in strength than increases ($\Delta r = .204$ vs. $.122$). Moreover, original studies associated with declines showed lower power to detect the observed summary effects ($M = 48.7\%$, $Mdn = 39.4\%$), compared to studies linked to underestimations ($M = 65.7\%$, $Mdn = 82.7\%$). In all, our findings show that the decline effect is not limited to a single research domain but instead represents a pervasive challenge across psychological science, rooted in the inflation of early findings and inadequate study power.



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sciforum-157617: Extending Mediation to Support Human Intelligence: Insights from Inclusive Research on Mathematics and Technology in Early Childhood Education

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Human intelligence is often described as an individual ability, yet research in education shows that children think and learn through the support of different forms of mediation that appear in their everyday activity (Vygotsky, 1978). In mathematics education, studies have highlighted how gestures, materials and representations help children construct and communicate meaning (Bartolini Buss & Mariotti, 2008; Bartolini Bussi & Baccaglini-Frank, 2015). Building on findings from the Norwegian projects *DiCoTe* and *VERDI*, we propose that children's intelligent behaviour is shaped by a broader range of mediational processes than those traditionally considered in semiotic theories.

The study is based on 21 video observations (15 from one project and 6 from the other), each lasting on average about 40 minutes, complemented by detailed field notes. Children engaged in mathematical exploration and technological play, and the material was interpreted through an inclusive research approach (Johnson & Walmsley, 2003) in which teachers, students and co-researchers with Intellectual and Developmental Disabilities (IDD) work together (Granone et al., 2023; Granone, 2025). This approach made it possible to identify how children use not only signs and representations, but also bodily movement, spatial orientation, touch, rhythm, dialogue and technological tools to test ideas, solve problems and explain their thinking.

Across the two projects, these multiple mediations were visible in children's problem-solving with coding toys (Granone & Reikerås, 2023), their spatial reasoning during activities with digital and physical artefacts (Granone & Knudsen, 2024), and in the ways they interacted with adults in supportive and dialogic environments (Granone & Pollarolo, 2025). These observations suggest that intelligent behaviour does not emerge only from internal cognitive processes but from participation in rich, multimodal and relational situations.

We discuss that supporting human intelligence requires recognising and valuing these layered forms of mediation. Expanding the concept of mediation helps us better understand how children think and offers new directions for designing inclusive and cognitively supportive learning environments in early childhood education.



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sciforum-156800: Interventions to Enhance Human Intelligence Across the Lifespan: An Integrative Review of Cognitive Training and Neuroplasticity Studies

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Introduction

Enhancing human intelligence represents a central challenge in contemporary cognitive and educational neuroscience. Intelligence, once regarded as a relatively stable construct, is now understood as a dynamic capability modulated by neuroplasticity, environmental enrichment, and cognitive engagement across the lifespan. Over the past two decades, a growing body of research has investigated training-based interventions designed to optimize cognitive performance and reasoning ability. However, empirical findings remain scattered and inconsistent across methodologies, populations, and theoretical frameworks. Synthesizing this fragmented literature is essential for clarifying how intelligence can be effectively developed and sustained throughout life.

Methods

This integrative review critically examined empirical studies published between 2000 and 2025 addressing cognitive training, neuroplasticity-oriented interventions, and educational enrichment programs aimed at enhancing human intelligence. Searches were performed in Scopus, Web of Science, and PubMed using Boolean combinations of “intelligence enhancement,” “cognitive training,” “neuroplasticity,” and “lifespan development.” Studies employing quantitative, qualitative, or mixed methods were included. The review followed PRISMA 2020 recommendations, with an additional assessment of theoretical contribution and methodological rigor using the Mixed Methods Appraisal Tool (MMAT).

Results

Evidence indicates that interventions focusing on executive functions, working memory, and reasoning yield moderate but consistent improvements in fluid intelligence. Adaptive and feedback-driven digital protocols demonstrate stronger effects than fixed training paradigms. Neuroimaging studies reveal enhanced prefrontal–parietal connectivity, increased dopaminergic modulation, and signs of cortical reorganization following extended cognitive engagement. Nevertheless, transfer effects to complex, real-world cognitive tasks remain limited, and long-term retention is rarely measured.

Conclusions

The cumulative findings suggest that human intelligence can be enhanced through structured interventions grounded in neuroplastic mechanisms. Yet, methodological heterogeneity constrains generalization. Future research should integrate multimodal designs, linking cognitive, neural, and environmental determinants, to construct a unified, lifespan-oriented model of intelligence enhancement.



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sciforum-159991: School opportunity for developing human intelligence potential—an inclusive case study model based on organizational needs analysis

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Many studies have already highlighted the impact of education on human intelligence. Ritchie (2018) in a conducted meta-analysis of 142 studies and over 600,000 subjects identified consistent evidence about the beneficial effects of education on cognitive abilities (even stating an approximately 1 to 5 IQ points for each additional year of education), effects that persisted across the life span and were evidenced across all broad categories of cognitive ability studied. Thus, the author considers education to be 'the most consistent, robust, and durable method yet to be identified for raising intelligence'.

School is the framework through which education produces its shaping effects.

Like human diversity, each school has its own organizational specificity. Therefore, through our proposal, we will illustrate the process of building a model based on the application of Universal Design for Learning in the Romanian school context (preschool and primary classes).

This case study illustrates the internal development solution identified within the IncluzivEduHub project by applying a specific Quality deployment methodology (Voice of the beneficiary, Affinity Matrix, Problem/Solution Tree) based on identifying the needs of the beneficiaries, addressing students at risk of academic difficulties and also those with high abilities. Starting from the needs of the beneficiaries, we ensure optimal cognitive adaptive evolution through Universal Design for Learning and educational therapeutic interventions for 226 students.

Supported by a specific inclusive intervention model, we introduced screening and coteaching and also peer mediation, collaborative learning, art and somatic therapy. The proposed model is proof that the school must assume social functions to identify and support the development potential of each individual student, showing the significant results obtained by stimulating creativity, teamwork, and the joy of learning in specific ways directly addressed to their known developmental needs. Every child matters!



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Session 5. Studies on Cognitive Processes

sciforum-164720: Attentional Fragmentation and Instructional Design in Onlife Classrooms

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This paper reports empirical findings from a convergent mixed-method action research study examining teachers' perceptions of students' attentional functioning in digitally mediated and hybrid learning environments. Data were collected from 356 in-service teachers through a validated 10-item Likert scale ($\alpha = .95$) and an open-ended qualitative prompt, and data were analysed using descriptive statistics, Principal Component Analysis (PCA), multiple regression, and thematic analysis.

Results show a strong and homogeneous convergence across school levels and disciplines, with item means ranging from 4.17 to 4.30 (0–5 scale), indicating a widespread perception of significant attentional disruption. Teachers consistently report fragmented and intermittent attention, early cognitive fatigue, high sensitivity to digital stimuli, and rapid engagement–disengagement cycles. PCA identified two latent dimensions explaining 64% of total variance: (1) methodological alternation and cognitive sustainability (41%), highlighting the regulatory role of multimodal, segmented, and recursive instructional design and (2) attentional discontinuity and cognitive overload (23%), reflecting attentional patterns consistent with neurocognitive models of plastic adaptation in high-density digital environments. Regression analyses identify training in digital pedagogy and AI literacy as significant predictors of teachers' sensitivity in recognising these emerging attentional patterns. Qualitative findings corroborate quantitative results, revealing micro-attentional cycles, embodied signs of overload, emotional–cognitive saturation, and the ambivalent role of technology depending on instructional design.

This study contributes an evidence-based, neuro-pedagogical account of attention as a situated and design-regulable process within onlife cognitive ecologies, empirically bridging teachers' perceptions, neurocognitive theory, and instructional design. It advances current debates by demonstrating that attentional fragmentation is not merely a behavioural deficit but a structurally modulated phenomenon that can be mitigated through intentional pedagogical design.



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sciforum-160382: Neurobiological and Behavioral Signatures of Intelligence-Related Cognitive Processes: Evidence from a Transgenic Alzheimer Model and Modulation by *Rubus fruticosus* Bioactives

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Understanding human intelligence requires integrating cognitive theories with the neurobiological architectures that sustain reasoning, working memory, information updating, and adaptive learning. Contemporary evidence positions intelligence as an emergent property of coordinated neural systems, including the prefrontal cortex, central to executive control and working memory, the parietal cortex, which supports abstract problem-solving, visuospatial computations, and mathematical reasoning, and the hippocampus, which enables relational encoding and flexible memory retrieval. Large-scale network connectivity further underpins efficient information processing, linking these regions into a dynamic architecture of intelligent behavior.

To illustrate how these mechanisms manifest under pathological conditions, we examined intelligence-related cognitive processes in the 5xFAD transgenic model of Alzheimer's disease, characterized by early impairments in mnemonic integration, attentional regulation, and cognitive flexibility. Six bioactive extracts derived from *Rubus fruticosus* were administered via oral gavage for seven days and prior to behavioral testing. Cognitive performance was assessed using validated animal analogues of core components of fluid intelligence: the Radial Arm Maze for working and reference memory, Y-Maze spontaneous alternation for spatial updating and cognitive flexibility, Novel Object Recognition for encoding efficiency, and Open Field-based metrics for exploratory attention. Galantamine served as the positive control.

Extract-specific enhancements were observed across working memory accuracy, alternation behavior, and recognition indices, with several compounds approaching or surpassing galantamine's performance. Preliminary neurobiological analyses suggest reductions in amyloid burden and inflammatory markers, pointing toward synaptic and circuit-level mechanisms supporting cognitive resilience.

By bridging neurobiological theory with behavioral evidence from a transgenic model, this contribution refines our understanding of how core cognitive processes underlying intelligence deteriorate and may be partially restored under neurodegenerative conditions. These findings position *Rubus fruticosus* bioactives as promising modulators of intelligence-related cognitive architecture.



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sciforum-160932: The ATHENA Competency Framework: An Evaluation of its Validity according to Instructional Designers and Human Resource Development Professionals

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Introduction

The ATHENA competency framework offers a multidimensional and agentic model of human performance, integrating cognitive, conative, emotional, knowledge-based, and sensorimotor resources into 60 fine-grained facets. While the framework is conceptually grounded in contemporary psychological theory, its applied usability depends on whether professionals who rely on competency frameworks can clearly understand and differentiate its components. This study provides the first empirical assessment of the semantic clarity and perceived dimensional coherence of ATHENA's 60 facets among instructional designers and human resource development (HRD) professionals.

Methods

Seventy-five practitioners (46 instructional designers; 29 HRD professionals) evaluated the clarity, appropriateness, and expected meaning of each facet using standardized definitions. Participants also assigned each facet to one of ATHENA's five theoretical dimensions. Ratings were collected via an online questionnaire and analyzed descriptively.

Results

Overall, practitioners judged the facet definitions as clear and meaningful, with high average ratings across the 60 facets and strong alignment with participants' expectations. Only two facets—heuristics and functional synesthesia—showed consistently lower alignment with preconceived interpretations. Dimensional assignment matched the theoretical structure for most facets; however, 14 facets (23%) were systematically reassigned by participants, often shifted toward the cognitive domain. This suggests that while definitions were understood, the psychological rationale for some facets' dimensional placement was not intuitively perceived.

Conclusions

The results support the semantic robustness of ATHENA's facets and their overall suitability for instructional and HRD applications. The misalignment of several facets' dimensional placement highlights the need for refined labels, clearer theoretical justification, or revised explanatory materials. These findings represent a critical validation step for ATHENA before larger-scale psychometric work and provide guidance for strengthening its integration within hybrid intelligence talent development systems.



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sciforum-160372: The Impact of Math Attitudes and Gender in Future School Choice: A Longitudinal Study

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Introduction: Middle school represents a critical stage for shaping future academic trajectories, particularly regarding STEM (Science, Technology, Engineering, Mathematics) participation. While cognitive abilities are known predictors of academic success, less is known about how they interact with affective-motivational factors and gender to influence school track choice over time. This longitudinal study investigated the specific contribution of gender, cognitive abilities (intelligence, working memory, and inhibitory control), and affective-motivational factors (math self-concept, interest, and anxiety) in predicting the choice between STEM and non-STEM high school tracks at the end of middle school.

Methods: Data were collected from a sample of 159 Italian students assessed longitudinally in the seventh and eighth grades. Participants completed standardized cognitive measures to assess general intelligence, working memory, and inhibitory control, alongside self-report questionnaires assessing their math anxiety, interest, and self-concept. Hierarchical logistic regression analyses were performed to determine the incremental contribution of each predictor to the likelihood of choosing a STEM curriculum.

Results: Findings indicated that gender and positive attitudes toward math were the strongest predictors of school choice. Boys were significantly more likely than girls to pursue STEM tracks. Notably, higher levels of math self-concept and interest significantly predicted the likelihood of choosing a STEM school. Crucially, the direct influence of actual cognitive performance was minimal and overshadowed by affective-motivational factors and gender in the final decision-making process.

Conclusions: These results highlight that students' perceptions of their competence and their interest in the subject may outweigh their actual cognitive performance when determining educational pathways. To promote equitable access to STEM and reduce the persistent gender gap, educational interventions should focus not only on cognitive skill enhancement but also on fostering positive self-concepts and enthusiasm for mathematics during early adolescence.



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sciforum-164738: Adaptive Performance and Cognitive Regulation in Immersive VR Vocational Training

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Immersive virtual reality (VR) environments offer novel opportunities to examine cognitive regulation and adaptive performance during complex, ecologically valid tasks. In vocational training contexts, learners must manage instructional support, regulate cognitive effort, and translate guidance into independent action, processes closely related to applied human intelligence. The present study examines behavioral indicators of cognitive regulation in a VR-based coffee preparation task using hand-tracking interaction.

Participants completed the same vocational procedure across two trials: an initial trial with full instructional guidance and a subsequent trial with reduced guidance. Performance was assessed using detailed temporal metrics for task segments, total completion time, interaction errors (object drops), and subjective workload and confidence ratings. Participants varied in prior VR experience and real-world coffee-machine expertise, allowing examination of expert–novice differences across both interaction and task knowledge dimensions.

Analyses focus on changes in performance and perceived workload following the removal of instructional scaffolding. Segment-level time distributions and guidance-related performance costs are examined to identify distinct performance strategies and potential bottlenecks. This study investigates how prior task expertise and VR experience relate to the regulation of cognitive effort under reduced guidance, highlighting the potential of VR-based behavioral measures for studying adaptive performance and applied intelligence in learning environments.



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sciforum-160438: Reasoning Ability but not the Item-Position Effect is Related to Implicit Learning

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Previous research on reasoning tests has revealed relatively consistent evidence for an item-position effect (IPE). To explain this effect, the learning hypothesis has been put forward, positing that learning the rules underlying the items leads to increasing individual differences from the first to the last item of a reasoning test. For a better understanding of the type of learning contributing to the IPE, the current study examined whether implicit learning was associated with the IPE in a reasoning test. For this purpose, 193 participants completed a Figural Analogies Test with 21 items, which were not ordered according to their difficulty, and a Serial Reaction Time (SRT) task comprising 2x8 blocks of ten 10-trial sequences each. Using bifactor modeling, a latent reasoning and a latent IPE variable could be identified in the reasoning test, with the latter characterized by monotonically increasing factor loadings. Implicit learning was evidenced by a significant reduction in response times across the blocks of the SRT task, where the same 10-trial series was always repeated (experimental condition), but not in the eight blocks of the control condition. From the response times in the experimental condition, two latent variables were extracted. Factor loadings of the first latent variable were fixed at the same value; factor loadings of the second latent variable increased strictly monotonically across the learning blocks, representing individual differences in the continuous (implicit) learning process. Latent reasoning ability was significantly but weakly related to implicit learning, whereas the correlation between the IPE and implicit learning just failed to reach statistical significance. Therefore, the present results supported the assumption of an association between reasoning ability and implicit learning. The IPE in the reasoning test, however, was unrelated to implicit learning, suggesting that it does not rely on implicit learning.



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sciforum-153380: Spatial ability across nations: Measurement invariance of the Three-Dimensional Cubes test in Filipino and Austrian undergraduates

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Cross-national comparisons of cognitive test scores are a subject of debate because measurement instruments are predominantly developed and validated on Western participants. Establishing between-nations measurement invariance (MI) is necessary to meaningfully interpret differences in intelligence test scores between countries. IRT-based approaches are particularly suitable for testing MI, because they allow for item-level examination of measurement properties and assessment of between-group test unidimensionality. The Three-Dimensional Cubes Test (3DC) is a Rasch-calibrated measure of visual processing that was originally developed for use in Germanophone countries. Prior studies showed (partial) MI across Austrian, Singaporean and US samples, supporting its suitability for cross-national comparisons. In this study, we compared spatial task performance from $N = 300+$ undergraduate students, respectively, from Austria and the Philippines. We used a stepwise approach to establish MI by examining Rasch-homogeneity within as well as across countries. Likelihood-ratio tests indicated model fit for all but one item, enabling a comparison of the mean person parameters after excluding the misfitting item. Our results indicate a very large mean difference between the groups (Cohen's $d = 2.22$), with the Austrian sample scoring higher than the Filipino sample. The present data clearly show the necessity of establishing measurement invariance for a meaningful cross-national comparison of cognitive subdomains.



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sciforum-164646: TEMPORAL ANCHORS AND COGNITIVE SCAFFOLDING: A CONTENT ANALYSIS OF COMPLEX NARRATIVE STRUCTURES

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Contemporary streaming platforms increasingly feature narratives with complex temporal structures that pose significant cognitive demands for audience comprehension. This study examines the narrative strategies employed to support cognitive processing in complex non-linear storytelling, using Netflix's "Dark" (Season 1) as a case study. The series presents a multi-timeline narrative spanning 1953, 1986, and 2019, with recurring characters across different ages, creating potential cognitive load challenges.

We conducted a quantitative content analysis of all eight Season 1 episodes, systematically coding 1,247 narrative segments for temporal characteristics, character appearances, scene transitions, and structural features. Statistical analyses included correlation tests, multiple regression, one-way ANOVA, and structural equation modeling to examine relationships between narrative complexity metrics and embedded cognitive support mechanisms.

Results revealed that despite high temporal fragmentation (mean temporal distance = 31.35 years, SD = 14.62), the narrative systematically embeds compensatory mechanisms to facilitate comprehension. Temporal anchors—visual and narrative cues establishing time period—appeared in 68.4% of segments, with their frequency significantly correlating with timeline complexity ($r = .412$, $p = .001$). Episodes with greater temporal fragmentation demonstrated increased use of establishing shots ($r = .338$, $p = .001$) and reduced scene complexity ($\beta = -.284$, $p = .006$). Structural equation modeling confirmed that these cognitive scaffolding strategies mediate the relationship between narrative complexity and potential cognitive load.

These findings illuminate how complex narratives incorporate external cognitive supports that may enable viewers to process information exceeding traditional working memory constraints. The study contributes to understanding how narrative design can scaffold cognitive processing and has implications for theories of distributed cognition, multimedia learning, and complex information architecture.



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sciforum-160135: The Cross-Temporal Stability of Sex Differences in Piaget's Water Level Tasks: A Meta-Analytical Multiverse

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The Water Level Tasks (WLTs) were originally developed by Jean Piaget to examine children's understanding of horizontality invariance and have since been widely used as a measure of spatial perception in adults. Piaget assumed that this task should be universally mastered by around the age of nine, thus reflecting the progression of concrete operational thought. However, subsequent research has shown that even some adults have substantial difficulties in correctly solving these tasks and indicated better performance of men compared to women. This sex effect has been often replicated, although its generality remains unclear. To address this gap, we synthesized all available evidence of WLT sex differences from 1964 to 2025 (261 independent samples comprising more than 37,000 participants) by means of a random-effects meta-analysis. To examine the generality of the observed meta-analytical summary effect across potential moderators, we conducted subgroup analyses and precision-weighted meta-regressions. Moreover, we performed meta-analytic specification curve and combinatorial meta-analyses, accounting for all reasonable as well as possible ways of which data to meta-analyze and how to meta-analyze them. Results indicated moderately-sized sex differences in WLT performance favoring men ($d = 0.52$) that increased with age but diminished over time. Specification curve analyses suggested stability of these sex differences across different test formats, sample characteristics, and meta-analytic model specifications, thus indicating a remarkable generality of this effect. In all, we show that WLT-based sex differences favoring men are moderate and robust but cross-temporally declining. In contrast to Piaget's assumption of a universal understanding of horizontality invariance by late childhood as measured by the WLT, women are outperformed by men in solving this seemingly simple task.



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