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8th MIC Conference 2024

Surfing on Creative Waves!

BOOK OF ABSTRACTS

September 15 - September 18, 2024

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Monday, 16th September

MIC Keynote Speech - I

Roni Reiter Palmon

Creative Cognition: What Happens Before Idea Generation

Cognitive processes that lead to creativity have been an interest to creativity theorists and researchers since the early days of the study of creativity. However, much of the research has focused on idea generation, and only limited research focused on other process. In this presentation I will focus on processes that occur before idea generation, specifically problem identification and construction. I will discuss what influences problem identification and construction at the individual and team level and it affects creative problem solving.

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Monday, September 16th

SESSION Nautilus

Mon-1

Individual Differences - I

Chair: Roger Beaty

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What drives creative self-concept judgements?

Benedek M.[1] & Lebuda I.[2]

[1] *University of Graz*

[2] *University of Wroclav*

Researchers often ask their participants to judge their creativity, such as "how creative do you rate yourself compared to others?" Although participants usually duly respond, these self-assessments appear a complex task if we think more closely about it (what creativity do you mean, and how should I know?). This raises the question of what information people rely on when judging their creativity. We studied a sample of 400 people who judged their creativity (0-100), justified their judgements openly, and completed more differentiated measures of creative self-concept, real-life creativity as well as broader traits related to personality and self-esteem. Results showed that creative self-concept judgements generally reflect individual differences in creative achievement but also appear to be prone to an above-average effect. Moreover, judgements capture both creativity-specific and unspecific aspects of self-concept, which together explain substantial part of variance in global judgements. Finally, self-assessments can be connected to Bandura's sources of creative self-efficacy such as mastery experiences. In sum, this study provides insights into the diverse constituents of global creative self-concept judgements.

Keywords: creative self-concept; self-assessment; individual differences

How We Use Creative Activities to Regulate Our Emotions

Smith K.A.[1], Kaufman J.C.[2] & Drake J.E.[3]

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[2] *University of Connecticut*

[3] *Brooklyn College and The Graduate Center, City University of New York*

The benefits of engaging in creative activities as a way to improve well-being and regulate emotions has gained increasing attention. However, much of this research has focused on creativity's relationship with well-being measures or the specific benefits of artistic activities after a mood induction. We aimed to investigate how individuals use a variety of creative activities to regulate their negative emotions. Participants (n = 669) were asked to think of times that they felt sad, depressed, angry, anxious, or stressed, and to list the activities they engaged in to help them cope with these emotions. Participants rated the activities for their effectiveness in regulating their emotions, their motivations for engaging in these activities, as well as selecting which activity they found most helpful in regulating their emotions. Participants also completed personality and creativity measures. Responses are currently being coded for activity themes, and active versus receptive creative engagement. We will also examine whether individual differences in personality traits and creativity predict who is most likely to turn to creative activities to regulate their emotions and whether there is diversity in the activities they report. By examining the frequencies and motivations for engaging in creative activities to regulate emotions, this study hopes to shed light on the intrinsic and extrinsic factors fostering engagement in creativity during challenging emotional times. Our findings have potential to lay a foundational framework for future studies and interventions and enrich our understanding of the emotion regulation benefits of everyday creative activities.

Keywords: Creative activities, Emotion-regulation, Individual differences

Subjectivity in Creative Self Beliefs: A Q-sort Analysis

Puryear J.S.[1] & Lamb K.N.[2]

[1]*University of Montana*

[2]*University of Alabama*

Over the past two decades, the study of creative self-beliefs has focused on generating instruments which target self-efficacy (Karwowski, 2011; Tierney & Farmer, 2002), self-identity (Karwowski, 2011), and self-perceptions (Reiter-Palmon et al., 2012). As is typical with scale development and validation, the focus tends to be on the items (Zielińska et al., 2022) and on parsimony in scales (Beghetto, 2006). Emerging work on implicit theories and beliefs about creativity (Cropley et al., 2019; Patston et al., 2018) and the prevalence of myths and facts related to creativity (Benedek et al., 2021) shifts the focus toward what people know and believe regarding creativity. In this study, we marry these two lines of thought via a re-examination of creative self-belief scales through the lens of implicit and subjective beliefs about creativity. Our goal is to determine if there are patterns in people's subjective beliefs about creativity which manifest themselves in the assessment of creative self-beliefs. We are using roughly seventy items from seven previously published scales on creative self-beliefs and self-perceptions to form the corpus of items for a q-sort analysis. As is typical in a q-sort analysis, participants will sort the items into a forced distribution based on their subjective beliefs about the items with respect to themselves. We believe there will be patterns in the respondent subjectivity which will provide insights into both what people believe about creativity generally and about themselves specifically with respect to creativity.

Keywords: creative self-beliefs, q-sort, implicit theories of creativity

Ambiguity tolerance and creative self-regulation

Stoycheva K.

Institute for Population and Human Studies at the Bulgarian Academy of Sciences

The presentation explores the role of ambiguity tolerance in the self-regulation of the creative action. It will elaborate on a recently proposed conceptual framework for examining the contribution of tolerance of ambiguity to the successful completion of the creative work (Stoycheva, 2023). The framework integrate information about the relations of ambiguity tolerance to creative thinking skills, creative performance, personality and occupational creativity with findings from the theoretical and empirical investigations of creative self-regulation. The purpose of this integration is to provide a big picture overview of tolerance of ambiguity as a personal resource in completing creative projects, sustaining creative pursuits and supporting lifetime creative productivity. The present analysis will advance the proposed conceptualization in two directions. First, it will further differentiate between tolerance–intolerance of ambiguity and uncertainty in individual behavior (Carleton et al., 2016;Hillen et al., 2017). Second, it will specify how the identified self-regulatory strategies (Ivcevic & Nusbaum, 2017; Ivcevic et al., 2023; Zielinska et al., 2022; Zielinska et al.,2023ab) help the creatively active individual to deal with ambiguity and cope with uncertainty in their creative actions. The conclusions will outline the relevance of the above theoretical considerations to the understanding and facilitation of creative behavior in different settings.

Keywords: tolerance-intolerance of ambiguity, intolerance of uncertainty, creative self-regulation

Monday, September 16th

SESSION Astrea

Mon-1

Neuroscience - I

Chair: Sergio Agnoli

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How does stress shape creativity? Multiple Evidence from Neurophysiology

Duan H.[1], Wang Y.[1], Zhang J.[1] & Duan W.[1]

[1]*Shaanxi Normal University*

Creativity, as a unique human talent, is one of the most important human activities. Nowadays, with the advent of the VUCA era, stress has become a regular part of life that people have to face. Both individuals and organizations often need to come up with creative problem-solving strategies under stressful situations. This study systematically explored the neurophysiological mechanisms of stress affecting creativity and the interventions to enhance creativity by means of neurophysiology and cognitive neuroscience. We found that physiological responses such as cortisol, EBR and pupil diameter under stress can negatively influence creative task performance, in which cognitive flexibility plays an important mediating role. A general decrease in upper-frequency alpha power after stress was also shown, reflecting a bottom-up stimulus-driven processing state. At the group level, stress improved group creativity performance. The couple group had significantly higher levels of cooperation and creativity scores under stress than the strangers group. At the intervention level, we found that tDCS mitigated creativity impairment by improving stress-induced prefrontal dysfunction. Future studies should further explore the mediating role of the neuroendocrine system and the regulating role mechanism of the individual baseline.

Keywords: stress, creativity, group creativity, neurophysiological mechanism

The impact of knowledge structure on scientific creativity and its cognitive neural mechanisms

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[2]*Shaanxi Normal University, Xi' an, China*

The cultivation of scientific and innovative talent and the enhancement of innovation are important strategies for national development. Exploring creativity based on scientific background is a necessary tool for scientific and technological progress. While the generation of innovative technologies and products relies on the existing knowledge experience of individuals, knowledge learning is the key processing of creativity. Therefore, scientific creativity is a process of information processing and reorganization based on domain knowledge. Knowledge can be divided into representational knowledge and verbal knowledge depending on the way it is represented. In recent years, researchers have begun to further explore the relationship between knowledge and creativity. however, Previous research has focused on the relationship between verbal knowledge and domain-general creativity. there are some questions that need to be solved, such as insufficient attention to special fields especially science domain, unknown cognitive mechanisms in special fields, and unexplored neural mechanisms. To date, no research has systematically explored the relationship between knowledge (including verbal knowledge and representational knowledge) and scientific creativity. The role of representational knowledge in scientific creativity cannot be ignored. Representational knowledge allows for the representation of the spatial structure of scientific knowledge and therefore facilitates the understanding of knowledge and the knowledge-based creativity. This study integrated research methods from psychology, education and cognitive neuroscience to examine the influence of knowledge on the creative idea generation in scientific domain and its underlying neural mechanisms.

Keywords: knowledge structure, scientific creativity, cognitive neural mechanisms

Ecological momentary assessment of creative ideation: Investigating the association between physical activity and creative ideation performance via physiologically informed prompts

Rominger C., Fink A., Benedek M., Weber B. , Perchtold-Stefan C. M. & Schwerdtfeger A.R.

University of Graz

Intervention studies showed a positive relationship between physical activity and creative ideation performance indicating the potential enhancing effect of physical activity on creativity. However, these studies have their methodological issues and a convincing application of physical activity as the active ingredient in a double-blind condition is not possible. Passive sensor technology (such as wearables) can track physical activity and might help to overcome this issue and consequently increase the confidence in research findings. We studied whether physical activity improves people's creative abilities by means of an activity-inactivity-algorithm. This algorithm applied creative ideation tasks in the verbal and figural domain when people showed higher intensity physical activity or sedentary behavior in everyday life situations. In a sample of 69 individuals, who participated in this 5-day micro-longitudinal study, we found no significant difference in creative abilities between sedentariness and more physically active situations. An exploratory moderation analysis, however, indicated a positive effect of physical activity for people showing a higher creative potential in the verbal domain; no moderation effect was evident for the figural domain. This quasi-experimental design indicates that naturally occurring high intensity physical activity might not increase the originality of ideas for all people, hinting at an inverted u-shape of the link between physical activity and creative ideation performance. While more creative people showed the expected increase of verbal originality after periods of higher physical activity compared to sedentary behavior others might benefit from lower levels of physical activity. This finding argues for tailored physical activity interventions to boost creativity.

Keywords: EMA; physiological prompts; sedentariness

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Monday, September 16th

SESSION Alvania

Mon-1

Domains of Creative Work - I

Chair: Angela Faiella

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Perceptions of ideas across domains of creative work

Dalsgaard P.[1], Rosselli del Turco E.[2] & Inie N.[3]

[1]*Centre for Digital Creativity Aarhus University*

[2]*UC San Diego*

[3]*IT University of Copenhagen*

This paper examines a particular facet of human creativity, namely how ideas are perceived and articulated by practitioners from four diverse domains of creative work: design, graphics, music, and science. Drawing upon studies that combine surveys (n=200) and semistructured qualitative interviews (n=60), we investigate how practitioners in their own words define what constitutes an idea, and in particular makes an idea good. On this basis, we identify similarities and differences in idea perceptions across these domains, as well as intra-disciplinary patterns. We then examine how differences in idea perceptions correlate with differences in how practitioners work with ideas in practice in what we label idea workflows, including the tools and interpersonal infrastructures they establish to develop ideas. Finally, we discuss our findings in light of prior academic definitions and frameworks of ideas in creative work. Insights from this study contribute not only to domain-specific practices but also offer cross-disciplinary implications for understanding the role and nature of ideas in creativity. The study thus further our insights into the specific domains in question, and also contribute to a broader understanding of the role and nature of ideas in creativity.

Keywords: Creativity, Ideas, Creative Work

Bruce Springsteen's Music: His Women Fans Speak Out on the Deep Significance of Creative Works

Mangione L. & Luff D.

Antioch University New England Keene, New Hampshire

What can be the effects of one artist's creativity on others? What is the importance of creativity to those who interact with it and delve into it? How are psychological responses to creativity understood? How can a work of art, in this case music, affect others, help in personal growth, be present through hard times, and create groups and communities? Springsteen's women fans have offered their views in two large and deep international surveys, discussed within a psychological framework, that are providing the basis for this proposal. Women spoke of seeing Springsteen through his work as a friend, family member, teacher, guide, or even therapist, due to the power of his music. The music has helped with fostering relationships, understanding emotions, dealing with the losses and disappointments in life, finding meaning in life, creating a sense of self, holding onto hope, gaining insight and self-confidence, navigating depression, and fostering identity development. It has provided companionship in national events such as September 11th or the Pandemic. They also discussed the importance of belonging and the significant role of fan groups cohering around Springsteen, whether through concerts, online groups, or meet-ups, and of course the fun, celebration, and camaraderie of being a fan. Creative acts such as songwriting and performance can reach people on a significant level, and this presentation offers ways to think about such effects on those who value art. The power of creativity to transform lives and bring people together is acknowledged here.

Keywords: Rockstar Fandom, Meaning-making

Rethinking high creative potential in terms of strength and fragility: The case studies of Mozart and Michael Jackson

Tordjman S.

University of Rennes

The case studies of Mozart and Michael Jackson illustrate the concepts of high creative potential, talent, and precocity in the musical domain. Studying these cases of exceptional musical talent highlights the usefulness of a multidimensional approach to exploring creative potential, which is not limited to academic abilities. It offers a better understanding of the process of transforming a creative gift into talent and allows us to examine the asynchronies observed in some individuals with high creative potential between extreme talent and impaired socio-affective development—the interplay between strength and fragility where cognitive functioning (including creativity) cannot be dissociated from emotional functioning.

Keywords: high creative potential, musical creativity, psychopathology

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The predictor role of presence on divergent thinking in virtual environments with different levels of content richness

Liu J.[1], Mercier M. [1], Lubart T. [1], Burkhardt J.M. [1] & Bougrine-Bourgeois S. [1]

[1]*LaPEA, Université Paris Cité and University Gustave Eiffel*

Creative thinking requires people to interact with the external environment and benefit from diverse resources and information to develop ideas. Interactive multi-media platforms such as websites have been shown to be effective tools to enhance creative performance. Virtual Reality (VR) head-mounted devices are a new form of multimedia that provides an immersive virtual experience, distinguishing itself from traditional virtual platforms (e.g. computer screens) with its high level of vividness and interactivity. In this exploratory study, we tried to understand if interactive immersive virtual environments helped increase divergent thinking processes. 39 undergraduate students participated in the experiment. Two virtual environments with more or less interactive content on the collaborative virtual platform "GLUE" were presented randomly to participants on conventional screens or VR headsets. Participants were asked to explore the given virtual environment freely for 10 minutes and complete the Alternative Uses Task before and after the exploration of the virtual environment. Originality, fluency, and elaboration of creative ideas were analyzed. We found that participants who explored the virtual environment in the headset showed a significant increase in fluency in divergent thinking processes. Also, we found that participants who explored the virtual environment with more interactive content showed a significant improvement in fluency of divergent thinking processes. The results imply a potential link between the enhancement of creative performance and the level of interactivity in the virtual environment.

Keywords: Virtual environment; interactivity; divergent thinking processes

Monday, September 16th

SESSION Nautilus

Mon-2

Education - I

Chair: Felipe Zamana

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Outcomes of a 3-year, project to foster learners' creativity in 15 schools

Sowden P., Warren F., Seymour M., Martin C., Spencer E. & Mansfield S.

University of Winchester, UK

Funded by Arts Council England, we have conducted a three-year programme of work, involving 15 primary schools, to foster learners' creativity in subjects drawn from across the curriculum. The programme comprised five interleaved streams of work focused on the Context, Knowledge, Agency, Pedagogies and Leadership needed for creativity in schools. Researchers and teachers worked together to develop a 'Creativity Navigator', which provided a framework of teaching for creativity bringing together psychological models of the creative process with educational models of creative 'habits' that may support this process. Teachers created a wide range of units of work in different curriculum areas (e.g. history, design & technology, science) that were each underpinned by our framework and trialled these with their classes. To assess the impact of these new pedagogic approaches, we have used a mixed-methods approach comprising quantitative measures (creative self-efficacy, metacognitive knowledge of creativity, confidence and efficacy to teach for creativity, well-being, school satisfaction), semantic fluency tasks, focus groups, interviews, teacher observation of creative outcomes in the classroom. To date, the measures have been completed twice, one year apart (quantitative - time 1: n pupils = 1482, n teachers = 71. time 2: n pupils = 1705, n teachers = 100; qualitative – interviews: 114, focus groups: 34) with a third wave of data collection due in May 2024. I will report a comparison of outcomes for schools and classes that were part of our intervention group with those that were not, over the three years of the project.

Keywords: schools; creativity; education

Disrupting and exploiting creative constraints

Le Hunte B.[1] & Benefield G.[2]

[1]*University of Technology Sydney*

[2]*Mobius Loop*

Creative constraints are necessary because our creativity must be purposeful and ideally transformative in order to change the world and have positive impact. But when do constraints stop becoming useful and destroy creativity and possibilities? And when can they enable and accelerate creative freedom and truly original ideas, resulting in radical innovation? Here are some of the questions we will explore:

- Why are constraints useful and when do they stop becoming useful?
- Can constraints be too controlling, and how do they best enable creative freedom?
- Which constraints should we keep? And for how long?
- How do we remove the constraints that hold us back?
- How do we move from safe spaces to brave spaces?

This presentation explores two contexts with real world examples – industry and academia – to find commonalities. We share our experiences of when constraints have been a force for good and when they have been too constrictive, and we offer some pragmatic advice on how to design constructive (and generative) creative constraints.

Keywords: Constraints, outcomes, innovation

Teaching for creativity: Impact on pupils with special educational needs and disability, or disadvantage

Warren F., Sowden P.T., Seymour M., Spencer E., Martin C. & Mansfield S.

University of Winchester

We present here findings from our work as part of a national pilot programme, funded by Arts Council England, to foster teaching and learning for creativity. We will report on the impact of teaching for creativity on children with special educational needs and disability (SEND) and those from disadvantaged backgrounds, with a focus on their approach to learning and engagement, creative self-efficacy, and implicit theories of creativity. Throughout the three-year Creativity Collaboratives project, we have worked in partnership with 15 primary schools, to support systemic change by developing and embedding pedagogies for creativity. Fostering pupils' sense of their own creativity has been an important focus of our programme of work and evaluation. In addition to pupil demographic data (including indicators of disadvantage and SEND status), we have collected baseline and mid-point data comprising both quantitative and qualitative measures, with a final data collection point due in May 2024. Interim findings from teacher interviews highlight positive changes in pupils' approach to learning in response to their teaching for creativity, with teachers perceiving creative units of work as being more inclusive and empowering for all children, and especially those with SEND status. We will consider these qualitative findings in relation to quantitative measures of pupils' creative self-efficacy, knowledge, and implicit theories of creativity, from all three waves of data collection, in order to understand the impact of this three-year programme of work with respect to pupils' inclusion in the classroom.

Keywords: creativity; education; inclusion

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Navigating Creativity Shifts: Mapping the transformation of frameworks as creative tools to educational provocations

Artigau A.J., Bosch T., Trossero I. & Aguilar F.

Universidad Austral

How can we translate an artistic methodology to develop cinematographic storylines into an educational framework? The purpose of this presentation is to dive into the creative process of Worldbuilding as it was conceived by Alex McDowell and how it evolved into an international educational collaboration. In previous academic papers, we have established the impact of Worldbuilding on students and how it aligns with the Participatory Framework of Creativity. At present, we want to study the development process of Worldbuilding from its origin to its current application. This research is a critical contribution to highlight the importance of art in systemic thinking. The methodology applied to understand this development will be the Evolving Systems Approach by Howard Gruber. More specifically, the idea is to construct a Network of Enterprise for Alex McDowell to visualize the different interests or enterprises that have inspired the mandala thinking approach. Utilizing qualitative research methods: interviews, archival analysis, and observational data will be necessary to trace McDowell's journey through the lens of Gruber's framework. This case study deepens our understanding of McDowell's prolific career and enhances our appreciation for the multifaceted nature of creativity, serving as a valuable resource for scholars and practitioners alike. Themes such as systems thinking, storytelling, transmedia, and future studies, amongst others, will be unpacked. An essential lesson to takeaway will be the importance of the future to recognize our present.

Keywords: Worldbuilding, storytelling, future studies

Monday, September 16th

SESSION Astrea

Mon-2

Methodology - I

Chair: M. Karwowski

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Researcher-As-Obstacle Framework: a Methodology for the Study of Creativity While it Happens

Julliard R.[1], Roy D[2] & Botella M[3]

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[3] *Université Paris Cité and Univ Gustave Eiffel, LaPEA*

Artists report relying on their "creative engine" to interact with their artwork in the making. This presentation showcases a novel interdisciplinary framework at the intersection of anthropology and psychology: the "Researcher-As-Obstacle" (RAO). Named after Glaveanu et al. (2013) findings that "obstacles" are needed for creativity to emerge, the RAO's framework gives the researcher the position of the main obstacle that the artist must overcome to create in an experimental setting. This methodology allows a close look into the artist-artwork interaction while it is happening. Even if the RAO framework alters the artists' output, based on previous research, it does not change how they rely on their creative engine. In this interdisciplinary framework, Anthropology provides fine descriptions of the process using the "participant observation" method and micro-phenomenology interviews (Petitmengin 2006) to access first-person cognitive and emotional insights. Psychology provides its rich tradition of studying the creative process (e.g., Wallas 1926; Rhodes 1961; Mace&Ward 2002; Botella et al. 2018) and designing experimental settings. For this presentation, a case study will illustrate the RAO framework. We asked a visual artist to draw with colored pencils for a limited time. We videotaped his bodily movements and the artwork's graphical development while he answered questions about what he does. We can thus map the creative engine phases of control and letting go that give rise, from the artist's perspective, to "surprising" outcomes that take on the appearance of "life," the criterion for the artwork to be seen as complete.

Keywords: Creative Engine, Interdisciplinary Methodology, Participant Observation

Playfulness priming: an online intervention study investigating the effects of trait playfulness on creative performance

O'Meara S.[1] & Smith K.[1] & Bhattacharya J.[2]

[1]*Goldsmiths, University London*

[2] *The Graduate Center, City University of New York*

Creativity is increasingly recognized as a vital component in educational and organisational environments. However, the search for a safe and effective intervention to enhance creativity remains elusive. In this study, we hypothesized that playfulness would be an effective method for enhancing creativity in adults. Play, a pivotal activity in a child's development, is well-documented for its positive link with creativity and imagination in young children, yet its impact on adults' creativity has received less attention. In line with the effect of priming by instructions (i.e. be creative) on the divergent thinking task, we predicted that priming participants to be more playful would lead to more creative responses. In our study, 216 participants (mean age = 31 years; 67% female) were primed to adopt either a playful or a creative mindset or were not primed at all (control condition) while solving a classical divergent thinking task (alternative uses task) and a real-world creativity task (workplace scenario). The task performances were evaluated for fluency - based on the total number of responses - and originality, using the consensual assessment technique. That is when cued to respond creatively and playfully, participants produced responses that were more unique than those who were not cued (control).We also measured individual differences in trait playfulness. Our preliminary results indicate that playfulness priming has an effect on some but not all creative measurements. Further, individuals with higher levels of trait playfulness show a larger effect of creative priming than those with lower levels. These findings suggest that playfulness might be an effective method to boost specific aspects of creative performance in adults, paving the way for novel avenues for fostering innovation in academic and organizational settings.

Keywords: Playfulness, creativity, divergent thinking

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A Mixed-Methods Approach to Mapping the Multifaceted Nature of Inspiration in Daily Life

Smith K.[1], Wang W.[2] & Drake J.E.[3]

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[3]*Brooklyn College and The Graduate Center, City University of New York*

Inspiration is a state often associated with creativity that remains under-examined in research. Current models emphasize sub-processes of feeling "inspired by" a stimulus and being "inspired to" do or create something. But what are people most frequently inspired by or compelled to create? Do these sub-processes always co-occur or are there individual differences? To address these questions, we conducted a daily life study with the goal of collecting a wide variety of first-hand accounts of inspiration from over 26 countries. Over a period of two weeks, 593 participants from both creative and non-creative backgrounds reported their qualitative and quantitative experiences of inspiration and creativity. To analyze individual's inspired experiences, we used a variety of text-mining approaches, including sentiment analysis, graph analyses, and structural topic modeling, an unsupervised machine learning technique for natural language processing. Our analysis identified six latent themes that define most experiences of inspiration. Less creative individuals often find inspiration in personal growth, with some being significantly moved by artistic experiences without necessarily feeling driven to create. In contrast, highly creative individuals tend to discover inspiration in various aspects of daily life, accompanied by a strong urge to bring their creative ideas to fruition. A subsequent set of hierarchical linear models find that the relationship between inspiration–creativity is moderated by personality traits and creative self-concept. By employing this novel mixed-methods approach, our findings not only enrich our understanding of the psychological basis of inspiration and its relationship with creativity, but also lays the groundwork for more refined models of inspiration.

Keywords: creativity, text-mining, daily life

Schaeffer's Charades: Measuring Creative Performance in the Visual and Auditory Domain

Steigerwald P., Hilbrich L., Strauch T., Meinel C. & Von Thienen J.

Hasso Plattner Institute, University of Potsdam

Since Guilford, it has been common to distinguish cognitive performance across varying media, such as quantifying creativity for semantic (verbal) versus figural (visual) domains separately. This talk presents Schaeffer's Charades, a digital game designed to quantify creativity across visual versus sonic thinking. Extending the testing logic of "Pictionary" used in neuroscientific research on creative cognition, our task requires participants to convey concepts through storytelling. The given concepts are abstract, such as "wedding" or "traffic," and participants place objects on scene grids over six stages in time to convey their ideas. Thus, participants produce mini-movies of moving or appearing and vanishing objects to convey their concept. In total, participants have access to 24 objects, which are identical across the visual and sonic conditions. In the visual mode, the objects are pictograms (such as symbols of a raindrop or laughing mouth), whereas in the sonic mode, objects are sounds (such as the sound of a raindrop or laughter). In line with the definition of creativity, the test investigates the extent to which the participants' solutions are novel and effective, alongside further metrics like fluency (number of objects used) and flexibility (diversity of objects used). The mini-movies are later presented to a jury tasked with discerning the correct concept among distractor items. The percentage of jury members guessing a concept correctly (such as three correct guesses among four judges) serves as a measure of solution effectiveness. Additionally, judges rate the perceived originality of the mini-movies. A repeated measures experiment with N=20 participants reveals that subjects generally produce more effective solutions in the visual rather than the auditory domain. This trend persists even when participants and jury members have a professional background in the audio realm. Enhanced creative performance in the visual domain may reflect the dominance of the visual system in the human brain, with more "processing capacity" dedicated to this medium. Furthermore, a construct validation is offered, showcasing expected relationships between different creativity metrics obtained.

Keywords: serious games, sonic thinking, visual thinking

Monday, September 16th

SESSION Alvania

Mon-2

Evolutionary Perspectives - I

Chair: G. E. Corazza

MARCONI INSTITUTE FOR CREATIVITY moving ideas

Adaptation: Our most creative human capacity

Jacobovici S.

Creative Arts Therapies Services

This presentation will develop the thesis that adaptation is a creative capacity that enables human survival beyond the physical. The presenter will elaborate on the duality of adaptation. The human capacity to take elements from one area of experience and adapt them to another area transcends the primitive side of adaptation: physical survival. Even Darwin addressed this duality when he said: "It's not the strongest species that survives, nor the smartest that survives. It is the most adaptable to change".

As an example, I would like to offer Leonardo Da Vinci's, The Vitruvian Man, as a metaphor for this duality.

The Vitruvian Man, also known as The Universal Man, depicts a nude man facing forward and surrounded by a square, while superimposed on a circle. The man is portrayed in different stances simultaneously: His arms are stretched above his shoulders and then perpendicular to them, while his legs are together and also spread out along the circle's base. This is not a portrayal of a human stuck or fixed in one place. The Encyclopedia Britannica, states: "Leonardo envisaged the great picture chart of the human body he had produced through his anatomical drawings and Vitruvian Man as a cosmografia del minor mondo ('cosmography of the microcosm'). He believed the workings of the human body to be an analogy, in microcosm, for the workings of the universe." Leonardo himself is the best example of the human capacity to adapt by taking from other parts of our environment and creatively enhancing our survival beyond physical survival. His "Notebooks" attest to that.

Keywords: Adaptation, Creativity, Innovation

Exploring Creativity through Form: An Interdisciplinary and Multi-Layered Framework for Creativity

Pawlick J.

Pontifical University of the Holy Cross, Rome, Italy

Though much of modern empirical and positivist philosophy tended towards reductionism and physicalism, recent observations from science (e.g., cellular biology) and philosophy (e.g., philosophy of mind) suggest the need for multi-layered explanations capable of expressing emergent phenomena. In this paper, I will explore the benefits of viewing creativity through the lens of one such non-reductionist framework: that offered by the neo-Aristotelian recovery of form or essence currently attracting attention in analytic philosophy. For the purposes of this paper, form can be described as a principle of i) definition/unity, ii) agency/activity, and iii) function/purpose present in complex systems. One example of form's relevance to creativity is illustrated by recent evidence for the irreducibility of cultural innovation to purely genetic evolution. As another example, formal notions might help to address the epistemological question: what "counts" as new? Additionally, this framework opens space for dialogue on creativity's axiological dimension: how does creativity generate value, and when is it ethical? Finally, notions of form dovetail with explanations of creativity as agency. This paper will also address difficulties facing the recovery of form in studies of creativity: e.g., the need to bridge gaps between technical and philosophical disciplines; the conceptual expansion required by a non-reductionalist/physicalist framework, and the challenge of applying notions principally present in natural philosophy to the study of artificial creations. Far from enclosing creativity within rigid definitions, theoretical frameworks with which to conceptualize and taxonomize creativity could reveal new areas for research and strengthen dialogue between the sciences and humanities.

Keywords: Form, emergence, value

SensEco: Fostering Creativity through Perspectives of Non-Human Species

Hilbrich L.[1], Steigerwald P.[1], Strauch T.[1], McKee H.[2], Li L.[3], Von Thienen J.[4], Labrune J.B.[3], Ishii H.[3] & Arnrich B.[5]

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Human creativity exerts a growing, yet not always positive, influence on our planet, with unsustainable technologies contributing to pollution and the climate crisis. This research aims to cultivate a deeper ecological mindfulness among creators by fostering empathy with nonhuman stakeholders. How does a mole perceive the rumble of a passing train? What sensations accompany a bat navigating near human structures? Enter SensEco, an educational, turn-based, serious game designed to facilitate perspective-taking across diverse species. In this immersive experience, players inhabit a space outfitted with stimuli such as wind, sound, touch, smell, vibration, and light, enabling them to immerse themselves in different perspectives within the given environment. These sensations are tailored to mirror the perceptual realms of various species, termed agents. Through the lens of these agents, humanity appears as an uncontrollable and invasive force, often introducing obstacles rather than opportunities in the agent's habitat. Players encounter the tangible impact of human presence through mini-games, emulating the natural behaviors of these agents. Each turn of the game's overarching narrative reflects escalating human influence, making the mini-games increasingly difficult. Intended for daily play over several weeks, SensEco offers creators and designers an opportunity to deepen their comprehension of rapidly changing natural habitats shaped by human inventions and designs. By immersing themselves in the experiences of other life forms, players may develop a more eco-friendly creative mindset, preferring creative decisions that favor sustainable solutions - a shift to be quantified through mindset questionnaires and real-world creative performance tasks.

Keywords: multi-modal perspective-taking, serious games, environmental awareness

Creative Wellness- Healing and Thriving through Making and Doing

Clapp E.

Project Zero, Harvard Graduate School of Education

As a species we have always been makers of things and creators of experiences, but in our current fast-paced and technology-driven worlds, many of us don't take the time to engage in the work of making and doing. Making and doing is elevated when it is brought to the collective or community level, and yet again, too often many of us lack the opportunity to participate in broader making and doing experiences. This lack of opportunity to engage in making and doing may contribute to anxiety, depression, and an overall sense of fatigue. In this paper we first make the link between creative participation (described here as making and doing) and wellness, we then present an emergent framework for healing and thriving through creative wellness.

Keywords: Creativity, Participation, Wellness

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Monday, September 16th

MIC Keynote Speech - II

Roger Beaty

Using AI to Assess and Enhance Human Creativity

The subjective human assessment of creativity has long stood as the gold standard. Now, advances in AI allow computational systems to mimic human creativity evaluation. I will present recent work on computational creativity assessment, from large language models assessing short stories to convolutional neural networks judging sketches. A key benefit of AI assessment is the ability to provide rapid, real-time feedback to people during the creative process, serving as on-demand idea evaluation aligned to human raters. By facilitating metacognitive reflection, real-time AI input can boost creative performance, helping people learn and become more accurate at evaluating their ideas. Ultimately, I will argue that AI should be used as a tool to promote human creative learning, rather than replace human creativity.

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Monday, September 16th

SESSION Nautilus

Mon-3

Organizations - I

Chair: R. Reiter Palmon

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The socio-technical impact of artificial intelligence on individual and team creativity

Parmentier G.

University of Grenoble Alpes/CERAG

The recent emergence of generative artificial intelligence tools, based on large language models has profound implications for business, research, and education (Diallo, 2023). These AIs perform cognitive tasks that have hitherto only been possible with humans, and they risk strongly modifying our ways of thinking, of searching for and processing information, as well as our cognitive processes of synthesis and analysis. As cognitive technologies, AI could significantly influence user creativity (Jia et al., 2023) and organizational creativity (Mikalef & Gupta, 2021).

Researchers' growing interest in the socio-materiality of creativity is particularly important in the context of the rise of digital technologies such as AI. We therefore propose to construct a new approach, which I call the socio-material approach to organizational creativity, mobilizing the theory of affordances (Gibson, 1977) to analyze the effect of the use of artificial intelligence technologies on creativity. Artificial Intelligence, as cognitive technologies, used at an individual level, in teams or deployed in an organization, is likely to foster or constrain creative activities with functional, cognitive, symbolic, psychological and social affordances.

To carry out this study, we plan to carry out two qualitative studies, one with graphists in the video game industry and the other with developers in the energy industry. We will interview technical directors, team managers and team members to identify the 5 types of affordances and their effects on individual, collective and organizational creativity. The method used will be thematic coding with a gradual rise in generality to identify affordances, mechanisms and effects of artificial intelligence on the creativity of individuals and teams. This is an initial exploratory study into the effects of AI on individual, team and organizational creativity. However, we anticipate several contributions from this research:

• Identifying the effects of artificial intelligence on individual, team and organizational creativity based on affordances

• An initial identification of mechanisms explaining the effects of AI on individual and team creativity.

• Initial recommendations to help the deployment of AI in the creative industries, so as to optimize its potential where it exists and limit its negative effects.

Creative Process Preferences Across Jobs and Organizational Function

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Creative thinking is widely touted as a 21st century workplace skill. However, creative thinking represents a complex form of cognition and thus is comprised of a range of more specific forms of cognition. FourSight is a self-report instrument useful in identifying individuals' cognitive style preference for four main forms of creative cognition: problem clarification, idea generation, solution development, and implementation planning. Based on the well-established Creative Problem-Solving model, a framework for creative cognition, the FourSight questionnaire has been completed by more than 60,000 professionals. This presentation explores how four creative process preferences, as measured by FourSight (i.e., Clarifying, Ideating, Developing, and Implementing), vary across jobs and organizational functions. If understood as an interaction between person and work environment, these creative process preferences may be useful in illuminating how different jobs and functions demand distinctly different forms of creative cognition. For instance, clarifying thinking seems to dominate the Financial function in organizations, while Consulting as an occupation shows a proclivity towards Ideating.

Keywords: Creative Process, Person-Job Fit, Creative Problem Solving

More than Brainstorming: Nurturing long-term Creativity in Interdisciplinary Tech Teams

Riebel J.A.

University of Applied Sciences, Mainz, Germany

This research explores the challenges faced by interdisciplinary teams in the early stages of user-centred software development projects. To address this issue, seven semi-structured interviews were conducted with IT professionals holding various roles in software development teams. The resulting qualitative content analysis focused on team creativity, communication, organizational aspects, and leadership.

Overall, the results suggest that considering different perspectives enhances creativity during the ideation phase. Diverse teams with varying backgrounds are more likely to avoid narrow-mindedness and preconceptions, leading to improved idea quality. However, communication can be challenging in interdisciplinary settings due to differing perspectives and problem-solving preferences among team members. The study identified other challenges within the team as either content-related or being team dynamic issues. It has been found that technical disputes can facilitate progress, provided that there is mutual appreciation and compromise. Early recognition and addressing of interpersonal conflicts are crucial for maintaining good team spirit. Regular retrospectives and a vibrant meeting culture with flat hierarchies can also enhance teamwork and lay the foundation for a creativity-encouraging environment.

Consequently, it is important to put significant organizational effort into establishing and maintaining committed, diverse teams. The study suggests that interdisciplinary teams may benefit from additional support structures, such as regular team meetings, workshops, and methodological guidance to facilitate their workflow. This is particularly crucial during the problem definition and idea generation phase of a project, as it prepares the ground for the development of user-centred solutions.

Keywords: creativity, ideation, interdisciplinary

Board games for group creativity: an experimental study

Mercier M.[1], Bourgeois S.[2] & Lubart T.[1]

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Games, especiallyboard games, have shown potential for helping improveindividuals' creativity While individual creativity is valuable, the complex nature ofmodern organizational work often necessitates group creativity. Because board gamesare social activities by design, this paper argues that board games might also benefitcreativity in a social context, i.e., group creativity. The study employs an experimentalapproach, contrasting the effects of creative and non-creative board games on groupcreativity. The latter ismeasured through a group divergent thinking task, evaluatingideas based on fluency, elaboration, and originality. In the experiment, groups of threeplayed either a creative or non-creative board game for 30 minutes, followed by a 15-minute brainstormingsession.. Results show a significant positive impact of creativeboard games on group creativity, with notable improvements in all three divergentthinking criteria, characterized by large or very large effect sizes. This highlights boardgames as a promising avenue for enhancing creativity within groups.

Keywords: board games, creativity, brainstorming.

Monday, September 16th

SESSION Astrea

Mon-3

Creative Process - I

Chair: E. Volle

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Effects of brief mindfulness training on creative problem-solving

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Mindfulness training is believed to positively impact fostering creative idea generation, assessed through divergent thinking tasks. However, research findings regarding the influence of mindfulness training on creative problem-solving, as evaluated by convergent thinking tasks, need to be more consistent. While some studies suggest that mindfulness can enhance attentional focus, supporting convergent thinking, others propose that increased attentional control may hinder creative problem-solving abilities. The current study aims to investigate the effects of brief mindfulness training on creative problem-solving and the underlying neural mechanisms. Twenty healthy novice participants of varying genders underwent both a 20-minute mindfulness training session and a control training session. They were instructed to complete affect measurements and convergent thinking tasks before and after the training sessions. Neural activity was measured by electroencephalography (EEG) during the performance of convergent thinking tasks. The results revealed a significant improvement in participants' performance on convergent thinking tasks after mindfulness training, whereas there was no improvement following the control training session. EEG analysis showed a significant decrease in task-related theta power (4-7Hz), an oscillation associated with attention control, specifically observed in the frontal and central cortex regions following mindfulness training. Conversely, no such change was observed after the control training session. These findings suggest that brief mindfulness training promotes the capacity to allocate attention more effectively and heightens awareness, which reduces the degree of attentional control, thereby supporting performance in creative problem-solving tasks.

Keywords: mindfulness, convergent thinking, EEG

Sparking Creativity: Encouraging Creative Idea Generation through Automatically Generated Word Recommendations

Wise T. & Kenett Y.N.

Technion - Israel Institute of Technology

Creative block is a familiar foe to any who attempt to create and is especially related to “writers block”. While significant effort has been focused on developing methods to break such blocks, it remains an active challenge. Here, we focus on the role of semantic memory structure in driving creative block, by having people get “stuck” in a certain part of their semantic memory network. We directly examine whether we can “pull out” a participant from where they got “stuck” in their semantic memory, thus leading to breaking creative impasse. To do so, we develop the Associative Creativity Sparker (ACS), which is a cognitive network science-based online tool that aims to spark creative ideas and break creative impasse: Once a participant “runs out” of ideas in a creative idea generation task, word recommendations are suggested to prime new ideas. These word recommendations are either towards or away from previous ideas, as well as close or far from the target object, based on a conceptual space extracted from the participants responses using online text analysis. Across two studies, our results indicate that the location of word recommendations affects the fluency and creativity of one’s ideas. We find that there is a sweet spot in one’s semantic space where word recommendations are most successful at sparking new and creative ideas, and we show how novice and experienced writers differently benefit from these word recommendations. Overall, our studies highlight the potential of the ACS to spark novel research, in typical and clinical populations.

Keywords: Semantic memory, mental fixation, NLP

Taming the Creative Action: The Effects of Self-Regulatory Daily Diary Intervention on Creative Performance and Beyond

Zielińska A., Lebuda I., Czerwonka M. & Karwowski M.

University of Wrocław

If one were to learn something new or master a skill, chances are there is already a manual for it. Tips on how to put together a dish, be a better boss, or take a great shot are readily available. However, these guides will likely fall short when striving to become a creative cook, a creative manager, or a creative photographer. While the ultimate how-to guide for achieving creative outcomes might never exist, research suggests that creative action can be, to an extent, deliberately directed and controlled. In this talk, we will present findings from a preregistered intervention study designed to foster a strategic, self-regulatory approach to creative projects and test the effects of such stimulation on creative self-perceptions, emotions, creative activity, and project performance. Students (N = 129) were asked to write a creative, mid-length story within 21 days. They reflected on their work in daily diaries (total day-level units = 2,400) and submitted drafts of their stories every week. Half of the participants received daily self-regulation prompts and set their writing goals using the tenets of mental contrasting and implementation intentions. The control group was not provided with any additional cues. We found that participants receiving self-regulatory prompts exhibited greater creative confidence beliefs than the control group. They also declared feeling more enthusiastic but at the same time calm and focused during the work. Furthermore, the prompted participants showed increased engagement in other daily creative activities. Finally, during the presentation, we will delve into the differences in the creativity levels of the stories over time and between the experimental and control groups. We will conclude with a discussion on the methodological challenges and prospects of guiding the creative action using creative self-regulation scaffolds.

Keywords: creative self-regulation, intervention, daily diary

Mixed methods to enhance the creativity of elderly people and their caregivers

Lellouche-Gounon, A. [1], Girandola F. & Bonnardel N. [1]

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One of the current societal challenges of demographic aging concerns the complex modalities of future products and services for the elderly, their medical, family and professional caregivers, so that they can easily carry out their joint activities of daily living. Our research aims to find approaches in cognitive and ergonomic psychology, particularly in prospective ergonomics, to guide participants with varied profiles to take up the challenge, during workshops, of collaborating inclusively and developing their creative potential, in the collective co-creation of a project for elderly people and their caregivers, in the ideation phase. We argue that participants in co-design sessions need to be guided by a technique that supports their activities to reach ideas or solutions that are both novel and appropriate to the creative design problem. To this end, we chose to study Bono's original 6 Thinking Hats method as well the 'Persona' ergonomics technique. We asked Master students in psychology and ergonomics, working as teams at the ideation stage, to design a bus adapted to short and medium-distance journeys for the elderly and their caregivers (family and professionals). Their contributions were notably analyzed in terms of the number of ideas generated (fluidity). The results show that De Bono's hat method outperforms the other conditions, while the Persona technique, contrary to the literature, do not seem to have a significant effect on participants' contributions.We propose interpretations for these results, and make proposals for potentially combining the De Bono hat method with other types of personas in prospective ergonomics.

Keywords: Co-design; Creativity; Prospective ergonomics

Monday, September 16th

SESSION Alvania

Mon-3

Future Studies - I

Chair: Jeb S. Puryear

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The deep links between creativity and foresight, yet to be explored

Scolozzi R. & Petrucci E.

Skopìa Anticipation Services S.r.l.

Creativity and foresight, two seemingly separate skills, intertwine in a fascinating dance, reinforcing each other and opening up new possibilities. Creativity unleashes imagination and originality, generating innovative ideas and novel solutions, it allows new paths to be explored, challenging established conventions and visions feeds on intuition, free associations and divergent thinking. Foresight focuses on the future, anticipating trends, challenges and opportunities, it helps navigate uncertainty, formulating plausible scenarios and adaptation strategies, it uses systemic analysis, data and models to build a proactive vision. In their relationships synergies emerge: creativity fuels foresight, providing the raw material to imagine alternative and desirable futures; foresight directs creativity, focusing it on real challenges and concrete opportunities. For example: entrepreneurs imagine a future where solar energy is the primary source of energy (creativity) and develops a technology roadmap to realise it (foresight). Artists create a work that reflects the possible consequences of climate change (creativity) and stimulate reflection on the urgency of change and the vision of strategic scenarios on which public policy or community efforts should focus (foresight). Together, creativity and foresight create a virtuous circle of learning and innovation, in which the both emerge and the "potential originality and effectiveness" (see Corazza's dynamic definition of creativity, 2016) can realize itself in nurturing novel possible and desirable futures. On the basis of our experience as practitioners and curious observers, we have identified a series of "powerful questions" to guide reflection on how to support these synergies in foresight practices, at different stages, in different contexts and with different actors. The questions are framed cross-referencing scope, context and actors of foresight, with the four main parts of creativity (emotional and motivational enabling forces, information, idea generation, and idea valuation).

Keywords: visualization; futures literacy; anticipation

Navigating the Space-Time Continuum of learning. The tinkering way to looseness

Rini S. & Corazza G.E.

University of Bologna, DEI – Marconi Institute for Creativity

Children learn in a holistic way that involves their full senses, their prior knowledge, their emotional way to relate to people and things and - already at a very early age - they can, to some extent, build models of the world, of physical phenomena and human relationships, in the seemingly overwhelming flux of data coming from an external world they are starting to explore to make sense of (cite). Something happens when they get in touch with formal education, where - in the traditional approach to teaching and learning - facts and knowledge are categorized into disciplines, into bits of information where the sense of the world is already pre-packaged for them (Corazza et al. 2021). We clearly see that - especially when considering Primary School books - knowledge is oversimplified and the activities proposed are often if not always very strict in terms of conceptual space: there is little to none freedom left to the learners to choose their path, producing original and creative artifacts. Very often the traditional (instructive) way of teaching is focused on developing intelligence rather than creativity (Corazza et al. 2022). In this way kids tend to be less engaged with the activity proposed and this model seems to increase the distance between the kids coming from a more favorable environment that values education - especially formal education and the traditional idea of curriculum - and the kids coming from more difficult backgrounds, that tend to underestimate the importance of education and school. In doing so the school institution is not realizing the ideal goal of democracy, where everyone's potential is developed to its maximum and kids are prepared to be active and creative citizens of the world.

Keywords: Space-Time Continuum, Tinkering, Education

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Surfing the Future Through Creative Problem Solving

Connie Phelps

Emporia State University

E. Paul Torrance organized the Future Problem Solving (FPS; 1974) program for children and adolescents to develop knowledge, skills, and dispositions needed to make positive change in their societies. Adapted from the Creative Problem Solving model (Osborne-Parnes, 1966), the six-step FPS program requires students to (a) identify challenges, (b) select an underlying problem, (c) produce solutions ideas, (d) generate and select criteria, (e) apply criteria, and (f) develop an action plan. The FPS mission develops the ability of young people globally to design and achieve positive futures. International Competition topics set 20 years in the future challenge participants toward how rather than what to think: terraforming (2020), neurotechnology (2021), antibiotic resistance (2022), and currency (2023). FPS can ignite curiosity and passion, enlarge vision, raise expectations, and encourage risk-taking through a range of competitive events for individuals and groups that nurture creative potential. In a survey of 220 stakeholders, Treffinger et al. (2011) found program goals served to develop life skills such as time management, leadership, self-direction, and community service. Since creatively gifted students often perceive the world around them with heightened awareness, FPS informs them toward globally citizenry about potential challenges facing them in the present and future. This study analyzes creative behaviors of diverse children and adolescents through Global Issues Problem Solving, Community Problem Solving, Scenario Writing, and Scenario Performance competitions. It also imagines the future selves of participants as they develop critical and creative thinking skills and collaborate with team members as problem-solvers and divergent thinkers (Phelps, 2023).

Keywords: Creatively gifted; Future studies; E. Paul Torrance

Monday, September 16th

Poster Session Nautilus

Mon-4

Education - II

Chair: Todd Lubart

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How creative am I? Assessing creative mindset and self-efficacy in 6th to 8th grade students

Pellegrino G.[1], Antonietti A.[2], Cornoldi C. [1], Feraco T.[1], Meneghetti C.[1] & Carretti B.[1]

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Adolescents' confidence in their creative abilities, along with their perceptions of whether creativity is innate or can be developed, can significantly impact their engagement in creative activities and approach to creative challenges. Believing that creativity is a fixed trait may lead individuals to underestimate their creative potential and invest less effort in tasks requiring creative skills.
To understand the role of these motivational and metacognitive factors in creative skills we adapted two questionnaires in Italian - the Short Scale of Creative Self (Karwowski, 2012) and the Creative Mindset Scale (Karwowski, 2014) - and assessed their reliability and factorial structure in a sample of 200 6th to 8th-grade Italian students. We also confirmed the convergent validity of the questionnaires with the Innovation Skills Domain of the Behavioral, Emotional, and Social Skills Inventory (BESSI, Feraco et al., submitted).

Finally, we explored the relations between creative mindset and self-efficacy with divergent thinking and creative problem solving. We administered five divergent thinking tasks (three verbal and two figural tasks), and a creative problem-solving task (Remote Associates Test). Three parameters were derived from divergent thinking tasks: fluency, originality (following a snapshot procedure), and flexibility.
Results show the importance of considering the role of creative mindset and self-efficacy for secondary school students, as they play a key role in shaping students' approaches to creative tasks and their subsequent performance. Consequently, evaluating these factors is important not only for research, but also for its practical applications in educational contexts.

Keywords: Creative Mindset; Creative Self-efficacy; Education

Creativity in Foreign Language Learning: an improvisation-based approach to Italian as a Foreign Language

Bonini I., Sowden P., Esser-Miles C.

University of Winchester

This study tests whether an improvisation-based teaching method allows beginner learners of Italian to be more verbally creative in the foreign language, compared to standard teaching. We also assess whether the learners' verbal creativity in English (native language) predicts the learners' creative use of Italian.

Improvisation-based FL learning appears to encourage creative expression and improve fluency in the FL (Schewe, 2007) since improvisation supports learners with combining FL words in novel ways to communicate effectively, overcoming tip of the tongue moments (Kurtz, 2015). This process resembles the creative process which produces new and effective ideas by combining concepts previously not associated (Gabora, 2010). Producing a creative response appears to initiate a spread of activation over several concepts thereby facilitating the co-activation of more remotely connected ideas. Creativity may benefit from improvisation (Sowden et al., 2015) and FL learning could benefit creativity (Van Dijk, 2018), potentially suggesting shared underlying mechanisms.

Twenty-three adult participants joined a 30-hour beginner Italian course and were randomly allocated to two groups. Both groups first received a 10-hour 'standard teaching' block followed by two further 10-hour blocks – one standard, one an improvisation-based intervention – in counter-balanced order across groups. Baseline divergent thinking in English was assessed, and after each block, participants performed two speaking tasks, which were scored for creative use of Italian as a FL. These scores are being analysed to compare the two groups' creativity in the FL over the three rounds of speaking tasks, controlling for baseline divergent thinking ability.

Keywords: Creativity, Education, Foreign Language Learning

Predictors of creative climate in enrichment activities for gifted students

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University of Ljubljana, Faculty of Education

The aim of this study was to determine the predictors of creative climate in enrichment activities for upper secondary school students based on Ekvall's 10-dimension model. Students (N = 672; M = 17 years; 56% female) and their mentors (N = 67, M = 43 years; 62% female) completed a self-report questionnaire about a specific enrichment activity in which they had participated. The results showed that both the students and the mentors perceived a very creative climate. In the group of students, the key elements of the activity explained 59% of the variance in creative climate. There were five statistically significant predictors: good interpersonal relationships and a collaborative atmosphere (β = .41), encouragement of student initiative and critical thinking (β = .20), mentor expertise (β = .14), good working conditions (β = .13), and opportunities for independent work and decision-making (β = .10). The creative climate was moderately correlated with the students' overall assessment of the activity ($r = .56$, $p < .001$). In the mentor group, the key elements of the activity explained 36% of the variance in creative climate. There was only one significant predictor: good interpersonal relationships and a collaborative atmosphere (β = .44). The results show that flexible learning environments are positively associated with perceptions of creative climate. The quality of relationships was particularly important for both students and mentors, followed by cognitive aspects (e.g. complexity of the activity, level of difficulty).

Keywords: gifted education, creativity, interpersonal relatioships

Creative potential and achievement in academic professionals: A systematic mini-review

Campidelli L.[1], Corazza G.E.[2], Lubart T.[3], Mangion M.[4] & Agnoli S. [1]

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More than half of a century of research addressed the relationship between creativity and academic achievement focusing mainly on student population, widely neglecting the impact of creativity among the rest of the academic population. This mini-review aims at systematizing the role of creative potential in academic achievement taking into consideration another core part of the academic population: academic professionals, whose definition includes all professionals working in academia (i.e., professors, researchers, lecturers). The present work analyses the existing evidence linking creative potential to academic achievement in academic professionals, following the PRISMA method for the selection and inclusion of studies in the review. The organization of the review follows the structure of creative potential as proposed by the multivariate approach (Sternberg & Lubart, 1995; Lubart, 1999), thus exploring the role of: cognitive, conative and environmental factors influencing academic achievement in professionals. The results of the five selected studies showed that, in line with the multivariate approach of creativity, different orders of factors defining individual creative potential predict different aspects of academic achievement, ranging from the number of publications to the type of academic collaboration during research. The evidence emerging from this first preliminary mini-review confirms the pivotal role of creative potential in academic achievement in academic professionals, partly confirming the results already highlighted in university students (Gadja, Karwowski & Beghetto, 2017), and highlighting the relevance of future investigation.

Keywords: Creative Potential, Academic Achievement, Academic Professionals

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Monday, September 16th

Poster Session Astrea

Mon-4

New Technologies - I

Chair: A. Kharkhurin

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Creativity and Generative AI: A theorical preliminary study

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Brainstorming is a renowned group creativity technique, which can be supported by several aids, such as, recently, generative artificial intelligence (GAI), a branch of artificial intelligence (AI) focusing on the creation of systems generating new content. In this systematic review, we examined empirical quantitative and mixed-method studies applying GAI tools during brainstorming sessions to outline potential drawbacks or advantages of this human-machine collaboration. The final pool of eight articles revealed that, first, fields of application are diverse, ranging from journalism to business, but with more emphasis on engineering and computer science, mainly including students or university graduates, except for only two studies including professionals. Then, GAI tools were used as either a support for creative ideation, or as facilitators and consisted of cognitive assistant to a partner chatbot, as Chat GPT-3/3.5, or ad hoc GPT-based GAI. Different types of brainstorming were included, from traditional, electronic, to brainwriting. Most studies focused on comparing performance ideation of humans vs. GAI. GAI influenced the dynamics of human creativity, encouraging lateral thinking and idea generation. Results suggest that although AI has some potential to improve brainstorming performance, it still cannot replace a human teammate. The studies also indicated that these tools may help social group dynamics, such as avoiding silences during conversations or helping familiarization. However, most studies focused only on divergent thinking, thus relying on a limited creativity definition. Further research is needed to outline guidelines for integrating GAI into creativity process in the most effective way.

Keywords: Creativity, Generative AI, Brainstorming

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Creative Future Scenarios of Work-related Risks in the Digital World

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University of Bologna

Artificial Intelligence (AI) has been heralded as "the fundamental and most pervasive emerging technology of the fourth industrial revolution" (World Economic Forum, 2018). Undoubtedly, AI holds a prominent position in shaping our future landscape, especially in the labour field. At the same time, other disrupting digital technologies are ramping up: quantum computing, the metaverse, and 6G communications.

While a general raise in productivity can be expected, the rapid integration of digital technologies in the workplace raises significant questions regarding the future landscape of work-related health and safety. It is important to anticipate the potential benefits and risks, for example new forms of stress, that could emerge for the human side of labour, by exploiting creativity in the formulation of alternative scenarios.

On the plus side, automating tasks with robots will reduce workers' exposure to hazardous environments but also improve employment opportunities for people with disabilities. Furthermore, artificial intelligence can be used to monitor and supervise workers for early detection of stress, health problems and fatigue. On the negative side, there is a risk to see the emergence of new forms of fears (will I lose my job?) and stress (keeping up with augmented productivity demands), as well as of new legal, regulatory and ethical issues (EU-OSHA - European Agency for Safety and Health at Work, 2021).

Technological advancements not only transform the methods of work execution but also influence the standards and anticipated approaches to tasks and responsibilities (Wallace, 2004). If perceived demands and role overload ensue, negative effects could be observed (Nijp et al., 2016). There exists a paradoxical risk characterized by the interplay between empowerment and potential enslavement (Schlachter et al., 2018; Jarvenpaa and Lang, 2005).

One side of this problem relates to the future of insurance against these new work-related risks. Creativity plays a vital role in envisioning futures scenarios (Corazza, 2017) and devising adaptive strategies for mitigating work-related injuries in the digital age. By fostering interdisciplinary collaboration and embracing a more inclusive foresight process, stakeholders can anticipate

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potential risks and leverage technological advancements to their advantage.

Keywords: Creativity; Artificial Intelligence; Insurance

The features of a gamified space fostering creativity: a Systematic Literature Review

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Univ. Grenoble Alpes, Grenoble INP, CERAG

“A dragon stands in your way. If you attack it, roll a die to find out if your sword stroke will wound it or just bounce off those iron-hard scales”. Regardless of the outcome, your creativity arises if you play in a proactive universe that provides room for fantasy and imagination (Dyson et al., 2016). Game features present an interesting approach to stimulating players' creativity, which is a necessary skill for innovation. This is precisely why there is a growing number of corporate creativity training courses offering gamified creativity sessions, such as LEGO SERIOUS PLAY. We can picture creativity sessions as spaces where participants come together within a specific time and place, aligning with the Cambridge dictionary's definition of space. A creativity session is gamified when game features are incorporated into the process. This work aims to conceptualize a gamified creative space, by identifying the multi-faceted game features that foster creativity. To achieve this goal, we conduct a systematic literature review through the Preferred Reporting Items for Systematic Reviews and Meta-analyses method (PRISMA), (Moher et al., 2010). We have refined the dataset from 270 papers to 69 pre-selected articles. This work provides a comprehensive map of the conditions for creative performance in a gamified space. We started to identify them: support (immersion, openness, time pressure), social organization (leadership, means of interactions), and the player’s behavior and feelings (motivation, expertise, and emotion). These conditions can turn into interesting testable propositions for the gamification of creativity.

Keywords: gamification, creativity, innovation

Reeling in Stories: An Investigation of Creative Behaviors and Creativity-Support on Instagram

Ceh S.M. & Benedek M.

University of Graz

Creative behaviors are increasingly impacted by digital technologies, but little is known about the way digital technologies support everyday creativity and what factors predict their creative use. We investigated to what extent individual differences in person-specific (creativity, personality) and platform-specific (e.g., perceived creativity support) characteristics relate to the creative use of Instagram. Results from a sample of 191 Instagram users revealed that more frequent creative use of Instagram was related to greater engagement in everyday creative behaviors, creative personal identity, a more positive attitude towards Instagram, greater platform-related self-efficacy, and greater perceived creativity-support. Regression analysis further revealed a unique contribution of everyday creativity, creative personal identity, and Instagram self-efficacy for creative use of Instagram. Although creativity was not the most central motive for using Instagram, the results from the present study indicated considerable levels of creative use, suggesting that common online spheres are important for everyday creative behavior. Together, this study identified relevant person- and platform-specific factors predicting creative behavior at Instagram, while also highlighting the relevance of creativity in the digital world even outside of devoted digital creativity tools.

Keywords: online creativity; creativity support; social media

Monday, September 16th

Poster Session Alvania

Mon-4

Domains of Creative Work – II

Chair: Sergio Agnoli

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Domain-generalization of valuation in creative ideation

Battistello G., Moreno-Rodriguez S., Volle E. & Lopez-Persem A.

FrontLab (Team LEVY), Paris Brain Institute, INSERM, CNRS, AP-HP, Sorbonne University, Paris, France

Is a talented painter also a proficient writer? The ongoing debate on whether creativity operates as a domain-general or domain-specific process yields a range of conclusions, adding complexity to our comprehension of creativity. Creative ideation involves two distinct phases: a generation phase for spontaneously forming associations, and an evaluation phase wherein cognitive control is presumed to play a pivotal role. Recent research delving into the evaluation phase proposes that it encompasses a valuation phase. In this stage, the subjective value of ideas relies on a combination of their adequacy and originality. This valuation energizes and drives idea generation and selection. However, the extent of evaluation's generalizability across domains remains uncertain. This study seeks to determine whether creative idea evaluation is a domain-general or domain-specific mechanism. 73 subjects completed free-generation tasks on three creativity domains: semantic associations, alternative uses and drawings. They were then asked to rate their responses according to how much they liked them (subjective value measurement), and how much they thought they were adequate and original. The results showed that the more participants liked their ideas, the faster they provided them, across the three domains. Across domains, the likeability of ideas relies on a combination of their adequacy and originality. Crucially, using computational modelling, we found that the same value function with consistent parameters between tasks governed idea judgments. These findings extend the evaluation phase of creative ideation across various domains, characterizing it as inherently domain-general.

Keywords: Creativity, Evaluation, Modelling

Creativity-Empathy Expert Elicitation Study

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University of Louvain

This study examines the link between two multidimensional concepts: empathy and creativity. It is based on the theoretical assumption that both arise from the interaction between lower-order psychological facets. Therefore, the creativity-empathy relationship can be explained by the existing (however, not yet confirmed) common resources, crucial for both phenomena. In order to empirically pre-identify these resources, this study uses expert knowledge-elicitation design. Namely, it involves two panels of experts (200 experts in psychology of empathy, and 200 experts in psychology of creativity) tasked to individually rate an extended set of operationally defined creativity and empathy resources (including cognitive, conative, and behavioral dimensions.), in terms of their relevance to the target construct (i.e., empathy or creativity). These resources were derived from the literature and a pilot study. In addition, the participants responded to a set of theoretical questions to clarify their approach to define empathy or creativity. Data will be analyzed using Many-Facet Rasch Models to estimate the relative importance of different resources for empathy and creativity based on evaluations of different experts' profiles (i.e., type of expertise, theoretical approach to creativity or empathy). Further, Network Analysis will be conducted to evaluate the conceptual distance between the facets (or resources), and ultimately identify the most central resources for both empathy and creativity (based on measures of centrality such as node strength, closeness and betweenness). This will allow us to clarify the empathy-creativity link within a common nomological network, and establish a reduced set of core resources of empathy-creativity that will be investigated in future cross-sectional studies. The data collection for this study is ongoing. The data analysis will be finalized in April 2024.

Keywords: creativity, empathy

How does comparing (dis)similar objects affect young children's creative idea generation? Exploring the role of diversity in facilitating creativity

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A common narrative about creativity is that diversity gives rise to unconventional and thus novel ideas, while research from the field of analogical reasoning studies suggests that the opposite of diversity, namely similarity, could also facilitate creativity. We proposed to resolve this paradox by hypothesizing that similarity can be conducive to creativity through facilitating relational thinking. We empirically tested this with a between-group design experiment. A total of 66 typically-developing Chinese children aged 5 to 6 years (M = 6.04 years, SD = .28) who were randomly assigned to two groups: either receiving high-similarity or low-similarity stimulus pairs for the comparison task. Afterwards, all children completed a divergent thinking task and received scores on dimensions of fluency, originality, and usefulness. Based on preliminary t-test and correlational analysis results (of 30 out of 66 participants), one main finding was that, when presented with high-similarity stimulus pairs, children indeed reported more alignable differences, even though this effect was only significant for surface alignable differences. However, contrary to our expectation, the effect of the comparison task was not carried over and did not influence children's creativity measures (fluency, originality, usefulness). This is intriguing to explain but also significant in informing us that, perhaps, only relational thinking pertaining to structural features is relevant to creativity.

Keywords: creativity, structural alignment, relational thinking

Willing to Pay More for Less? Analyzing Attitudes toward a Minimalist Aesthetic

Rezaei S., Mahadeshwar H. & Kapoor H.

Monk Prayogshala

The study explores people's implicit attitudes towards minimal and maximal aesthetics pertaining to home furniture. Through an Implicit Association Test (IAT), we explore whether individuals implicitly associate furniture belonging to either one of the aesthetics — minimal or maximal — as classy or tasteless more than the other. Additionally, we explore whether these implicit attitudes are influenced by the aesthetic quality of the furniture measured by the Art Reception Survey (ARS; Hager et al., 2012) (along the dimensions: cognitive stimulation, design innovation, design quality, positive attraction) and its gestalt features: representativeness, symmetry, conciseness, and complexity. We also explore whether people's implicit attitudes, the aesthetic quality of the furniture, and its gestalt features contribute to their willingness to pay for the same furniture. Last, we investigate cross-cultural differences in aesthetic preferences across India and the US.

Keywords: Implicit Attitudes, Aesthetic Quality, Minimalism

Monday, September 16th

SESSION Nautilus

Mon-5

Symposium - I

Chair: Michael Hanchett Hanson

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Creative Ecosystems: Personal, Societal, and Research Challenges

Chair: Michael Hanchett Hanson

Teachers College, Columbia University

From educational research, case studies and other methods, theorists using the participatory creativity framework have analyzed local creative ecosystems, the social, material, and technological environments from which creative work emerges. That work then defines much of the interface between the local system and larger societal systems. This presentation will provide an overview of this concept, present two examples of case studies, and propose the broad outlines of needed research. The case examples will be two very different people in different times and fields. One is the 20th century systems theorist, anthropologist, and biologist, Gregory Bateson whose work continues to inform a wide range of fields from communications studies to clinical psychology to ecology more than 40 years after his death. The other is the 21st-century musical writer, performer, and producer, fashion designer, and video director Tyler, the Creator. It is hard to imagine two people more different in disposition, starting place, or career trajectory (to date for Tyler, the Creator who is 33 years old). Yet we see in these cases striking similarities in the challenges of their local creative ecosystems, suggesting important issues for further research to validate, refine, and elaborate our understanding of how local creative ecosystems can work.

Keywords: creative development, local creative ecosystems, participatory creativity framework

Creative Ecosystem Fit as a Basic Unit of Analysis

Michael Hanchett Hanson

Teachers College, Columbia University

From educational research, case studies and other methods, theorists using the participatory creativity framework have analyzed local creative ecosystems, the social, material, and technological environments from which creative work emerges. That work then defines much of the interface between the local system and larger societal systems. This presentation will provide an overview of this concept, present two examples of case studies, and propose the broad outlines of needed research. The case examples will be two very different people in different times and fields. One is the 20th century systems theorist, anthropologist, and biologist, Gregory Bateson whose work continues to inform a wide range of fields from communications studies to clinical psychology to ecology more than 40 years after his death. The other is the 21st-century musical writer, performer, and producer, fashion designer, and video director Tyler, the Creator. It is hard to imagine two people more different in disposition, starting place, or career trajectory (to date for Tyler, the Creator who is 33 years old). Yet we see in these cases striking similarities in the challenges of their local creative ecosystems, suggesting important issues for further research to validate, refine, and elaborate our understanding of how local creative ecosystems can work.

Keywords: creative development, local creative ecosystems, participatory creativity framework

Strange Ducks and the Girls of the Crescent: Two Stories of Creative Ecosystems in Action

Edward P. Clapp

Project Zero, Harvard University

The participatory framework for creativity suggests that the unit of creative analysis is neither individuals nor groups, but rather, ideas. Creative ideas develop socially and emerge over time based on the contributions of a variety of stakeholders. But who are these stakeholders, and what unique roles do they play within an ecosystem of creative idea development? This paper will use a pedagogical resource known as the Stakeholder Mapping tool to make visible the primary and secondary stakeholders who compose the ecosystems associated with two creative ideas: The Strange Ducks Club (an online social media space developed by a global network of middle school students) and the Girls of the Crescent (a not-for-profit organization established to connect young Muslim girls to books that feature young Muslim female characters). Along the way, this paper will employ the biography of an idea approach to understanding creative idea development to illuminate the distributed and participatory nature of creative ecosystems. Throughout, this paper will suggest rich and meaningful implications for the field of education.

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The future isn’t what it used to be: A systemic perspective to knowledge-building

Felipe Zamana

L'Université de Paris-Cité

Despite sociocultural perspectives in creativity research, there is still much to cover in how creative processes work in local ecosystems. From a systemic and interdisciplinary viewpoint, this presentation will explore the ecology of interconnected processes both from societal and personal perspectives. First, we will unearth ancient human practices to understand how circumstantial roles were key to our social and intellectual development in the past. Then, we will explore: 1) how industrial practices are still deeply rooted in how we do business both educational and professional development, and 2) how both our spaces and thinking are designed for individualism in the creative economy era, favoring transactional creativity. Finally, we will discuss how the creative ecosystem concept can aid us in understanding our context and use the Participatory framework to face research challenges more effectively in the future.

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Monday, September 16th

SESSION Astrea

Mon-5

Education - III

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Development of Gifted Classes Observation Metric Assessment Rubric for Improving the Gifted Teacher's Competency

Jin-kyung Y.[1], Hye-jin Y.[2], Soo-jin P.[1], Kyung-hwa L.[2]

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[2]*Sejong International Academy*

The purpose of this study was to develop a gifted class observation metric and assessment rubric to identify the effectiveness of classes and to improve the competency of gifted teachers. Therefore, the components of observation assessment for gifted classes were derived by analyzing literature. Next, content validity (CVI, IRA) and consistency of the components and matric were confirmed. Theoretical experts and field experts in the fields of gifted and creativity education participated in assessing content validity. The results were as follows: The metrics for the gifted class observation assessment were organized according to the flow of the lesson into three phases: lesson preparation, implementation, and evaluation. Lesson preparation includes individualization and differentiation factors, checking the degree of awareness of the characteristics of giftedness and of each individual student. Implementation includes factors such as lesson introduction, lesson content, teaching and learning strategies including creative thinking, materials, and supports, helping teachers understand the content, strategies, and methods they use to teach gifted students. Evaluation includes factors such as assessment content, including creative products, methods, and the use of assessment results, helping teachers understand how effectively they use assessment results to inform instruction. The rubric was organized and structured based on these metrics. The results of this study can be used not only for class improvement but also as material for enhancing the capabilities of gifted teachers, contributing to nurturing the creativity and potential of each student and fostering future talent.

Keywords: Gifted Classes Observation Metric, Assessment Rubric, Gifted Teacher's Competency

The Role of Asking Complex Questions in Open- and Closed-Ended Problem-Solving

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[1]*Faculty of Data and Decision Sciences, Technion - Israel Institute of Technology*

[2] *Department of Psychology, University of Nebraska*

Question asking, a crucial yet underexplored aspect of creativity, is integral to information seeking and creative problem-solving. Previous research assessed the complexity of questions through Bloom's taxonomy of cognitive complexity, revealing that lower creativity correlates with asking simpler, closed questions, while higher creativity is associated with more complex, open-ended inquiries. The present study compares two problem-solving tasks involving open- and close-ended thinking. In Study 1, participants (N = 97) completed the alternative questions task (AQT), a creative questions task, the close-ended (one possible solution) Stumpers Task - a set of riddles with varying difficulty levels, and the alternative uses task (AUT), a common creativity measure. The complexity of AQT responses were assessed using Bloom's taxonomy. No correlation was found between AQT complexity and the accuracy (number of correct answers) for the Stumpers Task, although accuracy was correlated with AUT creativity (r = 0.3). In study 2, participants (N = 100) completed the AQT, AUT, and an open-ended (many possible solutions) creative problem solving (CPS) task, involving workplace dilemmas. Participants open-ended responses were evaluated for originality and quality. A positive correlation was observed between AQT complexity and the quality of solutions in the CPS task (r = 0.28), albeit not with AUT creativity. As such, we find a significant link between question complexity and open-ended—and not closed-ended—problem-solving. Thus, our results highlight the role of question-asking in open-ended problem solving, likely by facilitating problem finding and elucidation – the first stage of the creative process.

Keywords: Question asking, Problem-Solving, Complexity

Addressing the Learning Needs of the Creatively Gifted pandemic Learner

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[2]Texas A&M University-Commerce

[2]Poise for Success

The Pandemic has left educators of creatively gifted children with many challenges and opportunities. Three years after the Pandemic, educators are realizing that they are facing challenges that are the by-product of creatively gifted children who spent two years of their lives not having to interact with other children and therefore not learning the kinds of social and emotional skills expected by the early years classroom teacher. It has taken educators of gifted children quite a while to figure out what exactly happened, but now we know that the Pandemic was a trying time for parents who just did not know what to do with their children given that they did not have the option of taking them out of the home to places where the children could learn, in a natural way, how to share, how to not be the winner all the time, how to be kind and learn that "I am not the center of the universe" and to feel good about that knowledge. The disruptions caused by the pandemic, school closures, changes in routine, increased stress levels, increased screen time, reduced physical activity may have influenced creatively gifted children's self-regulation. Answers lie in teachers empowering gifted children with skills in giving and accepting criticism, coping with losing a game and not being first all the time. Teachers will become aware of how to create a learning environment where gifted children can practice self-regulation skills throughout the school day. Change in affective and academic will be the results.

Keywords: Learning Lost, Education During the Pandemic, Solutions to Pandemic Education

Saving Our Creatively Gifted Girls Through Avenues of Literacy

Robinson S. & Kyle Miller J.E.

Poised for Success

Bibliotherapy refers to using books to help individuals change their behavior and solve their problems (Furner & Kenney, 2011). Schechtman (2009) found that bibliotherapy can be used to teach social and emotional learning skills and increase reading development. Bibliotherapy is effective when teaching social and emotional skills because creatively gifted girls can relate to the characters they read about and apply that insight into their own lives. This is a safe and non-threatening method to teach SEL skills to children. This method can also be beneficial when creatively gifted girls read about characters who are authentic and experience issues relevant to their own lives. It is important for young girls to read about women who have used creativity and innovation to make an impact in the world. This presentation will focus on using 10 non-fiction picture books that inspire creativity and innovation in young girls to teach SEL skills. The women depicted in these books are Katherine Johnson, Sophie Germain, Sophie Kowalevski, Raye Montague, Temple Grandin, Elizabeth Friedman, Mary Golda Ross, Hedy Lamarr, Maryam Mirzakhani, and Dr. Ellen Ochoa. These women used perseverance, creativity, and innovation to solve the many problems they faced in their lives. Each of their impacts were great on society and their contributions led to many inventions and knowledge that influence the world we live in today. Participants will identify characteristics of CASEL's 5 SEL competencies, which are self-awareness, social awareness, self-management, responsible decision-making, and relationship skills. Participants will then explore the books by reading summaries and excerpts. Afterwards, participants will discover key components of effective SEL activities. Lastly, participants will participate in engaging research-based SEL activities.

Keywords: creativity in girls, bibliotherapy and Creativity, Literacy and Creativity

Monday, September 16th

SESSION Alvania

Mon-5

Creativity and Innovation

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Strategizing Surprise: Exploring the Complexity of Surprise in Creative Design Processes

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Surprise is fundamental to human action and cognition. While much of human behavior can be attributed to a propensity to minimize the element of surprise, creativity is the exception. Creativity involves breaking free from extant knowledge and contextual constraints to generate unexpected, valuable ideas. This is especially true in design. In an oft-cited paper, Dorst and Cross (2001) even argued that surprise is "what keeps a designer from routine behaviour" where the "'surprising' parts of a problem or solution drive the originality streak in the design project" (p. 436). Anecdotal evidence suggests that designers actively seek and deploy methods and tools to elicit surprise in their creative processes. But exactly how designers 'strategize surprise' in such ways remains poorly understood. Informed by advancements in cognitive psychology, we argue for further investigating the complex functions of surprise in creative processes, not least its detection, management, potential for errors, and impact on individual and group behaviors. We find it crucial to move beyond psychometric tests to examine surprise 'in the wild,' such as in the creative domain of design, which we focus on here. We contribute findings from a state-of-the-art literature review of twenty years of naturalistic, situated design research on the complex functions of surprise in creative processes. Key discussion points include the ongoing relevance of Schön's theories, the consequences of surprise-induced errors, the interaction between creative process and product, and the pertinence of surprise in our creative interactions with generative artificial intelligence (AI). We end by proposing future research initiatives to deepen our understanding of surprise in creativity in general and in design in particular.

Keywords: Creativity, Design, Surprise

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Synced Minds, Sustainable Designs: Exploring Empathy through Motion for More-Than-Human Innovation

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Drawing from insights in psychology and neuroscience, this paper explores the role of motion-synchrony in fostering empathy and leading to superior creative outcomes. Research consistently demonstrates that synchronized body movements, such as joint drumming, not only promote physiological alignment but also bolster social cohesion and joint performance. Conversely, individuals with autism spectrum disorder often exhibit challenges in mimicking motions, correlated with reduced empathy.This paper explores the potential of motion mimicry tasks as catalysts for cultivating empathy in collaborative design sessions aimed at sustainable solutions. Analyzing errors in motion mimicry serves as a marker for empathy deficits, prompting targeted interventions. These can take inspiration from cognitive support offered to individuals with autism spectrum disorder, in order to enhance their social outcomes.

In design sessions, creators must empathize at least with three key stakeholder groups: co-creators, end-users, and broader stakeholders impacted by the solution. For example, an infrastructure project affects both human mobility and the habitat of wildlife, necessitating empathy towards all affected entities. While traditional finger tapping tasks serve to induce motion synchrony among team members, interventions should also aim to enhance the designers' empathy towards non-human species impacted by their projects. This could involve mimicking the movements of affected species, such as imitating a woodpecker's head movements or a snail's tentacle stretchings. Anticipated findings suggest that humans may struggle more with mimicking non-human movements, particularly those of species further removed from humans in evolutionary terms. Additionally, individuals may vary in their proficiency when mimicking specific organisms, while higher mimicking proficiency may correlate with greater empathy towards those organisms. In turn, higher empathy levels are assumed to predict superior design outcomes, which are better able to address the target users' needs while not compromising the needs of other stakeholders including various nonhuman organisms. This paper introduces a pilot setup to explore the use of mimicry tasks and error analysis as indicators of

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empathy levels, highlighting the need for cognitive support to strengthen empathic connections and enhance creative performance in the pursuit of sustainable design goals.

Keywords: More-than-human Design, Motion Synchrony, Empathy

Ideation techniques focused on ideas or constraints: Their impact on novices' creativity in a collective setting

Bonnardel N., Sauceda P. & Pichot N.

Aix-Marseille Université PSYCLE & InCIAM

Considering that both dimensions - novelty and adaptation - are crucial in creative design problem solving, we conducted a study that aim to compare the effect of two ideation methods: one focused on idea generation, derived from the seminal brainstorming technique, and another one mainly focused on the generation of constraints related to the design problem at hand. In previous studies conducted with experienced participants, distinct results were observed between future designers and future teachers. In this study, our aim is to determine whether novices in a field can generate new and adapted design proposals despite their lack of expertise, and whether one of these two methods is the most appropriate to them. In a first phase, 126 groups of 3 psychology students were provided with one or the other of the ideation methods. In a second phase, a jury analyzed the creativity of their final design proposals. Results of the 1st phase show that participants who received the idea-centered method demonstrate greater creativity in terms of fluidity and flexibility in their productions, compared to the other participants. Results of the 2nd phase further show that productions generated in the idea-centered condition are perceived as more novel, while those generated in the constraint-centered condition are perceived as more feasible and appropriate. Thus, the use of a specific method with novices has an impact both on their creative design process and on the judgments attributed to their productions.

Keywords: Ideation methods; Ideas; Constraints

A cognitive-linguistic investigation of the concept and skill of innovation

Amador L.M.D.

University of Melbourne

Innovation has been essential to human progress and the development of the 21st Century world. Thus it has become a major buzzword in modern times, both in our daily lives and in research. It started gaining momentum as a topic of research outside of economics and management in the 1970s, leading to the emerging field of "Innovation Studies". However, despite this popularity, interdisciplinary conceptualizations and models of innovation and its skills have not been properly investigated. Furthermore, the relationship with other related concepts (e.g. creativity) has also not been clearly mapped out. Therefore, this research sought to address these gaps via answering two main questions: "What is innovation?" and "Is innovation a skill?". The approaches used were multidisciplinary literature reviews, to understand how different perspectives conceptualize innovation and its skill; a Prototype Analysis, to investigate the layperson's conceptualization of innovation, a perspective lacking from the literature; and a pilot study with a methodology inspired by grounded theory, to investigate and produce expert-filtered definitions and models of innovation and the skill of innovation. From these theoretical and experimental approaches, the definitions of innovation and its skills, developed from these findings are: Innovation is a creation or alteration of a tool or knowledge, which has significant influence on its relevant domain(s) or system(s), by one or more agents, either intentionally or attentionally. It can be discovered through luck, exploration or iterative development. The agent involved with innovation is visionary and capable of high-level ideation and knowledge implementation towards solving difficult problems.

Keywords: innovation, skill, conceptual model

Monday, September 16th

MIC Keynote Speech - III

Todd Lubart

Surf's up: Riding the waves of the 7 Cs

Based on the 7 Cs approach--Creators, Creating, Collaboration, Context, Creations, Consumption and Curricula--this presentation will examine how looking at combinations of topics from different Cs can yield new insights on creativity. Illustrative examples will be showcased, and spots that merit further investigation will be identified.

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Tuesday, September 17th

MIC Keynote Speech - IV

Emmanuelle Volle

Finding Creative Ideas: A Neurocognitive Journey from Memory to Decision

Creative thinking orchestrates the production of ideas and solutions that are both original and appropriate, empowering us to solve problems, adapt to change, and drive innovation. Psychological and neuroimaging findings suggest a two-fold model in which creativity relies on a generation and an evaluation component that involve distinct but interacting brain networks. The generation component forms candidate ideas, and the evaluation component assesses their originality and appropriateness. However, the neurocognitive processes and computations underlying each component and leading to the production of creative ideas remain to be clarified. In this talk, I will present recent findings that shed light on some of these processes and how they support remote thinking and creativity. Specifically, I will delve into the role of semantic memory structure and memory search processes in idea generation, the significance of valuation in idea evaluation, and their intricate interaction with cognitive control processes. I will also propose an understanding of how our brain shapes this creative landscape.

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Tuesday, September 17th

SESSION Nautilus

Tue-1

AI & Creativity - I

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Me, myself, and AI: The Role of Creative Self-Beliefs in Creative Activity and Achievement within AI-Augmented Contexts

Faiella A.*[1], Zielińska A.[2]*, Karwowski M. [2], Corazza G.E.[1] *co-first authors

[1] *University of Bologna*

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The advent of Artificial Intelligence (AI) is having a profound impact on society. Contrary to initial beliefs that AI and robotics would primarily affect tasks at the lower end of human intellectual and physical functions (Vinchon et al., 2023), recent advancements in Generative AI (Gen-AI) are transforming the most complex, cognitively demanding tasks, including those in creative domains. Therefore, it is necessary to invest significant research efforts to understand the opportunities and challenges arising from the integration of Gen-AI into the creative process, as well as its consequences for human creative potential and its expression. Creative self-beliefs (CSB) represent a broad set of characteristics reflecting people's convictions about their creative abilities. Among these, creative confidence and creative centrality are pivotal in determining whether and how creative potential is expressed (Karwowski & Beghetto, 2019). In this exploratory study, we empirically disentangled the self-perceptions people hold in relation to their AI-augmented creative abilities (AI-Augmented CSB, AIA-CSB) and more general, non-AI-specific views (Natural CSB, N-CSB), and examined their links with creative activity and achievement. The frequency of engaging in creative activities with and without AI support was measured in three domains: literature, music, and visual arts. As of December 2023, participants were more likely to engage in creative activities without AI than with AI. In line with previous studies (Lebuda et al., 2021), we demonstrated that N-CSB predict creative achievement across domains both directly and indirectly via creative activity. The AI-Augmented paths were more nuanced and domain-specific, suggesting that AIA-CSB can be beneficial for creative achievement but only through heightened AI-supported creative activity; the direct links were negative, indicating potentially harmful effects of AIA-CSB on creative achievement when not accompanied by greater engagement in AI-supported creative activity. These results largely held when controlling for personality traits and participants' trust in AI-based tools. Additionally, we demonstrated the varied structure of predictors of N-CSB and AIA-CSB among personality traits. Replicating previous studies, N-CSB were positively associated with Openness, Extraversion, and Conscientiousness, whereas AIA-CSB were positively linked to Extraversion and

Agreeableness. During the talk, we will discuss the implications of these findings in light of the rapid evolution of AI-based tools and their growing accessibility.

Keywords: Creativity; Creative Self-Beliefs; Artificial Intelligence.

Agentic Perspective on Human-AI Collaboration for Image Generation and Creative Writing: Insights from Think-Aloud Protocols

Lebuda I.[1], Rafner J.[2], Ceh S.M.[3], Zana B[2], Pederson I.[2], Sherson J.[2], Benedek M.[3]

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Despite the increasing body of research on co-creation between humans and AI, there remains a lack of understanding regarding how people approach and navigate the creative process in such collaborations. Examining these issues through the framework of creativity as agentic decision-making (Karwowski et al., 2019), with a focus on creative metacognition (Lebuda & Benedek, 2023), and creative self-regulation (Zielińska et al., 2022), could provide valuable insights to overcome engagement barriers and enhance cooperation effectiveness. Therefore, we present two studies analyzing metacognition and self-regulation in the image generation (Study 1) and creative writing (Study 2) co-creation processes between humans and AI. Through a mixed methods approach involving think-aloud protocols and semi-structured interviews, we unearthed how individuals monitor and regulate the creative process when collaborating with an AI partner, and how these dynamics link to their perception of their own creativity. One of the central themes that emerged was the challenge of managing uncertainty in the process and mastering the negotiation of constraints imposed by the AI partner. The unique nature of this collaboration raises several issues pertaining to ownership and the final product, which consequently shape participants' perceptions of their role as creative agents and their assessment of their own effectiveness in cooperation. We aim to interpret these findings through the agentic perspective on creativity, with a particular emphasis on metacognition and self-regulation. This approach will shed light on the strategies individuals employ to regulate and oversee the creative process in collaboration with an AI partner.

Keywords: Human-AI Collaboration; creative metacognition; creative self-regulation

Creativity in digitally mediated times: How digital tools support creativity across domains

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While digitalization is thought to have a major impact on creativity, little is known about how digital tools support the creative process across specific stages and domains. Building on a new digital creativity support framework that considers the role of digital tool features (i.e., functions, content, and community) across separable stages in the creative process (i.e., ideation, production, presentation), two survey studies (N1 = 497, N2 = 1200) examined the relevance and type of digital tools used across eight creative domains. We found that while digital tools pervade all stages in the creative process, there are notable differences in the extent and type of feature support across domains (e.g., handicraft vs. science) and skill levels. The reported tools revealed the high relevance of social media for creative behaviors, next to domain-specific tools. We discuss how creative behavior gets transformed by digital tools and implications for the research community.

Keywords: digital creativity; online creativity; creativity support

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Tuesday, September 17th

SESSION Astrea

Tue-1

Neuroscience - I

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Do people prefer thinking inside or outside the box? Studying creative choices reveals a bias against originality

Moreno-Rodriguez S., Lopez-Persem A. & Volle E.

Paris Brain Institute

Creativity involves a generation phase and an evaluation phase. Previous research indicates that idea evaluation involves subjective valuation via the Brain Valuation System (BVS), a network central to decision-making. Also, evaluation comprises a selection component: among generated ideas, which one is selected to be implemented? In this study, we investigate decision-making mechanisms during creative ideation as they may elucidate cognitive biases observed in creativity, such as the rejection of creative ideas under uncertainty. Forty participants completed an idea generation task, a likeability rating task, and a binary choice task in an MRI scanner, alongside assessments of creative abilities and behavior (AUT, ICAA, CAT,...). At the behavioral level, computational modelling revealed different valuation patterns depending on the task: likeability ratings were influenced more by originality than adequacy (i.e., individuals preferred more original ideas); but choices were biased against originality. Interestingly, bias size varied among individuals, and those with higher bias against originality scored lower on creativity scores than those with lower bias, highlighting the interplay between valuation patterns and creative abilities. These findings prompt consideration of which valuation patterns prevail during creative ideation: do individuals follow their declarative, unbiased preferences (as in the rating task) or their implicit, biased preferences (as in the choice task) when producing ideas? Future analyses including model comparisons of BVS signal during the generation task will address this question. Overall, this study challenges current accounts of the neurocognitive bases of creativity and underscores the importance of employing decision-making methods to explore creativity and its cognitive biases.

Keywords: creative choices, cognitive bias, MRI

Brain structural and functional correlates of the generation and combination of remote semantic associates in frontotemporal dementia

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While creativity is a key cognitive function across domains, a comprehensive understanding of its neurocognitive bases is still missing. Existing models emphasize the role of both generative processes, presumably associative and related to the default mode network (DMN), and controlled processes allowing to combine semantic associates, related to the executive control network (ECN). Bridging these 2 networks, the prefrontal cortex (PFC) is consistently associated with creativity. Hence, behavioral variant frontotemporal dementia (bvFTD), predominantly affecting the PFC, offers a unique model to characterize the role of frontal networks in creativity. We investigated creative thinking in 17 bvFTD patients and 26 controls using two verbal tasks that assess the free generation of remote semantic associates (FGAT) and the constrained combination of distinct semantic associates (CAT). We used whole-brain voxel-based morphometry to identify the regions critical for each task, and whole-brain ROI-based resting state functional connectivity to explore the connectivity profiles of these regions. Our findings show a critical role of the rostromedial PFC, connected to the DMN, in the generation of remote associations. Conversely, the rostrolateral PFC, connected to the ECN, was crucial for the combination of semantic associations. These results align with previous findings from our team in patients with focal frontal lesions and unveil the connectivity profiles of key creativity regions. Overall, the current findings highlight the critical role of the medial and lateral parts of the rostral PFC in distinct creativity processes and emphasize the importance of both the DMN and ECN in creativity.

Keywords: remote semantic associations, frontotemporal dementia, brain correlates

The differences and similarities of the neural underlying the effect of semantic network structure on scientific and artistic creativity

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[5] *Technion–Israel Institute of Technology*

Innovation is an important force driving the development of human society. In recent years, with the help of network science methods, researchers have begun to further explore the relationship between semantic network and creativity. Importantly, what are the consistent and different patterns of the mechanisms underlying the effect of semantic network structure on scientific and artistic creativity still unknow. In current study, two experiments were conducted to investigate the effects of individual semantic networks on brain activation and brain network functional connectivity in scientific and artistic creativity generation, respectively. The results showed that, the influence of semantic network connectivity on scientific and artistic creativity is separated and fused in brain activation regions and brain functional connectivity. Compared with the low-connectivity semantic network group, the high-connectivity semantic network group activated more prefrontal cortex (PFC) in both scientific and artistic creativity, but it activated the right middle temporal gyri (r-MTG) in scientific creativity and the left angular gyrus (l-AG) in artistic creativity. In terms of functional connectivity, the high-connectivity semantic network group showed stronger connectivity between the right dorsolateral prefrontal lobe and r-AG in scientific creativity, and stronger connectivity between l-PFC and r-AG in artistic creativity. These results suggest that the production of scientific and artistic creativity may involve different key brain regions and different brain networks and interaction patterns of left and right hemispheres. It provides implications for the cultivation of creativity in different fields.

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Keywords: Semantic Network Structure; Creativity; fNIRS

Tuesday, September 17th

SESSION Alvania

Tue-1

Socio-cultural aspects - I

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Can Creating Misinformation Counter its Spread?

Kapoor H., Rezaei S. & Mahadeshwar H.

Monk Prayogshala

Modern approaches to countering online misinformation have touted the viability of 'pre-bunking' or inoculation against misinformation by training people to identify or emulate tactics commonly used to generate fake news. Multiple studies have verified the effectiveness of prebunking. However, as Pennycook and Rand (2021) note, such approaches may be cognitively effortful and simply fail to achieve the intended results in low digital literacy populations. Another approach that has shown promise relates to providing prompts to users to reflect or discern how they know a particular news article to be true (or fake). Yet another find that using incentives (social or monetary) can curb the spread of false information (Kapoor et al., 2023; Rathje et al., 2023). Thus far, a significant chunk of misinformation research has focused on discernment and identification of misinformation, but little work has been done that deals with how misinformation is created. According to the self-generation effect, information is remembered (and consequently understood) better when one generates it as opposed to simply consuming it. In this proposal, we aim to study the impact of creation of misinformation on discernment of misinformation, weaving together novel areas of dark creativity and misinformation research. Thus, we aim to answer the following questions: 1. Are those who create misinformation better at identifying misinformation? 2. Do people who generate more creative misinformation better at identifying misinformation? 3. Can generating misinformation serve as a strategy for psychological inoculation? This project is ongoing and data analysis with preliminary results will be ready by Sept. 2024.

Keywords: dark creativity, misinformation, self-generation effect

How do parents' attitudes toward creative education affect children's creative selves? Cross-sectional and longitudinal surveys of Japanese parents and children

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The home environment promotes creativity development among children. Despite studies suggesting that place of residence, parents' educational background, and parents' creative self-beliefs influence children's creative selves, few studies have directly examined how parents' perceptions of their children's creativity and creative activities at home influence their children's creativity. In addition, parental and family influences may differ depending on the age of the child. Therefore, the current study conducted two surveys of children and their parents from elementary through high school. Eight hundred thirty-two parents participated in the web-based questionnaire survey. The results showed that parents whose children were in elementary school were more likely to recognize their children's creativity and attached greater importance to creativity education for their children than were parents whose children were in middle or high school. In addition to parents' creative selves, creative mindset, and creative activities, the results suggested that parents' expectations and perceptions of their children's creativity influenced children's creative activities at home. We also conducted survey 2, a six-month longitudinal survey for approximately 1,000 students from elementary through high school and their parents. Data collection for this survey will be completed this spring. On the basis of the two surveys, we discuss the impact of parents and home environment on children's creative self-efficacy.

Keywords: creative self-beliefs, creativity education, creativity mindset

Is My Creativity Like Your Creativity? Data-driven Discovery of Cultural Differences in Creative Performance Scores

Borchart K.P., Jaschek C., Meinel C, von Thienen J.

Hasso Plattner Institute, University of Potsdam

Creativity testing has evolved significantly from paper-based and manually rated assessments to automatic testing with internet-supported data collection. This shift entails changes in the demographic characteristics of study participants. While previously homogeneous university- or school-based populations were common, sampling platforms like MTurk led to the inclusion of much wider segments of the human population, notably spanning various continents and cultures. Whether all subjects share a similar understanding of creativity and respond to the testing tasks similarly is an open question requiring careful examination. We present an analysis of multiple datasets derived from online studies conducted over years of creativity testing, including both product- and process-based creativity assessments. Alongside creative self-report scales, we focus on three creativity tests: the Alternative Uses Test (AUT), CollaboUse, and the ImmuneDefense game. These tests require varying strategies to navigate, thus lending themselves to generating nuanced insights as to how creative expression may differ across varying cultural and geographic groups. Notably, for instance, we find Asian populations significantly outperforming North American ones on creative self-report scales like the Creative Achievement Questionnaire. However, when the same participants are evaluated by purportedly objective behavioral measures like the creativity tests mentioned above, the order is reversed, with the North American population significantly outperforming the Asian one. Might these populations systematically over- or underestimate their proficiency, or might the concept of creativity be different across the groups, with mainstream instruments biased to reflect the Western creativity construct? This talk scrutinizes patterns across populations and test outcomes to highlight culture-specific differences in creative performance metrics.

Keywords: creativity assessment, data analysis, cross-cultural creative expression

Tuesday, September 17th

SESSION Nautilus

Tue-2

Symposium - II

Chair: Solange Muglia Wechsler

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Assessing and developing creative potential in the classrooms: Three cultural perspectives

Chair: Solange Muglia Wechsler

Pontifical Catholic University of Campinas-Sao Paulo

The assessment and development of creative potential in the classrooms may be influenced by cultural characteristics existing in each country. Questions can be raised, in the first place, which areas of creativity are assessed, and which administration procedures are used to perform this evaluation. During the COVID time many questions were raised regarding the traditional way of assessing creativity using printed tests, thus suggesting that online administration formats could be faster and more reliable. Results obtained from Brazilian studies will discuss if online assessment of creativity yield comparable results to group-administration methods. In addition to cultural experiences, there is also the doubt if different types of creative thinking—divergent-exploratory and convergent-integrative—and intelligence can affect gifted and non-gifted students. Recent research findings from French studies, exploring the nuanced relationship between different types of creative thinking of children evaluated at CNAPH (National Center for Assistance to children and adolescents with High Potential) will be presented. Furthermore, there is the need to understand the core components that stimulate innovation in an educational environment. The contribution of creativity core components and its possible effects on Portuguese and Brazilian students and teachers will be discussed. Thus, these presentations aim to yield important information on cultural effects on creativity based on the experiences of three countries, France. Brazil and Portugal

Assessing children's creativity: Examining the influence of online versus group administration tests

Wechsler S.M.

Pontifical Catholic University of Campinas-Sao Paulo

The assessment of creativity has always been a challenge as there are disputes on which are the main ways to identify creative potential. During the COVID time many questions were raised regarding the traditional way of assessing creativity using printed tests, thus suggesting that online administration formats could be faster and more reliable. The purpose of our study was to compare children's performance on figural and verbal creativity test in two administrative situations: printed format in group situation, and online format in individual administration. The sample was composed by 140 Brazilian children, age 8 to 13, which were studying in public and private schools in Campinas (Sao Paulo state). The creativity test was composed by one figural measure and two verbal creativity measures. The printed version was group administrated in the students' classrooms and the online format was individually administered in the school computer lab, within an interval of 2 months. The tests were scored for fluency, flexibility, originality, and elaboration by trained psychology students. Means scores compared by Wilcoxon signed-rank test indicated significant superior results for the group administration in printed versions for both figural and verbal tests. In conclusion, group administrated situations tend to create a more stimulating environment for the emergence of creative responses in children than in an individual online format, which tend to limit children's creative expression. Therefore, it is necessary to consider and construct distinct norms to evaluate children's creativity using different assessment methods.

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Cultivating high creative potential

Feybesse C.

Centre hospitalier Guillaume Regnier, University of Rennes

This presentation delves into the intriguing intersection of creativity and giftedness, highlighting their distinct yet interconnected cognitive processes and their potential as educational assets for children. Starting with a concise literature review which aims to shed light on the evolving understanding of how intelligence and creativity interact. The presentation will include some recent research findings, particularly from a study exploring the nuanced relationship between different types of creative thinking—divergent-exploratory and convergent-integrative—and intelligence among both gifted and non-gifted children evaluated at CNAPH (National Center for Assistance to children and adolescents with High Potential) in France. This empirical grounding adds depth and relevance to the discussion, offering tangible insights into the dynamics at play within these cognitive domains. Finally, the presentation culminates in encouraging for the integration and promotion of creativity within the educational system. This advocacy underscores the significance of nurturing creative abilities alongside traditional academic skills.

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How do students and teachers creatively engage within the classroom? Componential Profiles in Education

Zamana F.

Université Paris Cité (LaPEA)

The purpose of this investigation was to examine the contribution of creativity core components on Gruber's (1988) Evolving Systems Approach model in education and its possible effects on both students' and teachers' creative behavior. An online questionnaire was developed using the Experimental Vignette Methodology to manipulate the variables and was administered to university students and teachers from Brazil and Portugal. The vignettes were prototyped using a fictional student within a classroom context where each component can be judged by participants as either high or low and the possibility for a creative outcome in that scenario. Finally, the results were analyzed according to Necessary Conditions Analysis to uncover the ideal amount of each component for creativity. Then, a non-hierarchical cluster analysis was used to draw the componential profiles based on the results. The results are discussed in terms of 1) the possible differences and similarities between students' and teachers' approaches to creativity in the classroom; 2) the intercultural differences between Brazil and Portugal; and 3) the impact of these componential profiles in innovative teaching methods.

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Tuesday, September 17th

SESSION Nautilus

Tue-2

Symposium - III

Chair: Efrat Bengio

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Growing from Mistakes through Creative thinking, Growth Mindset theory, Cognitive Functioning & Mediation

Chair: Efrat Bengio

Beit Berl Academic College, Israel

In everyday life we all make mistakes. The environment's reactions to children's mistakes shape their personalities for better or worse. Students with ADHD and children with learning disabilities often make mistakes, some because of the symptoms of the disorder. Even teachers and lecturers make mistakes. We all make mistakes. But what happens when Giffted children make a mistake? How can we grow from mistakes?

The symposium based on the theoretical and practical knowledge under three perspectives of growing from Mistakes:

1. Developing creative thinking, and creativity among students
2. Developing growth mindset
3. Applying principles of mediate learning experience to cope with mistakes and to develop creativity.

We will present the products of children and student teachers while dealing with mistakes through a giving assignment. The mistakes that will occur will be solved by creative and inventive thinking, through growth mindset method and by analyzing the cognitive functioning & mediation. In addition, we will discuss the emotional and behavioral aspects that characterize the reason for the reaction for mistakes.

Growing from Mistakes through Creative thinking

Margaliot A.

Achva Academic College, Israel

Mistakes can be a gateway to the advancement of student's creative ability, for the following reasons: Mistakes can be an opportunity for divergent thinking though recalculate the routine route. Mistakes provide an opportunity for risk-taking. Mistakes afford the opportunity to practice problem solving, dealing with mistakes develops resilience and reflective thinking, and more.

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Growing from Mistakes through Growth Mindset theory

Benaković K.

Psychologist, ECHA specialist in gifted education, principle of "Wind in your back gifted center", Croatia

Someone with a growth mindset views intelligence and other abilities as learnable and capable of improvement through effort. On the other hand, someone with a fixed mindset views those same abilities as inherently stable and unchangeable over time. When you have a growth mindset, you believe you can get the knowledge and develop skills necessary to succeed, which makes every challenge a learning opportunity. A growth mindset can empower you to perceive mistakes as learning opportunities.

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Growing from Mistakes - Analyzing Cognitive Functioning & using Mediation

Bengio E.

Beit Berl Academic College, Israel

Mediate Learning Experience based on the basic belief that the Individual can change significantly over a lifetime and beyond the limitations of different difficulties, while an appropriate mediation is given. Understanding the cognitive functioning and emotional behavior is important for planning the mediation. We will focus on understanding the possible causes of mistakes and providing appropriate meditation by educators to use mistakes as an opportunity for growth in working with Gifted Children and other population.

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Tuesday, September 17th

SESSION Nautilus

Tue-2

Symposium - IV

Chair: Jean-Baptiste Labrune

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Re-Imagining Creativity: Symposium on Sustainable Design and Environmental Impact

Chair: Jean-Baptiste Labrune

MIT Medialab, Massachusetts Institute of Technology

Human creativity has given rise to astonishing pieces of art, scientific achievements spanning from understanding the smallest particles to vast dynamics across the universe, and has produced commodities ranging from everyday utensils to luxury goods. Simultaneously, human creativity has led to the development of products and practices that threaten ecosystems on Earth, including human-induced climate change, depletion of natural resources, biodiversity loss, and pollution. While creativity literature often emphasizes that creative solutions are, by definition, novel and task-effective, the environmental crisis requires a third criterion: sustainability. Without creativity yielding sustainable solutions, our ability to continue creating anything may be compromised, as humanity faces challenges in sustaining life on this planet. Against this backdrop, the symposium explores different approaches to reconciling human creativity with the natural world. Contributions span legal and artistic perspectives to practical interventions aimed at facilitating sustainable creativity and design.

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La Pistona Observatory: Unraveling Copyright in Nature with Non-Human Stakeholders

Sveva Antonini

La Pistona Osservatorio sulla creatività in natura, Italy

La Pistona, Observatory on Creativity in Nature, serves as a platform for delving into the intertwined subjectivity and creativity within the natural world. The project aims to deepen our understanding of fauna and flora through empathic and artistic channels, fostering a profound connection with nature.

Exploring the dichotomy of "Inspiration or plagiarism?" La Pistona Observatory questions whether human creativity is a product of nature's influence or sometimes a mere replication of its ideas. Central to the project is the examination of nature as a subject of rights, contemplating the originality required by copyright law and the potential implications for human inventions.

This talk specifically focusses on the themes of creativity in nature, with a particular emphasis on nature as a subject of copyright. The discussion revolves around challenging conventional notions of creativity and exploring the symbiotic relationship between human ingenuity and the boundless creativity found in the natural world.

La Pistona presents itself as a hub for artists, scientists, students, and academia, fostering communication among diverse audiences. It hosts events showcasing nature's artistic and intellectual expressions, aiming to raise awareness and respect for the richness of fauna and flora. The Observatory unfolds at a 19th-century villa in Italy, named “La Pistona”, where this exploration of creativity in nature takes place.

AI-Enhanced Co-Creativity: Introducing 'Nature's Voice' during Creative Teamwork in Sustainable Design Hubs

von Thienen J, Strauch T., Steigerwald P, Hilbrich L, McKee H., Li L., Bertacchini A., Arnrich B., Ishii H., Labrune J.B.

Hasso Plattner Institute, University of Potsdam, Germany

Human creativity faces bottlenecks due to unsustainable resource use, contributing to a planetary crisis encompassing climate change, pollution, and biodiversity loss. However, amidst these challenges, emerging technologies such as generative AI offer promising pathways for innovation and collaboration.

This talk introduces Sustainable Design Hubs: dynamic studio spaces facilitating collaborative creativity with remote partners. These hubs integrate automated analyses of design practices, utilizing techniques such as team conversation analysis. Automated assessments gauge the creators' consideration of how their intended solution will impact ecosystems and social equality. Similarly, final products undergo automated evaluations of sustainability implications, with feedback readily accessible to creators.

In addition, Sustainable Design Hubs establish a technologically mediated connection to nature through elements like nature sounds and wind incorporated into the studio space. Beyond simple playback, the soundscape is dynamically synthesized live, providing tailored feedback. For example, when teams make unsustainable design choices, birdcalls in a simulated forest soundscape may cease, while wind sounds and air movement persist, signaling 'danger.' Approaches like this introduce the 'voice of nature' into the studio space, fostering an ambient and non-authoritarian feedback environment.

Overall, this talk explores the potential of human-AI collaboration across diverse sensory modalities to advance sustainable design practices. By showcasing examples of design hubs from both MIT University and the HPI Potsdam, it elucidates the underlying design principles of these hubs. Their impact on the creators' mindset, creative processes, and resultant products is examined, based on randomized experiments.

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Tuesday, September 17th

Poster Session Nautilus

Tue-3

Creative Cognition - I

Chair: C. Rominger

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Exploring scientific creativity and STEM attitudes via complex networks - The Forma Mentis and Woseco tasks

Haim E.[1], Ciringione L.[1], Lai C.[2], Beaty R.E.[2] & Stella M.[1]

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Creativity is a crucial aspect of human development, serving as a driving force behind innovation and problem-solving. Thus, the study and promotion of creativity have become increasingly important. This research introduces two network approaches aimed at understanding and nurturing scientific creativity: the Woseco and Forma Mentis tasks. The Woseco task, short for word-sentence-construction, fosters and measures verbal creativity. It requires participants to generate strings of sentences and captures individuals´ ability to link concepts across contexts. The latter is relevant for achieving remote associations which are a key aspect of scientific creativity. We compare Woseco networks with verbal fluency networks in 169 Austrian high school students. The resulting networks from the Woseco task exhibited heightened interconnectedness in contrast to verbal fluency networks, making the Woseco task a valuable addition to measuring creativity via semantic networks. Furthermore, attitudes towards science have been identified as relevant factors in the success of creativity training in STEM subjects. Therefore, we use Forma Mentis networks to explore the attitudes students (n1 = 159) and STEM researchers (n2 = 59) hold towards concepts of science. Our findings reveal a dominance of negative attitudes among students towards STEM subjects such as mathematics and physics. In contrast, experts hold mostly neutral or positive attitudes. The findings of these studies offer valuable insights for the refinement of creativity training programs. By considering attitudes through Forma Mentis networks and shaping semantic networks via the Woseco task, educators can enhance the effectiveness of initiatives aimed at fostering scientific creativity.

Keywords: Semantic networks; Creativity training; Scientific creativity

Investigating the relationship between hyperfocus and creativity in adults with and without ADHD

Bazhydai M., Karadag D. & Armstrong C.

Lancaster University

One understudied aspect of ADHD is hyperfocus – a state of intense concentration akin to flow, closely linked to creativity. Little research has investigated the relationship between ADHD, hyperfocus and creativity. In two studies, we examined the experience of hyperfocus and its relationship to creativity both in adults with and without ADHD (including those without a formal diagnosis and those suspecting ADHD). In study 1, participants (N = 703) completed an online questionnaire comprised of self-report measures of their ADHD diagnostic status, ADHD symptoms, creativity (measured with the Biographical Inventory of Creative Behaviors; Batey, 2007), and hyperfocus (the Adult Hyperfocus Questionnaire; Hupfeld et al., 2018). We found an effect of the ADHD diagnostic status on hyperfocus but not on creativity, while both hyperfocus and ADHD symptoms predicted higher creativity, regardless of the diagnostic status. In study 2, participants (n = 108) completed the same measures of ADHD symptoms and creativity, complemented with the openness to experience subscale of the Big Five personality inventory (John & Strivastava, 1999), and a set of questions related to the occurrence, frequency, duration and pervasiveness of hyperfocus experiences (Groen at al., 2020). Those with ADHD scored higher on creativity and openness to experience and spent more time in a state of hyperfocus than those without ADHD. These results lend support to the theoretical links between creativity, hyperfocus and ADHD symptoms, and highlight the importance of hyperfocus, while not a defining feature and not part of the diagnostic criteria, in the lived experience of ADHD.

Keywords: creative achievement, hyperfocus, ADHD

Dynamics of semantic memory search underlying creative ideation

Vigreux L., Altmayer V., Ovando-Tellez M. & Volle E.

Sorbonne University, FrontLab at Paris Brain Institute (ICM), INSERM, CNRS, Paris, France

Creative ideas likely result from searching and combining semantic memory knowledge, yet the mechanisms underlying memory search remain unclear. Using an associative fluency task based on polysemous words (PolyFT), Ovando-Tellez et al. (2023) distinguished two search components related to Clustering (exploiting a given meaning) and Switching (changing for another meaning) that were then segregated into fast and slow components (Ovando-Tellez et al., under review) and correlated with creative and executive abilities. Interestingly, only slow Switching followed predictions from the marginal value theorem (MVT) of the optimal foraging theory (Hills et al. 2012).

To extend and replicate these findings, 92 French-native participants underwent a computerised version of the PolyFT, using the original three cue-words, and 46 additional polysemous cue-words. In addition, participants completed a set of established creativity tasks, executive tests, and a relatedness judgement task to build individual semantic networks.

Using a Principal Component Analysis, we were able to differentiate the two search components and found significant correlations of these components with creativity and executive tests, replicating the initial study. Additionally, we revealed novel relationships between Clustering and Switching and the properties of semantic networks. The link between memory search components and creativity were clarified when decomposed into fast and slow components based on inter-response time. Consistent with the previous study, slow but not fast Switching followed predictions from MVT.

Overall, our results replicate and extend prior findings, identifying cognitive components of memory search related to creativity and providing new insights on how individuals search their memory for creative ideas.

Keywords: semantic memory search, creative ideation, executive functions

Laughing Across the Bridge: The Role of the Associative Gap in Humor Appreciation

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Humor is a complex cognitive skill central to human interaction, yet it is still far from understood. Theories suggest that the essence of humor lies in incongruity, the art of forging unexpected connections between seemingly unrelated ideas, creating a conceptual gap that triggers surprise and amusement. This gap is crucial for the emergence of humor; yet, to fully appreciate the joke, one must have the ability to bridge this gap. Our study aimed to investigate whether associative ability—our skill in linking unrelated ideas—allows "crossing" this gap, influencing how we comprehend and enjoy humor. 120 participants were assessed for humor appreciation and associative ability. Humor assessment involved ratings of 200-word pairs, sorted into four categories by their expected humor and semantic distance —indicating how close or far the meanings of two words are. Participants rated the humor ("How humorous or humorless is this word pair?") and coherence ("How much sense does this word pair make when used together?") of each pair. Participant's associative ability was assessed through the Bridge-the-Associative-Gap (BAG) task, which requires participants to integrate two given words through an association. We found that participant's associative ability and coherence impact humor appreciation largely in word-pairs that are relatively semantically close. For word-pairs that are relatively far apart, the distance between the words negatively affects their humor appreciation. These findings reveal the intricate balance essential for humor appreciation, emphasizing the need to recognize incongruities between concepts while skillfully forging connections that transform them into novel, humorous insights.

Keywords: Humor, Associative Ability

Tuesday, September 17th

Poster Session Astrea

Tue-3

AI & Creativity - II

Chair: Izabel Lebuda

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Exploring the Frontier of Imagination: Alternative Uses and the Creative Dynamics of Generative AI

Vavassori G.M. & Corazza G.E.

University of Bologna, DEI – Marconi Institute for Creativity

A new category of tools, popularly known as generative artificial intelligence (AI), can generate artistic content of exceptional quality for visual arts, concept art, music, fiction, literature, video, and animation. The potential of these AI tools is expected to fundamentally transform the creative processes through which creators conceive ideas and bring them to fruition. As the notion of creativity is reimagined, numerous sectors of society may undergo transformation as well. We argue that generative AI does not signify the decline of art, but rather transforms it, serving as a unique medium with its own distinct capabilities.

This poster explores the creative capacity of text-to-image (T2I) AI tools, examining their ability to conceptualize and visualize alternative uses of common objects, in line with the classic Alternative Uses Test (AUT, Guilford, 1967). Our primary focus is on assessing these tools' divergent thinking ability, measured by accuracy to the prompt, originality, and effectiveness. Through a custom testing methodology that evaluates AI-generated solutions for creativity, followed by their representation through text-to-image models, this study aims to determine whether these AI tools can transcend their initial training parameters, showcasing innovation and understanding in uncharted contexts. The research evaluates the creativity of AI outputs, highlighting the importance of innovative and effective solutions that challenge conventional norms. It examines AI's ability to encourage divergent thinking by incorporating unexpected elements and defying traditional associations. Furthermore, the study explores AI's capacity to integrate diverse domains, merging disparate elements from various fields to produce coherent and novel outputs.

Through this comprehensive analysis, the study aims to shed light on the potential of text-to-image AI tools to demonstrate creativity, innovation, and a nuanced comprehension of complex concepts, thereby pushing the boundaries of their initial programming into unexplored creative realms. MIC Conference participants will be able to express their own scores on the AI generated images, through a QR-code interface to a form, that will be made available by the poster itself.

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Keywords: Creativity, AI, Alternative Uses

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APA-CEP: A Novel Approach to Augmenting Human Creativity sans Human Intervention

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Faculty of Data and Decision Sciences, Technion – Israel Institute of Technology

Creativity is a highly valued trait in a constantly evolving world. It involves the ability to generate new and useful ideas, playing a vital role in various domains such as technology, arts, academia, education, politics, and the economy. Enhancing individuals' creativity has become an important focus, leading to the development of numerous programs and methodologies. However, most existing programs involve human intervention and limited utilization of computerized methods, restricting accessibility. Here, we introduce the Automated, Personalized, and Adaptable Creativity Enhancement Program (APA-CEP), a novel personalized training program that eliminates human guidance, providing automatic adjustability and upgradability. APA-CEP offers a fully automated, customizable training experience without the need for direct human instruction. By engaging participants in a story-writing task, the program evaluates their creative output using an large language model (LLM). This model adjusts the complexity of tasks in real-time based on individual performance, ensuring a tailored learning journey. Furthermore, the program leverages the LLM to provide dynamic instructional guidance, enhancing the creative process. Conducted via a dedicated website, APA-CEP aims to bridge the gap in automated creativity training, offering wider access to innovative tools designed to cultivate creativity in a more inclusive, adaptable manner.

Keywords: AI, Training

Unveiling the Semantic Overlaps in Willpower Constructs: An AI-Driven Approach to Refining Psychological Frameworks

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Creativity, a cornerstone of human innovation, underpins advances across all disciplines and cultures, driving progress and solving complex challenges. At the heart of creativity lies the power of will—the ability to focus, persist, and navigate through the intricacies of novel ideas and uncharted territories. However, the field of willpower is characterized by its diverse array of constructs, such as willpower, grit, self-control, conscientiousness, resilience, self-discipline, endurance, self-regulation, and self-motivation. The would-be overlap among them calls for integrating them into a more comprehensive framework. Unfortunately, this important work has not been addressed—even its first step—to prove the existence of the overlap has so far never been conducted in an objective, data-driven way due to traditional methods' subjective limitations.

This study introduces an innovative, AI-driven methodology to objectively identify and quantify semantic overlaps among willpower-related constructs. Leveraging the BERT (Bidirectional Encoder Representations from Transformers) model, our research meticulously analyzes the eight key psychological constructs related to willpower. By vectorizing 135 items from the scales representing these constructs, we compute semantic distances to identify the closest item groups as the nomination of redundancy. Moreover, to complement this computational analysis, we incorporate expert validation and empirical methods to ensure the integrity and reliability of the redundancy identification. This comprehensive approach, blending AI-driven semantic analysis with expert validation and empirical testing, provides a concrete, data-driven identification of redundancy among willpower-related constructs, which paves the foundation for reevaluating and refining the conceptual frameworks and pioneers a novel path towards resolving long-standing theoretical ambiguities in psychology.

Keywords: Willpower, Comparative Measurement, BERT

Examining vector computation as a potential working mechanism of Large Language Models in generating emotional metaphors: An explorative study

Anna Mao[1], Kai Mao[2], Honghong Bai[3], Chien-Te Wu[4], Kaiping Peng[1], Song Tong[1]

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Large Language Models (LLMs) showed great potential in thinking and creating. It is theoretically presumed that LLMs performs over a semantic network of knowledge; whereas, technically, knowledge is represented as vectors, and the generation of new knowledge relies on the change of vectorial representations. In this novel, explorative study, we examined vector computation as a potential working mechanism underlying LLMs, specifically respecting generating emotional metaphors. From literature, we collected 30 emotional metaphors (5 emotions, with each linked to 6 entities, e.g., "She was burning up with anger"). For each emotion-entity pair ("anger-fire"), we then input the definitions of the emotion and the entity to GPT-2. By specifying the weight of (emotion : entity), we carried out vector computation using GPT-2 and generated 9 emotion metaphorical sentences, eventually resulting in 270 metaphorical sentences (minimum corrected by GPT-4 on grammar). We first evaluated and found that the vectorial representation of GPT-generated and the original metaphors were only moderately similar. Second, we asked 21 university students (N=30, 9 excluded as they failed all attention check trials) to choose among the 9 GPT-generated sentences which is most similar to the original metaphor. Students tended to choose sentences that were more emotional-weighted (44%) over equal-weighted (35.6%) or entity-weighted sentences (20.5%). Taken together, this study suggests that vector computation may indeed empower GPT-2 to generate original metaphors (dissimilar from original metaphor in their vectorial representations), whereas the effectiveness of the generated metaphors seems to be questionable as the more emotional-weighted metaphors (which were actually less metaphorical) drew more attention from human evaluators.

Keywords: Emotional Metaphors, Large Language Models, Vector Computing

Tuesday, September 17th

Poster Session Alvania

Tue-3

Individual differences

Chair: Paul Sowden

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Are Anxious Thoughts More Original? Effects of Trait Anxiety on Counterfactual Divergent Thinking

Rezaei S.[1], Kapoor H[1], Mahadeshwar H[1] & Kaufman J.[2]

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Exploring the complex dynamic between emotional states and creativity, this study explores the distinct impacts of trait anxiety and optimism on creative thinking and problem-solving. Building on the premise that both positive and negative emotions can significantly impact creativity, we aimed to unravel the nuanced roles of trait anxiety and optimism in shaping creative outputs. Utilizing a diverse sample (N = 647), the study employs counterfactual divergent thinking tasks to examine how individual differences and contextual factors moderate creative performance. The findings reveal an interesting relationship: trait anxiety, especially when combined with therapy experiences, appears to boost creative fluency in generating negative outcomes, while optimism acts as a protective factor, enhancing creative problem-solving abilities. This study challenges the traditional binary view of emotional influences on creativity, highlighting the critical role of individual differences and experiences in shaping creativity. Conclusively, it advocates for a refined understanding of how emotional states interact with creativity, suggesting that educational and therapeutic approaches should be tailored to leverage these insights for optimizing creative potential.

Keywords: Trait Anxiety, Counterfactual Thinking, Creative Performance

How does authenticity link to general, malevolent, and benevolent creativity: Association patterns and psychological mechanisms

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Authenticity refers to being aware of and acting in congruence with one's true self. Recently, researchers have begun to establish a positive association between authenticity and an important ability/trait of human beings—creativity. However, the nuanced association between authenticity and different facets of creativity with different moral valence has not been disentangled. Considering authentic individuals usually have higher levels of morality, the present research employed four studies to systematically examine the relationship between authenticity and different types of creativity indicators that varying in moral valence (neutral, malevolent, and benevolent), as well as the underlying mediating mechanisms. The results revealed, authentic people have higher level of self-rated creativity and divergent thinking performance, are more likely to engage in creative activities and obtain creative achievements. Meanwhile, they have higher level of morality, and thus are less likely to utilize their creative potential for unethical or malevolent purposes. Moreover, our results identified that variables such as openness to experience, openness to change, moral disengagement, and perspective taking can mediate the authenticity-creativity association, providing preliminary accounts for the underlying psychological mechanisms of this link. Based on our findings, interventions target on developing an authenticity personality, keeping an open mind towards new experiences and ongoing changes, and viewing things from different perspectives may be considered as possible ways to stimulate individuals' typical and benevolent creativity. In contrast, developing an authenticity personality or decreasing individual's moral disengagement may be utilized to reduce the frequency of MC behaviors.

Keywords: authenticity, creativity, moral valence

Building Narratives Through Empathy: The Role of Empathy Mechanisms and Associative Thinking in Creative Writing

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University of Louvain, Belgium

Empathy emerges as a pivotal skill in creative writing, yet previous studies lack an understanding of its multidimensionality and specific impact of its processes on the capacity to generate narrative stories. This cross-sectional study delved into the various cognitive and affective empathy processes — i.e., perspective-taking, online simulation, emotion contagion, proximal responsivity, and peripheral responsivity—and their contributions to creative writing. In addition, it tested the mediating effects of associative thinking — a common empathy-creativity resource — on the relationship between empathy and creative writing. 104 participants completed performance-based tasks and self-report measures of empathy, associative thinking and creative writing. Structural equation modeling indicated differential effects of empathy facets on creative writing, with perspective-taking emerging as a positive predictor. Additionally, online simulation (i.e., effortful perspective-taking) exhibited an indirect positive influence on creative writing, mediated by associative thinking. In summary, associative thinking appears to be a robust ingredient of both empathy and creative writing, while cognitive empathy mechanisms, particularly perspective-taking, contribute sizably to creative writing skills. Future research, employing experimental or longitudinal designs, should explore the directionality and causality in the relationship between creative writing and empathy, while examining the contribution of their common resources such as associative thinking.

Keywords: creative writing, empathy, associative thinking

Is music training linked to self-regulation and other creative achievements and what is the role of family in these relationships? An update since MIC 2023

Kakaziani T.E., de Rooij A. & van Bakel H.

Tilburg University

Eminent creative achievers such as Einstein are often accomplished music performers. Anecdotal evidence often suggests that music instrument training leads to skills that enable creative achievement in other domains, such as art and science. We propose that acquiring self-regulation skills is crucial to this creative transfer. Long-term music training requires long-term rehearsals, knowledge and expertise, during which learners need self-regulation skills to control their emotions, behaviors and cognition. Past studies showed that family support could help music learners become aware of their self-regulation skills. Family support might therefore moderate the transfer of self-regulation skills acquired through music training to other creative domains. To explore these conjectured relationships, we conducted a survey study (n = 402) in a student sample. Contrary to our expectations, the results showed that the amount of music training participants received was negatively related to self-regulation. The partial moderating effect of family support was negative on self-regulation. Lastly, our study showed that certain aspects of self-regulation (performance and self-reflection) were negatively associated with music training. Furthermore, positive correlations between self-regulation and creative achievement found previously were not replicated. We speculate that focusing mainly on the quantity of music training did not help us unravel other quality aspects of participants' training. Our findings enable us to investigate next the effects of sub-constructs of self-regulation on different creative domains and with different styles of family support. We shed light on an understudied topic that could potentially reveal how creative transfer is facilitated.

Keywords: music training, family support, creative transfer

Predicting Creative Achievement From Creative Problem Solving and Divergent Thinking

Ruiz B.

Baylor University

What predicts creative achievement? An understudied predictor is creative problem-solving ability while divergent thinking ability has mixed results. To further investigate these predictors American undergraduate students (n =308) at a large public university in the United States of America were given the creative achievement questionnaire (CAQ), nine creative problem solving (CPS) questions (3 math, 3 verbal, 3 spatial), and one AUT prompt. Performance on each CPS triplet was summed to create subscores: math CPS, verbal CPS, and spatial CPS. The AUT responses were analyzed for fluency, flexibility, elaboration, and originality. Each domain on the CAQ was regressed onto the three CPS subscales and four facets of the AUT responses (fluency, flexibility, elaboration, and originality). Creative achievement in music was predicted by flexibility. Writing creative achievement was predicted by spatial creative problem-solving and flexibility. Creative achievement in inventions was predicted by mathematical creative problem-solving. While science creative achievement was predicted by mathematical as well as spatial creative problem-solving ability. Future studies can assess if these relationships are stable when looking at a group of professional level creative achievers in each domain.

Keywords: Creative Achievement, Creative Problem Solving, Divergent Thinking

Tuesday, September 17th

SESSION Nautilus

Tue-4

Symposium - V

Chair: Honghong Bai

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Navigating Creativity: Exploring the Role of Metacognition

Honghong Bai

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Metacognition is generally defined as cognition about cognitive phenomena, or more simply, as "thinking about thinking" (Flavell, 1979, p. 906). Building on these definitions, the importance of metacognition in creativity has been recognized decades ago (e.g., Davidson et al., 1994; Finke & Ward, 1992), but more recently research started to increase on this topic. Kaufman & Beghetto (2013) defined creative metacognition as "a combination of creative self-knowledge (knowing one's own creative strengths and limitations, both within a domain and as a general trait) and contextual knowledge (knowing when, where, how, and why to be creative)" (p. 160). Expanding on this concept, Lebuda and Benedek (2023) proposed a framework for creative metacognition, highlighting three metacognitive processes relevant for creativity: metacognitive control, metacognitive monitoring, and metacognitive knowledge. Here, metacognitive control entails the regulation of processes such as starting, finishing, or changing effort allocation during cognitive tasks. Metacognitive monitoring involves the subjective assessment of how a task was, is, and/or will be performed. In other words, it encompasses processes such as the self-assessment of (expected) success and discernment, which is the ability to distinguish creative ideas from uncreative ones. Metacognitive knowledge refers to knowledge of what type of strategy is appropriate in a particular task, plus when and how to apply this strategy.

In this symposium, we will delve into creative metacognition and the processes involved. In the first presentation by Kamila Urban, the relationship between metacognition, self-efficacy, and creativity in successful problem-solving is explored. Following that, Mare van Hooijdonk will present a study on self-assessment accuracy across two domains. The third presentation by Marta Czerwonka will pay attention to metacognitive monitoring at the response level by exploring discernment. The final presentation by Marek Urban will dive into metacognitive monitoring and the regulation of strategies during creative problem-solving, with the assistance of AI.

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Relationship between metacognition, self-efficacy and creativity in successful problem-solving

Kamila Urban, Azizul Ghofar, Candra Wicaksono, Peter Seban, Matúš Brziak

Institute for Research in Social Communication, Slovak Academy of Sciences, Slovakia

Problem solving is an essential 21st century skill, requiring coordination of cognitive, motivational, and creative factors. However, research often isolate these components, overlooking their joint impact. This study aims to bridge this gap by investigating the interplay between metacognition, self-efficacy, and divergent thinking, and how they mutually influence the quality and originality of solutions to a complex, ill-defined problem among university students. Employing structural equation modeling, the research explores the direct effect of metacognitive skills on problem-solving performance, as well as the mediation effect of divergent thinking in the relationship between creative self-efficacy and problem-solving performance. Beyond this, the study aims to identify additional factors that may contribute to problem-solving effectiveness, such as domain-specific knowledge. The findings of this study have the potential to inform educational practices by highlighting the importance of fostering an integrated approach to developing problem-solving skills. This approach includes enhancing metacognitive awareness, bolstering creative self-efficacy, and encouraging creative thinking to equip students with the aptitude to navigate the multifaceted challenges of contemporary society.

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Delving into Self-Assessment Accuracy in Creativity

Mare van Hooijdonk, Marije Westerveld, Noortje Janssen, Evelyn Kroesbergen

Radboud University Nijmegen, the Netherlands

The extent to which individuals judge their performance on a creative task (i.e., apply metacognitive monitoring) is crucial, as it influences their decisions to persist or discontinue searching for alternatives, thereby potentially affecting the likelihood of generating creative ideas (Ackerman & Thompson, 2017; Urban & Urban, 2023). Previous research has generally found that self-assessments rarely accurately reflect actual creative performance (Kaufman et al., 2010; Kaufman, 2019; Kaufman, Beghetto, & Watson, 2016; Van Broekhoven et al., 2022). To assist students in improving their self-assessments, it is crucial to gain deeper insight into factors associated with self-assessment accuracy across domains. Thus, our study aims to address the following questions: (1) Can students accurately self-assess their performance across various aspects of creativity on creative tasks? (2) Do students exhibit consistent patterns of self-assessment accuracy across different domains? And (3) Is self-assessment accuracy on creative tasks associated with creative self-concept and personality traits (Big Five)?

A sample of 170 first-year university students (Mean age = 18.63, SD = 1.47; 150 female) completed an alternative uses task and TCT-dp (Urban, 2004). Students were asked to self-assess their performance and completed a questionnaire assessing creative self-concept and personality traits (Big Five). Preliminary results revealed that students mostly overestimated themselves in terms of fluency on the alternative uses task. Self-assessments of fluency were significantly predicted by actual performance ($\beta = .35^{**}$), but only a small portion of the variance was explained ($R2 = .12$). More results will be shared during the conference.

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Does the Tendency to Discern Ideas Accurately Increase Over Time? Exploring the Dynamics of Metacognitive Monitoring at Response Level

Marta Czerwonka, Jakub Jędrusiak

Institute of Psychology, University of Wrocław, Poland

Being able to distinguish creative ideas from uncreative ones, which is called discernment, is crucial for deciding which one is worthwhile to invest time and effort. The ability to accurately recognize one's own ideas, as a core component of metacognitive monitoring, is based on previous experiences and knowledge related to both the specific challenge at hand and creativity in general (Lebuda & Benedek, 2023). Nonetheless, a crucial question lingers: does the tendency to evaluated ideas more adequately increase over time? Therefore, we examined whether and how discernment dynamically changes.

In this preregistered online study participants (N = 398) solved two divergent thinking tasks and were instructed to be creative. Participants self-assessed presented in alphabetical order ideas in terms of originality and usefulness. Next, they ranked the randomized set of their ideas [1] from most to least creative and [2] from the first ideas to the last one (the order in which ideas were produced). For exploratory purposes, we asked participants to report the extent to which they felt attached to each of their ideas (see Lazar & Miron-Spektor, 2022). Additionally, to extend the scope of this work the potential predictors of discernment (dynamic creative self-efficacy, evaluation apprehension, and task-relevant knowledge) were examined. During the presentation we will delve into the dynamic changes in metacognitive monitoring in creativity over time. We will conclude with a discussion on the temporal patterns of evaluating ideas and how to facilitate the process of assessing one's own ideas more accurately.

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The Role of Metacognitive Monitoring and Regulation in Creative Problem-Solving with Assistance of Generative AI

Marek Urban, Cyril Brom, Filip Děchtěrenko, Jiří Lukavský, Veronika Hrabalová, Filip Svacha, Kamila Urban

Institute of Psychology, The Czech Academy of Sciences, Prague, Czech Republic

Although recent studies on creative problem-solving have emphasized the role of metacognitive regulation, co-regulation, and socially shared regulation, little is known about the regulation of complex problem-solving when interacting with generative AI tools. This study investigates the role of hybrid human-AI regulation in solving complex, ill-defined problems through the assistance of ChatGPT 3.5, involving seventy-seven university students. The research highlights the positive correlation between the frequency and elaboration of human prompts to AI and creative problem-solving performance. Advanced process mining techniques were employed to distinctly highlight differences between high and low performers, revealing that high performers engage in iterative, context-rich interactions with AI, continuously refining outcomes through strategic, elaborative prompting (i.e., iterative item-by-item monitoring and regulation of the outcomes). In contrast, low performers tend to adopt a non-iterative, information-gathering approach. These findings suggest that strategic, elaborative prompting enhances problem-solving effectiveness, offering insights into optimizing hybrid human-AI systems for complex problem-solving tasks, and underscore the importance of metacognitive strategies (i.e., constant metacognitive monitoring and regulation) in engaging with generative AI for creative problem-solving.

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Tuesday, September 17th

Session Astrea

Tue-4

Education - IV

Chair: ***M.-Paz Celume***

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Enhancing Undergraduate Learning Through Howard Gruber's Case Study Approach

Ana Jorge Artigau & Florencia Aguilar

Austral University

This presentation aims to unpack our experience teaching the Evolving Systems Approach to undergraduate students. Howard Gruber's framework, grounded in his theory of the evolving structure of creative thought, provides a unique perspective that encourages students to delve into the complexities of real-world situations. To this day, we have had five consecutive cohorts of Design students in our classroom. Even when the learning journey differs from the graduate experience, students recognize the course's impact on them. The objective of this paper is to share and document the semester-long journey that students take in order to write their cases.. First, we will explain the importance of the Evolving Systems Approach and what aspects are highlighted in the course. In addition, we also develop other theories that help deepen and open the scope of view of what students are investigating in the case. All these theories also share a systemic view of Creativity, visualizing the importance of the context when understanding the creative work they are writing about. The process of iteration through the different perspectives developed in the course helps students understand the complexity of creative work and how it changes throughout life. For the final students are asked to hand in a reflection in the format of their choice to show what Creativity is in the light of their case. Materializing what they have discovered throughout the semester helps them understand the complexity that characterizes Creativity in particular and thinking in general.

Keywords: Case Studies, Systemic Thinking and materiality.

Development of H-CAM as a teaching model for creativity enhancement and the effectiveness of the H-CAM based program

Heera, Bae[1], Jusung, Jun[1], Kyounghoon, Lew[1], Kyung-hwa, Lee [2]

[1]Soongsil University; [2] Sejong International Academy

The purpose of this study was to develop educational models to foster the creativity and the program based on the model. Therefore, a History-based Creative Achievement Model (H-CAM) was devised to strengthen learners' creative achievement, and a creative education program based on it was developed. In this study, to develop H-CAM and program, first reviewed and analyzed previous studies and literature, and confirmed the final model through content validity. And then the experimental research was conducted to identify the effectiveness of the program. As a result of the research, first, a teaching model for creativity enhancement H-CAM was developed and it can be used from elementary school to college. Second, the creative education program of five sessions (2h/differential) based on H-CAM was developed. Third, the effectiveness of the program was identified through the experimental study that 40 university students participated. The H-CAM and creative education programs developed in this study are designed to derive creative achievement ideas by discovering creative achievements in history and incorporating them into domain knowledge or daily life, and to produce their own creative output based on them. Therefore, students exposed to these curricula will naturally be able to achieve their creative achievements. The expression of creative ideas is a very important competency in fostering talent in the future society. Exploring Korea's culture and history in the process of expressing creative ideas and discovering and converging Korea's unique creative values to achieve creative achievement will help to have creative capabilities with secured identity.

Keywords: Creativity, History-based Creative Achievement Model (H-CAM), Creativity program

Riding the Wave of Creative Behaviors in Schools: Frank E. Williams and Educational Engineering

Connie Phelps & Joyce Miller

Emporia State University; Texas A&M-Commerce

The collective work of Frank E. Williams provides an enduring pedagogical framework to recognize, support, and evaluate creative potential in P-12 schools. This study examines a wave of creative teaching and learning behaviors known as education engineering spanning two decades (1965-1982) with illustrative pedagogical materials and applications. Researchers with specialization in creativity including J. P. Guilford, E. Paul Torrance, Sidney Parnes, Calvin Taylor, and Frank E. Williams collaborated during the Torrey Pines Conference (1965) to discuss and disseminate their findings on creative teaching behaviors. In 1966, Williams directed the federally funded National School Project with six model school districts in five states across the USA. The project bridged theory and practice with individualized in-service training at each pilot school site and teacher-generated projects using strategies to develop thinking processes. Williams created a three-dimensional cube model with Subject-Matter Content, Productive-Divergent Thinking Process, and Teaching Strategies components (1969). With a total of 644 cells, the Williams cube helps teachers plan differentiated instruction for diverse learners and serves as a curriculum model in Gifted Education. Williams expanded this framework into a five volume how-to-book set in the Total Creativity Program (1972). This comprehensive resource enhances existing teaching behaviors by pairing thinking and feeling behaviors without incurring expensive materials. The program encourages creative potential with three levels differentiated for teacher trainers, training program participants, and classroom teacher use with their students. The materials distinguished between intellectual and non-intellectual behaviors contributing to creativity. The Creativity Assessment Packet (1980) measures fluency, flexibility, originality, vocabulary, and comprehension.

Keywords: Creative behaviors, Gifted Education, Frank E. Williams

Tuesday, September 17th

Session Alvania

Tue-4

Health & Wellness - I

Chair: ***Cecilia Segatta***

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The Interplay between Critical Thinking Disposition, Mindfulness Disposition, and Creative Self-Concept among Allied Health Professionals

Margaret Mangion & Leonie Baldacchino

The Edward de Bono Institute for Creative Thinking and Innovation, University of Malta, Msida, Malta

The dynamic and complex nature of healthcare environments necessitates that AHPs (Allied Health Professionals) – a distinct group of practitioners who are trained and registered in health-related areas (e.g., physiotherapy and nutrition) but who are not doctors, dentists, nurses, or midwives – not only possess clinical expertise but also exhibit broader cognitive and psychological attributes, such as critical thinking, mindfulness, and creativity. These attributes are believed to enhance decision-making, patient care and practitioner resilience, but limited literature is available on their interplay in the AHP context. This study aims to address this research gap by investigating the relationships between critical thinking disposition, mindfulness disposition and creative self-concept within this professional group. Using a quantitative research methodology, data was gathered from a sample of 246 AHPs through validated instruments, and the relationships between variables were examined using regression analysis. This revealed a significant positive relationship between critical thinking disposition and creative self-concept, indicating that practitioners who have a pronounced inclination towards critical thinking are likely to identify themselves as creative. Conversely, the relationship between mindfulness disposition and creative self-concept did not achieve statistical significance. This suggests that a greater tendency to be mindful is not necessarily associated with a higher level of self-perceived creativity among AHPs. These results suggest that interventions to develop critical thinking are likely to have positive impacts on AHPs' creative self-concept. However, further research is required to examine why no significant relationship was found between mindfulness and creativity in this study, which contradicts previous research in other settings.

Keywords: Critical Thinking, Mindfulness, Creative Self-Concept

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Emergence modes and therapeutic issues of the creative process in psychodrama with schizophrenic patients

Victoria Caillet

Aix-Marseille Université

The objective of this oral communication is to present our creation of a new group treatment for hallucinating and delusional schizophrenic patients, based on a new protocol. We wanted to adapt the psychodrama device to subjects suffering from paranoid schizophrenia and more precisely from hallucinatory and/or delusional disorders. We called this protocol “Playing your delirium, playing your hallucinations”. This was implemented and tested within an adult psychiatry department at the Clinique des Trois Cyprès in Marseille for six months.

We realized that this specific device had allowed the emergence of a groupal creative process that could be considered as a therapeutic process, a catalyst for intrapsychic reorganization and reduction of hallucinatory and/or delusional disorders.

We will therefore attempt to demonstrate how this creative process promotes the treatment of hallucinatory and delusional disorders in schizophrenic patients.

In order to illustrate our point, we will offer clinical illustrations centered on several sessions of this experimental device.

Keywords: Creative process, hallucinatory and delusional disorders, psychodrama, Psychology of Creativity

An Investigation of Divergent Thinking Among Surgeons and Surgeon Trainees in Canada (IDEAS): A Mixed-Methods Study

Alex Thabane, T. McKechnie, V. Arora, G. Calic, J. W. Busse, R. Sonnadara, M. Bhandari

McMaster University

When unforeseen problems occur in life-critical situations, the ability to generate original, effective solutions when no prescribed procedure or solution is available – the ability to be creative – can save lives. We aimed to assess the creative potential of surgeons and surgeon trainees by conducting a divergent thinking survey using a validated questionnaire, followed by two semi-structured interviews with top-scoring participants. Participants also self-assessed their confidence in creative problem-solving and the effect of the surgical training on their creative potential. We performed descriptive analyses and multivariable linear regression to identify factors associated with divergent thinking. We also conducted a thematic analysis of the interview responses. Eighty-two surgeons and surgeon trainees were surveyed - of these, 43 were junior trainees and 28 were senior trainees. General surgery, orthopaedic surgery and plastic surgery represented 71.9% of the participants. The median participant age was 28 years (range 24-73), 51.2% of whom were female. Participants demonstrated levels of divergent thinking that were higher but not meaningfully different from the adult norm. While participants scored significantly higher than the average adult on fluency and flexibility, they scored below-average on originality. Regression analysis identified higher divergent thinking scores among females. Interviews with top-scoring participants affirmed the value of creativity in surgery for problem-solving, and the potential adverse effect of medical training on creativity.

Keywords: Surgery, Divergent Thinking

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Idea management among clinical psychologists and therapists

Mihaela Taranu, E. Rosselli Del Turco, P.Dalsgaard

School of Communication and Culture, Department of Digital Design, andInformation Studies, Aarhus, Denmark

Ideas and their management are deemed highly significant for practitioners in various creative professions, including designers, researchers, and music professionals (Inie & Dalsgaard, 2020; Inie et al., 2022; Rosselli Del Turco & Dalsgaard, 2023). Clinical psychologists and therapists, tasked with continually finding innovative strategies to assist patients amidst the absence of a one-size-fits-all treatment (Cohen, Ashar & DeRubeis, 2019), exemplify the demand for ongoing creativity in healthcare practice. However, surpisingingly little research has focused on how these practioners manage their creative ideas. This presentation focuses on findings from a study involving 60 clinical psychologists/therapists who participated in an online survey, supplemented by in-depth interviews with 16 of the practitioners. We delineate their conceptualizations of creative ideas in practice and identify the distinctive aspects of their workflow, including the tools and infrastructure facilitating idea development. Furthermore, we scrutinise specificities and commonalities in the approach to idea management between clinical psychologists/therapists and practitioners in previous research.

Keywords: Idea Management, Therapy

Tuesday, September 17th

Extended Speech by the beach

Anatoliy Kharkhurin

Speaking the Languages of Sea and Land: Bilingualism and Creativity

Over the last few decades, researchers studying bilingual cognitive and linguistic development have made significant progress. Their findings support the claim that bilingual development may establish unique mental architectures that could lead to cognitive advantages later in life. One of these advantages appears to be the capacity for creative thinking.

This idea was formalized in the Multilingual Creative Cognition framework (Kharkhurin, 2015) based on two premises. First, speaking more than one language extends an individual's cognitive capacities (see Bialystok, Craik, & Luk, 2012, for an overview). Second, from the creative cognition perspective (Ward & Kolomyts, 2019), creativity is considered a product of normative cognitive functioning, and an increase in general cognitive functioning may facilitate an individual's creative abilities. Hence, if the acquisition and use of multiple languages facilitate general cognitive functioning and result in more elaborate cognitive structures and/or functioning, it may also facilitate creative functioning (Kharkhurin, 2012). Over the last decade, a growing body of empirical evidence demonstrated a positive effect of bi-/multilingualism on creative cognition (see Kharkhurin, 2018; van Dijk, Kroesbergen, Blom, & Leseman, 2018, for an overview).

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However, the Multilingual Creative Cognition approach appears to take a relatively narrow perspective on both phenomena of creativity and multilingualism, for it focuses primarily on the cognitive mechanisms underlying creative capacity and on the way the functioning of these mechanisms could benefit from an individual's linguistic competencies. At the same time, academic interest in learning multiple languages and their implications has broadened to include plurilingualism (Piccardo, Germain-Rutherford, & Lawrence, 2021). Similarly, the study of creativity has evolved with models emphasizing its multidimensional nature (e.g., Csikszentmihalyi, 2014; Glăveanu, 2013; Kharkhurin, 2014; Lubart, 2017).

Both shifts paved the way for reconsidering the relationship between linguistic and cultural diversity on one side and creativity on the other. Hence, Kharkhurin (2021) proposed a new framework for research in multilingual and creative practices, Plurilingual Creativity. This framework emphasizes the agency of plurilingual speakers with a collection of sometimes unequally developed languages at their disposal. It recognizes the primacy of the interaction of multilingual and multicultural experiences and the importance of intercultural competence. It also admits the multidimensional nature of creativity. Altogether, Plurilingual Creativity considers the interplay of language and creative practices through various factors such as cognitive processes, personality traits, personal experience, motivation, attitudes, socioeconomic and sociocultural conditions, and education.

The Plurilingual Creativity paradigm also has practical benefits for education. While the academic community has begun to explore the potential links between creativity and the use of multiple languages, programs that foster creative capacities and plurilingual abilities are still separate. Researchers and teachers in these fields often have mutually exclusive training, focusing on either creativity or language-related disciplines. Additionally, programs that offer multilingual teaching often neglect the importance of nurturing intercultural competence. However, the Plurilingual Intercultural Creative Keys educational system (https://pick.hse.ru/en/; Kharkhurin & Pasechnik, 2020) combines plurilingual and creative training strategies to develop students' linguistic, intercultural, and creative competencies. This approach aims to help individuals successfully adapt to the modern world.

Wednesday, September 18th

MIC Keynote Speech - V

Macarena-Paz Celume

Navigating the Emotional Oceans of Creative Thinking

In the vast ocean of human expression, creativity emerges as a dynamic force (Corazza, 2016, 2019), much like the waves that ebb and flow. Join on a journey through this keynote speech as we explore the intricate relationship between creativity and emotions. Rooted in contemporary psychological research (Ivcevic 2022; Ivcevic, Hoffmann, & Kaufman, 2023), this exploration will unravel the interplay between creative thinking and mood dynamics. Aligned with the conference theme, "Surfing on Creative Waves," we will delve into the emotional mechanisms shaping our most inventive moments. From the profound influence of affective states on creative thinking in adults (Baas, De Dreu, & Nijstad, 2008; Davis, 2009; Zenasni & Lubart, 2002) as well as in children (Agnoli et al. 2023; Celume, Ivcevic, & Zenasni, 2023; Garaigordobil et al. 2022; Teske et al. 2017) to the role of mood in fostering creativity through arts (Botella et al. 2023; Celume, Besançon, & Zenasni, 2019), we'll unveil the psychological threads weaving the tapestry of inspiration. By deciphering these intricate connections, we aim to surf the waves of inspiration with mindfulness, fostering a harmonious interplay between our emotional states and the evolving canvas of creative thought. Join for an insightful journey as we navigate the nuanced emotional dynamics inherent in the expansive landscape of creativity.

MARCONI INSTITUTE FOR CREATIVITY moving ideas

Wednesday, September 18th

Session Nautilus

Wed-I

Individual differences - III

Chair: ***Evelyn Kroesbergen***

MARCONI INSTITUTE FOR CREATIVITY *moving ideas*

IDHOL, a holistic model for the analysis of individual differences in the creative process

Sergio Agnoli

Department of Life Sciences, University of Trieste; Marconi Institute for Creativity

This presentation will introduce a new dynamic theoretical framework for understanding the role of individual differences (IDs) as necessary mechanisms in the creative process: the Individual Differences HOListic (IDHOL) model. Some micro- and macro dynamics in which IDs participate as organizers of the creative process will be specifically explained. The IDHOL model essentially explains where and when IDs can influence the creative process by considering three layers of influence, each of them representing a possible level of analysis for the study of IDs in creativity research: the psycho-biological layer, the context layer, and the creative states layer. This model is intentionally used to show that individuals can only be considered central to the study of a creative process if they are viewed as holistic entities, and that their idiosyncratic influences in the process can only emerge because of the interactive dynamics with the various places (contexts) and moments (states) necessary to the process.

Keywords: IDHOL; individual differences; creative process; theoretical model

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Do Fans of Violent Stories Show a Higher Potential for Creative Harm? Investigating True Crime as a Stimulating Environment for Malevolent Creativity

Corinna Perchtold-Stefan, K. Sattler, S. Veit, C. Rominger & A. Fink

University of Graz

A dynamic approach to creativity examines how creativity is influenced by context. In this regard, little is known about the negative environments that foster malevolent creativity – creative ideas intentionally generated to harm others. While studies show that active violence exposure (trauma, abuse) may increase malevolent creativity in afflicted individuals, it is unclear whether violent media consumption (as passive violence exposure) may have similar effects on people's capacity to generate damaging creative ideas. We investigated the media phenomenon of true crime consumption where people listen, read, or watch narrations of real-life crime stories involving kidnappings, sexual assault, and murder. Since these narrations often feature detailed descriptions of successfully and uniquely harming others, we tested whether true crime fans show increased malevolent creativity on a psychometric performance test. In sample 1 (n = 162), controlling for gender, age, general verbal creativity and trait aggression, true crime consumption showed a small positive correlation with the number of generated malevolent creativity ideas (fluency, sr = .15), but not with degree of harmfulness (malevolence), or originality of ideas. In sample 2, (n = 302), we managed to replicate the small positive association of true crime consumption and ideational fluency (sr = .11), again observing no effects for malevolence or originality of ideas. While our data suggests that true crime fans are more inventive in producing creative ideas to harm others, they do not show elevated malevolent creativity in general, which argues against the idea that true crime consumption increases harmful, antisocial cognition in daily life.

Keywords: malevolent creativity; violence exposure; creativity environments.

Gender Conditions in Creativity

Manuela Romo & Marina Porto

Universidad Autónoma de Madrid

The evolution of homo sapiens is marked by creativity that has been the driving force of human progress. However, women's contribution to this process has been underestimated. The field determines which products and therefore which people will be considered creative; according with the System Theory of Csikszentmihalyi, – adopted in our research- the field is composed of the experts, in the words of Csikszentmihalyi: the "guardians of the domain". It is normally made up of men and that makes difficult to appreciate women's creative products.

In our research with 25 spanish creative women recognized as eminent in various disciplines, we have detected what barriers do women have to face in their creative work, as well as strategies to promote creative equity, according to the qualitative analysis carried out with the Atlas program. Based on the data from our study, we propose suggestions to promote gender equality in creativity; it is about promoting substantial changes rejecting androcentric dynamics in the domain with openness to the contribution of women and restructuring fields with more women in authoritative roles in the discipline.

Keywords: gender, creativity, eminence.

Wednesday, September 18th

Session Astrea

Wed-I

AI & Creativity - III

Chair: ***Min Tang***

MARCONI INSTITUTE FOR CREATIVITY *moving ideas*

Large Language Models (LLMs) as an Intervention for Creative Writing

Tim Sptisberg & T. Kettler

Baylor University

Researchers are intrigued by artificial intelligence (AI), and especially publicly available, low-to-no-cost web-based access to large language models (LLMs) such as ChatGPT. In creativity research, inquiry has centered around utilizing AI efficiencies for the scoring of creativity assessments and the impact of AI on creative generativity more broadly, and in education research, studies have centered around how schools can manage student engagements with AI to ensure that submitted work is truly a student-product. There is, however, to date, very little work in either space about how LLMs might be utilized as a generative thought/work partner for student writers, and the degree to which potential for written creativity might be expanded upon or curtailed not only via encounter with an LLM, but in how that encounter has been managed by writing instructors. Our research commenced with a small scale (N<50) experimental intervention conducted under the aegis of a university-based GT "Super Saturday" 3-hour single-day programming offering to students in grades 7-12. Students spent hour 1 creating creativity (AUT) and creative writing baselines, hour 2 in one of three randomly assigned treatment groups to accomplish a creative writing task (short story): no AI assistance, unmanaged AI assistance, scripted AI assistance, and hour 3 in a large-group instructor-led lesson about revising in partnership with AI. Early results indicate that LLM/AI could be a powerful partner for creative enterprise, but that HOW such partnerships are formed and managed matters as much, if not more, than whether they are utilized at all.

Keywords: creative writing, AI, education

How creative are GPT-3.5 and GPT-4 in comparison to Cambridge and Oxford students?

Luning Sun, Y. Yuan, L.Jiang, X. Xie, F. Luo

University of Cambridge

Creativity used to be considered a higher-order thinking skill only possessed by humans. However, this notion is being overturned by the recent advancement in large language models (LLMs), which are estimated to affect 80% of the workforce, including occupations in the content creation industry. To understand how creative LLMs are, this study took GPT-3.5 and GPT-4 as examples and compared their performance on a range of creative tasks to a group of Cambridge and Oxford students. Specifically, we administered the Remote Associates Test (RAT), the Alternative Uses Test (AUT), and two creative writing tasks to the students and the two LLMs (at five different temperatures). All the responses, except for the RAT, were rated following the Consensual Assessment Technique. The results show that both LLMs outperformed the students on the RAT, ranking in the top 10th percentile. On the AUT, GPT-3.5 and GPT-4 were able to generate a large number of ideas. Averaged across the six objects, the ideas generated by both models were judged more creative than those by the students. While the LLMs revealed a better use of language in the creative writing tasks, they were outperformed by the students in terms of creativity and diversity in the stories. Our findings suggest that LLMs are strong in associating concepts and generating ideas but suffer from weaknesses in producing creative and diverse stories. Based on this initial evidence for LLMs' linguistic creativity, we discuss the impact of LLMs on the future of work.

Keywords: Large Language Model, Creativity, Future of Work

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Human-Human, Human-Internet or Human-AI: Which collaboration is the most promising for creativity? An experimental study

Min Tang, S. Hofreiter, C. H. Werner, A.Zielińska, M. Karwowski

The University Institute of Schaffhausen, Switzerland

Artificial Intelligence (AI) has become a hot topic in the creativity literature, with scholars exploring its potential applications: (1) as a tool making human creativity more efficient, (2) as an equal collaborator contributing to the development of creative ideas all the way to (3) as a sole creator that might replace humans in providing new and meaningful contributions. Yet, research on generative AI's influence on human creativity oversights the comparability of different groups. Usually, in experimental settings, when participants work with AI, they have an advantage due to additional information and knowledge provided by ChatGPT, while the control group works independently, devoid of any external cognitive support. Drawing on the theories of cognitive enhancement, this study examines how people collaborate with human peers, Internet resources, or AI in completing creative thinking tasks. A total of 202 students from a German university participated in a between-group experiment with four conditions and four creativity tasks used as focal dependent variables (two Alternate Uses Tasks, one Consequences Task, one Problem-Solving Task). In the human-human condition, participants worked in dyads, collaborating with a peer student. In the human-Internet condition, they used Google Search to produce and develop their ideas. In two remaining human-AI conditions, participants interacted with ChatGPT, following either basic or specific instructions. Participants' creative self-efficacy was measured twice: before and after creativity tasks, while their perception of difficulty, required efforts, and evaluation of the partner (human, Google, AI) was recorded after finishing the tasks. We observed small and unsystematic differences between conditions in creativity tasks when average scores where considered. However, when we focused on participants' best ideas scored with the recently proposed multidimensional top-scoring method (Forthmann et al., 2023), the human-human condition clearly outperformed the human-AI conditions ($d = 0.58$, 95% CI: [0.19, 0.96], for the pairwise comparison with both human-AI conditions combined). Although working with AI was perceived as much easier than working with human dyads or with Google, it did not translate into more creative outcomes. Moreover, interacting in human dyads made people more creatively confident: an effect not observed in the remaining groups. We discuss cognitive and motivational mechanisms associated with using AI to support creativity.

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Keywords: Generative AI, ChatGPT, cognitive enhancement, human creativity, creative self-efficacy, multidimensional top-scoring method

Explore human-LLMs collaboration for creativity through the lens of concepts

Peng Cheng & Honghong Bai

Tsinghua University & Radboud University

'Concept' first gained the attention of philosophers such as Kant as an epistemological tool, which transforms the perceptive, intuitive experiences into knowledge. Hegel, however, considers 'concept' has a broader, ontological meaning: It is also the driving force of cultural and historical developments. Through concepts, individuals' experiences are socialized to a collective level, eventually becoming part of the external world which, in turn, to be experienced and learned by other individuals. In this regard, concepts and concept generation are the foundation for human creative activities. Stemming from Hegelian philosophy, we scrutinized the creative potentials of the fast-developing large language models (LLMs) nowadays, and explored how human and LLMs can collaborate to achieve creativity. From recent literature, LLMs were found to manifest great freedom and proficiency in connecting and mapping concepts from different domains, such as yielding novel hypotheses based on theories and evidence originated from disjointed research domains. Such activities can, in contrast, be time-consuming and sometimes even impossible for human. Yet, LLMs lack autonomy (e.g., passively respond to external inputs), spontaneous self-grow abilities (e.g., highly data-driven and rely on training data), and human-like constraints (e.g., give false or illogical responses), likely because LLMs are in nature de-embodied. This disembodiment also hinders LLMs to contextualize their generated concepts within broader societal and historical frameworks, a critical step in transforming creative ideas into tangible realities. Against these findings, we proposed two possible routes for human-LLMs collaboration for creativity and discussed concerns alongside these routes.

Keywords: Hegelian, concept, human-AI collaboration

Wednesday, September 18th

Session Alvania

Wed-I

Domains of Creative Work - III

Chair: ***G.E. Corazza***

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Riding the Writing Wave

Margaret McVeigh

Griffith University

Doing creative work is like catching a wave. Surfers describe the feeling of riding a big as one of excitement and accomplishment. But a lot goes on before you ride that wave. There is the envisioning of what it would be like to catch the perfect wave. There is the research and knowledge about where and when to find the perfect wave. There is the flow of being on the wave and hoping it will never end. Then there is the sharing of the story about catching that big break. To be a successful surfer requires the attributes of the creative personality, the knowledge of the domain of surfing and continual refinement of chance meets opportunity. This paper will use the research methodology of artistic/creative reflective practice to discuss the big wave I took to the shore – the writing my 2023 book, Screenwriting from the Inside Out: Think and Write Like a Creative (Palgrave Macmillan). To do this I will discuss the four stages of the creative process: Inspiration and Envisioning, Research and Insight, Writing and Flow and Shaping (McVeigh 2023) which I both present and deploy in the book. In doing so I will discuss how I applied findings from the academic fields of screenwriting as creative practice, cognitive psychology and cognitive neuroscience - including the attributes of the creative personality, the factors impacting creative personal identity and theories of creative cognition - to anchor them in the art and craft of screenwriting to help writers think and write more creatively.

Keywords: screenwriting, creativity, creative writing, Creativity in the Arts

On the Involute Structure of Creative Waves and How to Circle Them Up. A Call to Action

Nicole Derikx

House of Art & Agency

Once creativity is in motion, it takes on multiple dimensions, as many as twenty-six according to the latest findings in physics. In biology, we can observe the left-handed helix shape of Z-DNA, a curling motion often seen in creative waves; another example is the enigmatic "involute hierarchical structure of the index" in the socio-(im)material. Similarly, *Becoming a Poetics of Possibilities** is a multi-layered, kaleidoscopic, "speculative" contextualization where the medium is the message, and everything is in the process of "doing". Raising fundamental questions about how we know what we know about creativity and the imagination, these phenomena are approached from (branches of) aesthetics, anthropology, film and literary studies, psychology, and philosophy from Aristotle to Žižek, in which visions representing current theory are overlaid or challenged. From the "becoming" of this *Poetics*, some operationalizable "qualia" have been derived, such as appearance, encounter, event, experience, and (un)surprisingly, "taste and tackiness," with agency and flair in the forefront. As an "apparatus," the *Poetics* simultaneously provides a tool for reverse-engineering and understanding the involute's transformation to the next level. To this end, artworks and interpretations of artworks are ideal stimuli, for works of art are difficult yet meaningful in every sense, and interpretations are at the heart of agency. The *Poetics* serves as a prelude to subsequent mixed-methods empirical research. Resulting outcomes can contribute to the development of a common language and framework, with the ultimate goal of creating cross-disciplinary, useful knowledge that directly informs and inspires action to future-proof (arts) education and environments.

* Derikx, N. P. M. (Upcoming, 2024). *Becoming a Poetics of Possibilities. Using Art Interpretations to Reverse-Engineer the Imaginative Act and Receptive Mind.* Palgrave Macmillan.

Keywords: Agency and Flair; Art Interpretation; Involute Hierarchical Structure of the Index

Exploring the Emotional Palette of Musical Instruments - Novel Tools Trigger Artistic Innovation

Leonardo Auri, Henrik von Coler & Christoph Meinel

Technische Universität Berlin

Music and emotion are fundamentally intertwined. This relationship prompts questions around measurement, theory, and design. Do different musical instruments offer varying capacities for inducing different emotions in the listener? For instance, the violin is often associated with tenderness or sorrow, while the trumpet might more easily convey triumph. Could the introduction of new instruments broaden the available emotional spectrum, potentially giving rise to new genres or modes of expression?

This paper introduces the Emotive Musical Instrument Scale (EMIS), a method for assessing the emotional expressivity of musical instruments, building upon the Geneva Emotional Music Scale (GEMS). The study evaluates and compares the capacity of both traditional and innovative musical instruments to elicit a wide range of emotions in listeners.

The EMIS protocol asks expert musicians to produce short musical excerpts intended to evoke specific emotions according to the dimensions of the GEMS scale. Listeners evaluate the excerpts using the GEMS questionnaire. The results are compared to ideal scores, allowing for analysis of instruments' expressive strengths and weaknesses.

An instrument may inherently favour certain emotional palettes. Furthermore, based on EMIS analysis and additional qualitative assessment of a novel neural-network-based electro-acoustic instrument, preliminary evidence suggests that the emotional dimensions captured by GEMS may only represent a subset of the full range of musical emotional expression. This potential underrepresentation may be attributed to the GEMS framework's initial reliance on a limited range of music genres and instruments.

Keywords: Musical Expressivity, Innovative Instruments, Emotional Musicology

Wednesday, September 18th

Session Nautilus

Wed-3

Education - V

Chair: ***M. van Hooijdonk***

MARCONI INSTITUTE FOR CREATIVITY *moving ideas*

Investigating the links between curiosity, wonder, and creativity in school children

Marina Bazhydai, Daphne Barker & Charlotte Rothwell

Lancaster University

Creativity has been theoretically linked with curiosity and wonder as epistemic emotions supporting creative process. However, empirical investigations are rare, in particular in school aged children, partially due to the methodological difficulties in reliably measuring each construct. 436 UK children aged 9-11 were tested online. Creativity was operationalised as divergent thinking and assessed using the unusual uses task. The consensual assessment technique was used to rate the responses and generate a creativity index. We also included a single self-report item ("I am a creative person"). Wonder was captured with the newly validated Wonder Chart (Broekhof & Schinkel, 2023; Bazhydai, Barker, & Rothwell, in prep). Curiosity was measured with the attitudes towards curiosity self-report scale (Post et al., 2019), a behavioural measure indicative of children's motivation to resolve ambiguity and propensity to choose more ambiguous stimuli (connect-the-dots task; Jansen et al., 2021), and the parent-report epistemic curiosity scale (Piotrowski et al., 2014). We also measured the Big Five personality traits parent-report (Asendorpf & van Aken, 2003). The mean creativity rating on the unusual uses task was positively correlated with children's attitudes towards curiosity, preference for ambiguity and propensity to choose more ambiguous stimuli as a behavioural measure of curiosity, but not to wonder, self-reported creativity, or parent-report personality measure of the child's openness to experience and curiosity. These results highlight both methodological considerations (validated measures, trust in children's self-report, utility of parental report, online task administration) and conceptual links between wonder, curiosity and creativity (Bazhydai & Westermann, 2020; Glăveanu, 2019).

Keywords: children, epistemic emotions, creativity measures

Innovative problem solving in young children: How exploration, executive function, and divergent thinking matter?

Jiajun Guo, H. Bai, X. Long, X. Su, W. Pang

East China Normal University

This study examines the influence of exploratory behaviors, executive function (EF), and divergent thinking (DT) on preschoolers' abilities to solve creative problems, particularly within the tool innovation paradigm. Building on prior research, our investigation involved a variety of tasks to capture the breadth of children's tool innovation behaviors. The research found that innovative skills exhibited significant variability across tasks and generally increased with age, suggesting a developmental progression. Importantly, a higher level of DT and increased engagement in exploratory behaviors were key predictors of tool innovation success. Moreover, both general intelligence and DT were positive and significant predictors of exploratory behaviors. As children mature, they tend to exhibit a higher likelihood of achieving "one-shot success," completing tasks without attempting less productive options. Notably, our investigation also unveiled that young children were generally less competent in solving innovative tasks involving subtraction compared to those involving addition and reshaping, which warrants further research in the future. Regarding the role of EF, inhibition and cognitive flexibility emerged as contributing factors, albeit with a lesser impact compared to the roles played by DT, exploratory behaviors, and general intelligence. These findings extend our understanding of the behavioral and cognitive correlates of innovative problem solving in early childhood. They underscore the role of ideation, discovery behavior and general intelligence in children's creative problem-solving abilities in tool innovation. Future research should delve deeper into these relationships, and instructional strategies aimed at fostering creative and innovative problem-solving skills should consider incorporating activities that promote these key abilities.

Keywords: tool innovation, divergent thinking, executive function

How does fear of creativity influence math learning? A study on creativity anxiety in primary school students

Eleonora Doz, S. Agnoli, S. Pellizzoni & M.c.Passolunghi

University of Trieste, Department of Life Sciences

Creativity has long been recognized as a crucial component of mathematical achievement. Despite its central role, just recently researchers have started focusing on emotional factors hindering the potential expression of creative abilities, such as creativity anxiety. Creativity anxiety refers to the fear or apprehension experienced when required to be creative. Previous studies conducted on adults found creativity anxiety to detrimentally affect creative thinking, even after controlling for general anxiety. These findings suggest that creativity anxiety may hinder individuals from reaching their full creative potential, thereby impacting achievement across different domains. However, no study has investigated the effect of creativity anxiety in primary school children and specifically on mathematical creativity and math achievement.

The present study aimed to investigate the role of creativity anxiety in math learning by exploring the relationship between creativity anxiety, individual differences in domain specific (mathematical) and domain general creative thinking and math achievements in primary school children. Third, fourth and fifth graders were tested on creativity anxiety (CAS; Daker et al., 2020), general (EPoC; Lubart et al., 2011) and mathematical creativity (Mathematical creativity test; Kattou et al., 2013), and different measures of math achievement (calculation skills, arithmetic reasoning, and word-problem solving). Data collection is currently underway, and the findings will be discussed in the presentation. The results could contribute to deepen the understanding of the complex relationship between creative thinking and math learning considering children's individual differences in creativity anxiety, as well as offer insight for the development of interventions aimed at fostering greater mathematical potential.

Keywords: creativity anxiety, mathematics, mathematical creativity

Unraveling the interactive effects of Fear of Evaluation, Feedback Valence, and Feedback Hierarchy on Creative Performance in high school students

Xiaojing Gu[1], Yuchen Zou[2] & Peiqi Shi[2]

[1] Center for Educational Science and Technology, Beijing Normal University; [2] Faculty of Education, Beijing Normal University;

Evaluative feedback plays a crucial role in educational settings. The current study aims to examine whether individual differences in fear of evaluation vary in the way they respond to evaluative feedback, subsequently influencing creativity in high school students. Study 1 (N=531) explores the interactive effects of fear of positive (FPE) and negative evaluation (FNE), feedback valence (positive, negative), and feedback hierarchy (person, task) on high school students' creative performance. Results reveal that FNE participants experienced a significant decline in response to task negative feedback compared to the positive feedback condition; no such difference was found for FPE participants. Study 2 (N=251) intervenes with a creativity strategy to mitigate the negative impact of task negative feedback on FNE participants' creativity. Findings suggest that the creativity strategy alleviates the adverse effects of negative feedback on the creative performance of FNE participants. These results have implications for guiding evaluators in providing constructive feedback and assisting students in effectively coping with negative feedback.

Keywords: Fear of evaluation, feedback valence/hierarchy, creativity

Wednesday, September 18th

Session Astrea

Wed-3

Creative process - II

Chair: ***Stefano Rini***

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Creative problem finding through Uh-oh moments - spreading activation in negative insight

Hill, G.[1] & Kemp, S. [2]

[1] *University of Buckingham;* [2]*Kings College London*

Theories of creative insight were developed with a notion of Aha as a sudden and novel moment of understanding that provides a solution to a problem. The origins of this conceptualisation can be seen to draw from early stage-theories of creative problem solving, such as Wallas, where the creative insight occurs as a solution in a moment of illumination. Recent work suggests that in addition to problem solving, creative insight may also take the form of problem finding moments (negative insight or Uh-oh moments). It is important therefore to explore how psychological theories and models of creative problem solving that were developed for positive, problem-solving moments can be applied to problem finding insight. For goal focused, process accounts such as Representational Change Theory and Criterion for Satisfactory Progress theory, a lack of a goal seen in problem finding, negative insight is problematic. Spreading activation through associative networks likewise assume that there is awareness (activation) of the problem to be solved. In problem finding insight, where there is no activated goal, the concept of salience is argued to be useful in bridging this theoretical gap. Therefore, it is proposed to extend the spreading activation theory of creative problem solving to incorporate problem finding insight moments. Such an approach compliments contemporary work with a focus on semantic, associative networks in the area of creative problem solving.

Keywords: Insight moments, creative problem solving

The influence of stimuli modality on creative performance

Cecilia Segatta, W.Ross, P. Bernardis, L.Campidelli, G. E.Corazza, A. Faiella, S.Mastria, M. Zanon, S.Agnoli

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The presented pre-registered study aims contributing to creativity research offering a new perspective on the influence of stimuli modality on creativity performance in one of the most used divergent thinking tests: the Alternative Uses Task (AUT, Guilford, 1967). Research findings show that stimulus modality may interfere with the ability to produce creative solutions in the AUT. For instance, pictorial modality is often related to a functional fixation that constrains creative cognition (Chrysikou et al., 2016). In the present study we will implement three stimulus modalities: verbal, pictorial, and video (basic manipulation of the stimulus). The study will investigate the creative performance in 42 individuals, presented with an AUT task characterized by different stimuli modalities. We hypothesize that stimulus modality can influence the creative performance in divergent thinking tasks (i.e., AUT). Specifically, (H1) ideas generated by participants after the presentation of an object in the verbal modality will be more creative compared to the ideas generated after the corresponding pictorial presentation; (H2) ideas generated after the presentation of an object in the video modality will be more creative than the ideas generated after the corresponding pictorial presentation; (H3) ideas generated after the presentation of objects in the verbal modality will not differ in creativity as compared to the ideas generated after the video presentation of objects manipulation . The data collection is currently ongoing; results of the analyses testing the pre-registered hypotheses will be presented at the conference.

Keywords: Creative performance; stimulus modality; Alternative Uses Task

How does motivation of the artists shape reception of their work?

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Previous research has unveiled a myriad of reasons for creative behavior. However, there have been few attempts to examine how the motivation of creators impacts the way their works are appreciated and assessed by laypersons. The present work included two online experiments aimed at revealing how people perceive and assess paintings based on the motivation of the artist who created them. In the first experiment, 229 participants (48% females; age: M = 19.48, SD = 1.50) were presented with three paintings each accompanied by a different motivation. The artist's motivation was a within-subjects factor with three levels: monetary condition (i.e., a way to make a living), passion condition (i.e., art is a loved activity bringing fulfillment), and control condition (i.e., neutral information about the artist's life). Participants had to rate each painting by creativity, likability, and technical skill. The mean comparison found negligible differences across motivation conditions for each rated quality (Cohen's d = 0.01–0.11). The second experiment was conducted to replicate the previous findings and had two minor modifications: (1) participants rated three paintings in each motivation condition, and (2) paintings were sampled from the Vienna Art Picture System (VAPS) dataset with optimized stimuli standardization. The second experiment is in the stage of data collection, and preliminary results will be ready by the time of the conference.

Keywords: creative motivation; visual arts; art perception

Effects of 360°videos of virtual nature on creativity for organizations

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Virtual nature has increasingly emerged as similar to real nature in conveying positive moods, supporting wellbeing and restoring cognitive function. However, the impact of virtual nature on creativity is still to be fully explored. These studies were based on the practical need of employees at work: to generate original and meaningful ideas in a limited amount of time and under pressure. Then, 360° video (virtual nature condition) was compared with autobiographical recall of a nature (autobiographical recall condition) to assess employees' divergent thinking abilities. During the second study, we investigated the emotional impact. The experiment followed a within-subject research design involving healthy employees. The CNS and EBS were used to measure nature attitudes. In addition to the Alternative Uses Test (AUT), after each condition, participants were asked ad hoc questions to measure presence and immersion. In the second study, before and after each condition, the AESTHEMOS, PANAS and a single item of emotion were administered. Results of the first study showed that creativity levels did not differ between the two conditions. However, an ANCOVA model including nature's beauty engagement as a covariate, showed a significant difference between the two conditions in terms of flexibility. Specifically, flexibility increases after exposure to 360° video condition. This suggests that virtual nature can provide the same benefits to divergent thinking as simply recalling a memory of a natural place, and that individual variables can affect its effectiveness. Data collection of the second one is still ongoing.

Keywords: divergent thinking, nature, video 360°

Wednesday, September 18th

Session Alvania

Wed-3

Methodology - II

Chair: ***Lorenzo Campidelli***

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Be fluent and be creative: How instruction effect translates into creative agency

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University of Wrocław

Research on creative self-beliefs conducted in the last two decades has mostly focused on their role in initiating and sustaining creative behavior. However, the sources of creative confidence remain relatively less understood. Social Cognitive Theory views people's performance as the main driver of their self-perception, with the reverse relationship (the causal self-perception – performance link) also being well-established. In the present preregistered study, we experimentally tested the role of task performance in creative confidence. More specifically, we used the "be creative" instruction to manipulate participants' divergent thinking performance and examine if this manipulation (and the expected boost in performance) translates into their creative confidence. Participants (N = 300) solved the Alternate Uses Task (AUT) under "be fluent" or "be creative" instructions and answered both task-specific and trait-like creative confidence items. Consistent with our hypothesis, the ideas were more original in the "be creative" condition, with a robust effect size (d = 1.23). People who performed better were found to be more confident, but only when task-specific and not trait-like creative confidence was considered. Notably, however, we did observe a moderated mediation effect: task performance mediated the link between instruction and trait-like creative confidence among those participants who were metacognitively accurate, i.e., able to adequately assess creativity of their ideas. In sum, these findings not only speak to the relevance of performance as a building block of creative agency but also highlight the role of creative metacognition in this process.

Keywords: creative confidence, AUT instruction effect, creative metacognitive accuracy


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Testing verbal fluency and the Woseco task for capturing scientific creativity among Austrian teenagers via semantic networks

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Scientific creativity is present when individuals create novel links between distant scientific and non-scientific concepts. Such creative linking can be trained with the novel Word-sentence-construction (Woseco) task. This paper tests the Woseco task as a network-building process, capturing individuals´ ability in linking concepts across contexts. For instance, one might write: "At school there are blackboards. Teachers use blackboards." leading to the chain "school-blackboard-teacher". Iterating across sentences, one can build a Woseco network. Compared to verbal fluency networks, capturing co-occurrences of recollected ideas, the Woseco task emphasises syntactic and context-related connections. The latter might be relevant for achieving remote associations and problem-solving, both key aspects of scientific creativity. This study compares Woseco networks against verbal fluency networks created by N = 169 students enrolled in middle schools and academic secondary schools in Austria. 90 of these students underwent a SCIP (Scientific Creativity in Practice) intervention including perspective-taking, alternative uses and logic reasoning. The Woseco networks showed more prominent features of creativity than fluency networks, i.e. higher node clustering ($t = 14.88$, $p < .001$), lower network distances separating concepts ($t = -9.95$, $p < .001$) and overall lower network modularity ($t = -23.93$, $p < .001$). Additionally, significant differences in semantic network structure were observed between the intervention and control groups ($p < .022$) with the intervention group showing more flexible and interconnected networks. Hence, the Woseco task represents a promising contribution to creativity research for further investigating and potentially measuring scientific creativity.

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Keywords: Semantic networks, Creativity training, Scientific creativity

Developing a New Figural Remote Associations Test: A Pilot Study

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Pontificia UniversidadCatólica de Chile

Currently, there are not many remote association tests created in the Spanish-speaking world. In this paper, we introduce a new Figural Remote Associations Test (FRA-T) tailored for Spanish-speaking populations. The FRA-T asks test takers to find or identify a key object/thing based on its association with three images that are presented. Each of these images has a specific type of association with the key object/thing. Thus, the key object/thing can be in the CONTEXT provided by one of the images, or it has a similar FORM or a regular INTERACTION in everyday life with one of them.We piloted the test in a small sample of middle school and high school students from urban schools in Santiago, Chile (n=173, female=77). In addition to the FRA-T, participants answered a divergent thinking test, a verbal test of remote associations, and three self-report scales of mind wandering, mindfulness, and playfulness. They also answered a short scale of everyday creativity. The FRA-T correlated positively with both the divergent thinking (r=41; p<.001) and the verbal remote associations test (r=.49; p<.001). It also correlated positively with the scale of everyday creativity (r=30; p<.05). A multiple regression found the scale of playfulness predicted the FRA-T taking into consideration both the mind wandering and mindfulness scales. We discuss the nature of the tasks presented in the test to the participants, its suitability to assess individual differences in creativity in middle school and high school participants, and the methodological limitations of the pilot study.

Keywords: creativity; assessment; individual differences

Automatic Scoring of Creative Problem-Solving with Large Language Models: A Comparison of Originality and Quality Ratings

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Penn State University

Creative problem-solving is a naturalistic form of creative thinking involving the generation of solutions that are not only original but also of high quality (i.e., plausible and effective). Naturalistic tasks that evaluate both originality and quality are vital for the promotion of creativity in real-world settings—yet scoring such tasks remains challenging, due to costly human labor required to manually rate task responses. Past work has shown that large language models (LLMs) can be trained to predict human originality ratings of responses to tests of divergent thinking. In the present research, we extend this work to creative problem-solving, examining whether both originality and quality can be automatically scored for a naturalistic creativity task. We gathered data from 10 studies, amounting to 3,235 participants who completed a creative problem-solving task (CPST). We then fine-tuned two open-source LLMs, RoBERTa and GPT-2, to predict human ratings of originality and quality on the CPST, and compared their performance to two other scoring methods: elaboration (i.e., word count) and semantic distance. We found that RoBERTa and GPT-2 models predict solution quality (RoBERTa, r = .78; GPT-2, r = .77) better than solution originality (RoBERTa, r = .72; GPT-2, r = .72). Moreover, we found that both models outperformed elaboration (quality, r = .68; originality, r = .49) and semantic distance (quality, r = .44; originality, r = .39) methods. We further found that RoBERTa and GPT-2 generalized to new CPST items not present in their training set, more so for quality (RoBERTa, r = .89; GPT-2, r = .89) than originality (RoBERTa, r = .41; GPT-2, r = .40). We therefore show for the first time that naturalistic creativity tasks can be automatically scored for both originality and quality. We also demonstrate that predictions of quality are more easily generalized to unseen prompts than predictions of originality,

suggesting that human judgments of originality are inherently more complex. Open access is provided to the models and training data.

Keywords: Automated Scoring; Creativity; Creative Problem-Solving; Large Language Models

Wednesday, September 18th

MIC Closing Keynote Speech - VI

Giovanni Emanuele Corazza

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