



MIC Conference 2023

BOOK OF ABSTRACTS

Blended Edition

September 11 - September 13, 2023



**UNIVERSITÀ
DEGLI STUDI
DI TRIESTE**



Fondazione Guglielmo Marconi



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
DIPARTIMENTO DI INGEGNERIA DELL'ENERGIA ELETTRICA
E DELL'INFORMAZIONE "GUGLIELMO MARCONI"



Journal of
Intelligence
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**UNIVERSITÀ
DEGLI STUDI
DI BERGAMO**



healthcare
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Notes:

Venue: University of Trieste, Department of Economics, Business, Mathematics and Statistics, Building D, Via Valerio no 4/1, Trieste

All conference times are CEST (Central European Summer Time)

Session identification taxonomy: stream-day-number

Streams are: Rita Levi Montalcini in Aula 3A or Claude Monet in Aula 3B,

Days are: Mon (Sep 11), Tue (Sep 12), or Wed (Sep 13)

Monday, September 11, 2023

9.00	<i>Online connection check-in</i>	
9.10	<p>MIC Conference 2023 opening Roberto Di Lenarda (<i>Rector of the University of Trieste</i>), Giovanni Emanuele Corazza (<i>President of Fondazione Marconi and MIC Founder</i>), Todd Lubart (<i>President of ISSCI</i>), Sergio Agnoli (<i>University of Trieste</i>)</p>	
9.30	<p>MIC Keynote Speech Zorana Ivcevic Pringle</p> <p><i>Beyond creative ideas: The mechanisms of creative action</i></p>	
10.00	 <p>Session Rita-Mon-1 AI & Creativity - Theory</p> <p>Artificial Intelligence & Creativity: A manifesto for collaboration <i>Florent Vinchon, Todd Lubart, Sabrina Bartolotta, Valentin Gironnay, Marion Botella, Samira Bourgeois et al.</i></p> <hr/> <p>Creativity and Innovation in Education in the Age of AI <i>Iwona Fluda</i></p> <hr/> <p>Creativity in Virtual Environments: Aspects Promoting Creative Work Alone and in a Group Setting <i>Daniel Sundquist, Maxence Mercier, Samira Bourgeois-Bougrine & Todd Lubart</i></p> <hr/> <p>A Hybrid Intelligence Approach to Training Generative Design Assistants: Partnership Between Human Experts and AI Enhanced Co-Creative Tools <i>Janet Rafner, Yaoli Mao, Yi Wang, Jacob Sherson</i></p>	 <p>Session Claude-Mon-1 Creativity in Art</p> <p>Creativity in Education and Museums: Partnerships in Formal and Informal Learning <i>Tricia Filippini, Donna Hulsey</i></p> <hr/> <p>Developing a STEAM Education program to facilitate students' multi-faceted understanding of history <i>Daichi Shimizu, Ibuki Yomogida, Takeshi Okada</i></p> <hr/> <p>Talking to an Art Piece: Pre-K's and Professionals Interacting With a Work in Progress <i>Helane S. Rosenberg</i></p> <hr/> <p>Arts and Sports Biases in Lay Persons' Perceptions of Creativity: A Preliminary Study <i>Min Tang, Sebastian Hofreiter</i></p>
11.00	<i>Break</i>	

September 11, 2023



11.15	 <p>Session Rita-Mon-2 <i>Creative Cognition</i></p> <p>Managing Your Muse: Exploring Three Levels of Metacognitive Control in Creative Ideation <i>Mathias Benedek, Izabela Lebuda</i></p> <hr/> <p>To defer or converge, that is the question <i>Paulina Larocca</i></p> <hr/> <p>Inhibitory control and creative cognition: Unravelling a paradoxical relationship <i>James Lloyd-Cox, Alan Pickering, Andrew Cooper, Joydeep Bhattacharya</i></p> <hr/> <p>Spillover Effects in Creative Thinking: Exploring the Impact of Prior Tasks on Creative Performance <i>Jennifer Haase, Paul H. P. Hanel</i></p>	<p>Session Claude-Mon-2 <i>Personality & Ind. Differences</i></p>  <p>Criminal Genius or Everyday Villain? Malevolent Creativity in Prisoners and the General Population <i>Corinna Perchtold-Stefan, Enikő Szabó, Christian Rominger, Andreas Fink</i></p> <hr/> <p>Investigating Daily Inspiration and Creativity in Creative and Non-Creative Individuals <i>Kaile Smith, Jennifer Drake</i></p> <hr/> <p>Are magicians like everyone else? Let's study their personality. <i>Marion Botella, Cyril Thomas</i></p> <hr/> <p>Personality and pro-environmental behaviour: the mediating role of creative potential <i>Massimiliano Palmiero, Marco Giancola, Simonetta D'Amico</i></p>
12.15	<i>Lunch</i>	
13.15	 <p>Session Rita-Mon-3 <i>Measurement</i></p> <p>A Systematic Review of Divergent Thinking Assessment <i>Janika Saretzki, Boris Forthmann, Mathias Benedek</i></p> <hr/> <p>Process-Based Creativity Assessments for Faster, More Objective, and Scalable Creativity Assessments <i>Kim-Pascal Borchart, Christoph Meinl</i></p> <hr/> <p>Going beyond self-report in measuring creative self-concept: An initial exploration of the photo-prompting technique <i>Lidia Wojtycka, Aleksandra Zielińska, Izabela Lebuda, Maciej Karwowski</i></p> <hr/> <p>Disrupting patterns of interaction to enact creative dynamics <i>Julien Laroche</i></p>	<p>Session Claude-Mon-3 <i>Education & Development</i></p>  <p>Exploring the relation between creativity, anxiety and arithmetic word problems in primary school children <i>Eleonora Doz, Sergio Agnoli, Maria Chiara Passolunghi</i></p> <hr/> <p>Creativity and blackness: how black students understand the construction of their creative processes at public university <i>Mônica Souza Neves-Pereira, Manuela Coelho Amin Ferraz</i></p> <hr/> <p>Interim outcomes of a 3-year, multi-level project to foster learners' creativity in 16 schools <i>Paul T. Sowden, Marnie Seymour, Lorraine Pattinson, Jo Cottrell, Frances Warren, Judy Waite et al.</i></p> <hr/> <p>Cognitive and Creative Benefits of Lightening Up: Using Positive Humor in Education <i>Donna B. Hulsey, Tricia Filippini</i></p>
14.15	 <p>Session Rita-Mon-4 <i>Cognition and Neuroscience</i></p> <p>The Cognitive Neural Mechanism of Knowledge Influencing Scientific Creativity and Its Application <i>Weiping Hu, Yangping Li, Xinyi Li</i></p> <hr/> <p>Do you like your ideas? A study of the neural bases of idea evaluation in creativity</p>	<p>Session Claude-Mon-4 <i>Theoretical propositions</i></p>  <p>Pollinating Connections <i>Barbara Doran, Paulina Larocca</i></p> <hr/> <p>Social Semiosis: a bridge between Creativity and Communication <i>Ana Jorge</i></p>

	<p><i>Sarah Moreno Rodriguez, Alizée Lopez-Persem, Emmanuelle Volle</i></p> <p>Rethinking the Creative Process: Examining the Beginning and End of Ideation Using the Alternate Uses Task <i>Rafał Jończyk, Olga Witczak, Iga Krzysik, Katarzyna Bromberek-Dyzman, Guillaume Thierry</i></p> <p>The Emotional Antecedents of Insight: A Physiological Exploration <i>Sergio Agnoli, Wendy Ross, Anita D'Anselmo, Sara Scrimin, Radwa Khalil, Christian Rominger</i></p>	<p>De Daumier-Smith and the Creative Thinking <i>Katya Stoycheva</i></p> <p>Thinking about Creative Thinking: The 4P Framework of Creative Metacognition <i>Julia von Thienen, Theresa J. Weinstein, Christoph Meinel</i></p> <p>How senior executives improvise in response to major crises: Two unfolding paths <i>Ana Luisa Ilha Villanova, Miguel Pina e Cunha, Luca Giustiniano, Francisco Xavier Froes</i></p>
15.30	<p>MIC Keynote Speech Maciej Karwowski</p> <p><i>Creativity as Agentic, Strategic, and Purposeful Action</i></p>	
16.00	<p><i>Break</i></p>	
16.15	<p style="text-align: center;">Plenary Symposium-Mon-5 Chairs: Giulia Fusi & Barbara Colombo</p> <p style="text-align: center;">Creativity and Health: applications and future directions</p> <p>Creativity, health and neuromodulation. Where is the hidden link? <i>Barbara Colombo, Stefania Balzarotti</i></p> <p>Creative cognition as a resource for health in healthy and pathological aging <i>Giulia Fusi, Maura Crepaldi, Virginia Maria Bors, Jessica Gianni, Marina Zanetti, Ignazio Di Fazio, Emanuela Facchi, Laura Colautti, Francesca Garau, Massimiliano Palmieri, Salvatore Bonfiglio, Alessandro Antonietti, Maria Pietronilla Penna, Luca Rozzini, Maria Luisa Rusconi</i></p> <p>Parkinson's disease and creative abilities: what do we know so far? Mechanisms and future implications <i>Chiara Siri, Alessandra Ranghetti, Viviana Cereda, Maria Luisa Rusconi, Margherita Canesi</i></p>	<p><i>Sponsored by</i></p> 
17.15	<p>MIC Keynote Speech Robert Sternberg</p> <p><i>Transformational Creativity</i></p>	
17.45	<p><i>End</i></p>	
<p><i>Welcome Cocktail at Immaginario Scientifico</i></p>		

Tuesday, September 12, 2023

8.50	<i>Online connection check-in</i>	
9.00	MIC Keynote Speech Nathalie Bonnardel <i>Cross-pollination in collective and individual creative situations: Views and perspectives on some mechanisms and methods to foster it</i>	
	 Symposium Rita- Tue-1 Chair: Kamila Urban	Symposium Claude-Tue-1  Chair: Adva Margaliot
9.30	Creative Metacognition and Creative Regulation: from Individual to Group Perspective Creative Problem-Solving in Essay Writing: A Mixed-Methods Study <i>Marek Urban, Kamila Urban</i> <hr/> How famous artists write about their metacognition, self-regulation and creative problem-solving? <i>Filip Svacha, Marek Urban</i> <hr/> The Role of Co-Regulation and Socially Shared Regulation in a Case Study of Beatles <i>Kamila Urban, Marek Urban</i>	Fan for Fun: Methods for Developing Creativity through Mediate Learning Experience The Role of Creativity in the Process of teachers' professional education <i>Adva Margaliot</i> <hr/> Mediated learning Experience (M.L.E) <i>Efrat Bengio</i> <hr/> The contribution of an International Collaboration between two gifted centers from Croatia and Israel, for the development of friendship, values, and mutual commitment to create the best practices of creativity through Mediated Learning Experience <i>Ksenija Benaković</i>
10.30	 Session Rita-Tue-2 Cognitive approaches to creativity The Body-Mind Connection: Interoceptive sensitivity and mode shifting in creative thinking <i>Francesca Torno Jimenez, Caroline DiBernardi Luft, Joydeep Bhattacharya</i> <hr/> The way we search our memory predicts our creativity: A cognitive multiplex network approach <i>Yoed N. Kenett</i> <hr/> Self-Regulation Prompts Improve Creative Performance <i>Aleksandra Zielińska, Izabela Lebuda, Marta Czerwotka, Maciej Karwowski</i>	 Session Claude-Tue-2 Creativity in Team and at Work The effect of debriefs on team creative behavior and outcomes <i>Roni Reiter-Palmon</i> <hr/> Team creativity: A deep dive into developing a taxonomy <i>Sudapa Chompunuch, Vincent Ribiere, Valerie Chanal</i> <hr/> The change of perspective and point of view set by mobile teams in psychiatry: a creative (r)evolution <i>Sylvie Tordjman</i> <hr/> Enhancing Creativity Ideation for New Product Innovation through Weak Signals: Ideas and Concepts


	A Review and Meta-analysis of the Convergent Thinking from Perspectives Cultures and Neural Mechanisms <i>Jing Chen, Qunlin Chen, Jiang Qiu</i>	<i>Pondchanok Piraintorn, Nicolas Lesca, Irene Fan</i>
11.30	<i>Break</i>	
11.45	 <p>Session Rita-Tue-3 Mini Talks/Posters</p> <p>Cognitive components of creativity and their structural brain correlates in frontotemporal dementia <i>Victor Altmayer</i></p> <hr/> <p>Do you like your ideas? Computational account of how subjective idea valuation energizes and guides creative idea generation <i>lizée Lopez-Persem, Sarah Moreno-Rodriguez, Marcela Ovando-Tellez, Théophile Bieth, Stella Guiet, Jules Brochard et al.</i></p> <hr/> <p>Unlocking the switch: Exploring the neural mechanisms underlying creative switching <i>James Lloyd-Cox, Francesca Torno Jimenez, Joydeep Bhattacharya</i></p> <hr/> <p>Electrifying creativity with language: Brain dynamics of creative thinking in Polish-English bilinguals with semantic association objects <i>Ricky Pinaría, Rafał Jończyk</i></p> <hr/> <p>Distracted by words: the roles of irrelevance processing and openness on creative performance <i>Simone Zasso, Laura Franchin, Giovanni Emanuele Corazza, Sergio Agnoli</i></p>	 <p>Session Claude-Tue-3 Mini Talks/Posters</p> <p>Revolutionizing Sustainability through Creativity: An Empirical Approach to Enhancing Zero-Waste Garment Design <i>Jeremy M. Bernardoni</i></p> <hr/> <p>Creating or designing: What creativity and design thinking can learn from each other <i>Erin Michelle Todd, Grace Gandy, Payton Stewart</i></p> <hr/> <p>Religiosity: A Hindrance or Catalyst of Creative Beliefs and Achievement <i>Carol M. Raymond, Lindsay Ellis Lee</i></p> <hr/> <p>Creativity Quotes: Studying Quotes as reflection of lay conceptions about Creativity <i>Simon Ceh, Brian Lucas, Izabela Lebuda, Mathias Benedek</i></p> <hr/> <p>An overview on psychological well-being and emotional intelligence of adolescents. Is there a place for creativity? <i>Zeynep Özal, Federica Ambrosini, Roberta Biolcati, Giacomo Mancini</i></p>
12.45	<i>Lunch</i>	
13.45	MIC Extended Speech Indre Viskontas <i>Crossing Cultures: When a Neuroscientist Directs Opera</i>	
14.15	ISSCI General Assembly	

16.00	<i>Break</i>	
16.15	 <p style="text-align: center;">Symposium Rita-Tue-4 Chair: Todd Kettler</p> <p style="text-align: center;">The Influence of Belief Systems on Creative Education</p> <p>Teacher Beliefs about Creativity and Creative Pedagogy: A Systematic Review <i>Tim Spitsberg, Beatrice Ruiz</i></p> <hr/> <p>Teacher Beliefs about Assessing Student Creativity <i>Meg Atha, Jen Katz-Buonincontro</i></p> <hr/> <p>Creative Self-Beliefs Research in Education <i>Paula Alvarez-Huerta</i></p> <hr/> <p>Supporting and Sustaining Creative Pedagogy: The Importance of Teacher Belief Systems <i>Todd Kettler</i></p>	 <p style="text-align: center;">Symposium Claude-Tue-4 Chair: Shaunise Robinson</p> <p style="text-align: center;">Using Children’s Books that Inspire Creativity and Innovation in Young Girls to Teach SEL skills</p> <p style="text-align: center;"><i>Shaunise Robinson Joyce Miller Connie Phelps Martina Brazzolotto</i></p>
17.15	MIC Keynote Speech Vlad Glaveanu <i>Who let the bees out? The cross-pollination revolution of Possibility Studies</i>	
17.45	<i>End</i>	
Social Dinner		

Wednesday, September 13, 2023

8.50	<i>Connection check-in</i>	
9.00	MIC Keynote Speech Neil Maiden <i>Co-creative AI tools: Codifying creativity knowledge to augment human creative thinking</i>	
9.30	 <p style="text-align: center;">Session Rita-Wed-1 <i>Creativity in Organizations</i></p> <p>Creativity Predictors in Organizational Contexts: An Empirical Study in Creative Ecosystems <i>Felipe Zamana</i></p> <hr/> <p>Creative processes in a hybrid work environment: A case study <i>Øystein Tønnessen, Bjørn-Tore Flåten</i></p> <hr/> <p>Spurring Inclusive Entrepreneurship through Creative Cross- Pollinations <i>Leonie Baldacchino, Margaret Mangion</i></p>	 <p style="text-align: center;">Session Claude-Wed-1 <i>Creativity & Technologies</i></p> <p>The effect of avatars and contextual cues in virtual environments on creative performance <i>Jiayin Liu, Jean-Marie Burkhardt, Todd Lubart</i></p> <hr/> <p>Avatarize Your Creativity: Exploring the Power of Avatars in Boosting Innovative Thinking <i>Karima Toumi, Nathalie Bonnardel, Fabien Girandola</i></p> <hr/> <p>#Creativity: Exploring Lay Conceptualizations of Creativity with Twitter Hashtags <i>Simon M. Ceh, Alexander P. Christensen, Izabela Lebuda, Mathias Benedek</i></p> <hr/> <p>Zeitgeist - participatory, real-time interface for Flow stimulation <i>Shama Rahman, Oliver Gingrich</i></p>
10.30	 <p style="text-align: center;">Session Rita-Wed-2 Mini Talks/Posters 2</p> <p>Decoding poetic creativity: The moderating role of expertise and personality traits <i>Soma Chaudhuri, Joydeep Bhattacharya</i></p> <hr/> <p>Designing a creative contemporary dance program for non-dance majors to facilitate “dancing without realizing” <i>Yuko Nakano, Takeshi Okada</i></p> <hr/> <p>Exploring Changes in the Multimodal Behavior of Actors in Acting Training <i>Jingyan Sun, Takeshi Okada</i></p> <hr/> <p>Is music training linked to far transfer effects on other creative achievements and what is the role of family in this relationship? <i>Theano Eirini Kakaziani, Alwin de Rooij, Hedwig van Bakel</i></p>	 <p style="text-align: center;">Session Claude-Wed-2 Mini Talks/Posters 2</p> <p>Japanese self-reports on their creativity conception, creative activities and achievements <i>Chiaki Ishiguro, Tokunori Sato, Nobuyuki Inamizu, Kazuki Matsumoto, Takumitsu Agata, Takeshi Okada</i></p> <hr/> <p>Aesthetics and Sustainable Design Through Reconstruction/Redirection: Moving Fashion Forward <i>Mary Ruppert-Stroescu, Jeremy Bernardoni</i></p> <hr/> <p>Baylor mathematical creativity test <i>Gülşah Batdal Karaduman, Todd Kettle</i></p> <hr/> <p>Non-Conformist Achievers: Investigating the Role of Conscientiousness in Scientific Creative Achievement <i>Sebastian Hofreiter, Min Tang</i></p>

	<p>Creativity and education: a proposal for the development of classroom creative processes <i>Mônica Souza Neves-Pereira, Alane Medeiros Carvalho, Ana Beatriz de Castro Silveira Bichuette</i></p>	
11.30	<i>Break</i>	
11.45	 <p style="text-align: center;">Session Rita-Wed-3 <i>Embedded and Embodied Creativity</i></p> <p>The Body-Mind Connection: The role of cardiac afferents in creative mode-shifting <i>Francesca Torno Jimenez, Caroline Di Bernardi Luft, Joydeep Bhattacharya</i></p> <p>-----</p> <p>The heart's role in creative ideation performances in daily life: Insights from ambulatory monitoring <i>Christian Rominger, Andreas Fink, Bernhard Weber, Corinna M. Perchtold-Sefan, Mathias Benedek, Andreas R. Schwerdtfeger</i></p> <p>-----</p> <p>From Lab to Life: Physiologically Informed Creativity Research in Naturalistic Settings <i>Manisha Manaswini, Holly McKee, Christoph Meinel, Bert Arnrich, Julia von Thienen</i></p> <p>-----</p> <p>Show us what you got! A cross-cultural comparison of mindset presentation in "...Got Talent!" TV shows <i>Izabela Lebuda, Simon M. Ceh, Mathias Benedek</i></p>	 <p style="text-align: center;">Session Claude-Wed-3 <i>Individual Differences in Childhood</i></p> <p>Mood and Creativity in Children: Differential impacts on convergent and divergent thinking <i>Macarena-Paz Celume, Zorana Ivcevic, Franck Zenasni</i></p> <p>-----</p> <p>Profiles of Creative Potential in Children: Findings from Slovenian Adaptation of EPoC <i>Mojca Juriševič, Urška Žerak</i></p> <p>-----</p> <p>Creativity, mind wandering and mindfulness: An exploratory study in Chilean student <i>David Preiss, Benjamin Carmona</i></p> <p>-----</p> <p>Creative problem solving as a multilevel regulatory process in Child-Robot-Interaction <i>Margarida Romero</i></p>
12.45	<i>Lunch</i>	
13.45	<p>MIC Keynote Speech Giovanni Emanuele Corazza</p> <p><i>Creative Cross-Pollinations: The Dance of Surprising Ideas</i></p>	
14.15	 <p style="text-align: center;">Session Rita-Wed-4 <i>Arts & Writing</i></p> <p>"Thinking on Paper": exploring the role of journalling during the creative process of screenwriting <i>Margaret McVeigh, Andreia Valqueresma</i></p> <p>-----</p> <p>Promoting perceived creativity in the prospective behavior: Benefits of design-fiction <i>Bagousse</i></p> <p>-----</p> <p>The effect of creative drama on the creativity process <i>Gülşah Batdal Karaduman, Tolga Erdoğan</i></p>	 <p style="text-align: center;">Session Claude-Wed-4 <i>Miscellany</i></p> <p>Activation of Metacognitive Monitoring in Creative Ideation <i>Marta Czerwonka, Izabela Lebuda, Aleksandra Zielińska, Mathias Benedek</i></p> <p>-----</p> <p>Perceived Embodiment and Creativity in Digital Art <i>Laure Herman, Caterina Moruzzi</i></p> <p>-----</p> <p>Board Games and Creativity : The Mediating Role of Playfulness <i>Maxence Mercier, Samira Bourgeois-Bougrine</i></p>

	<p>Embodied Sound Generation - Introducing the unexpected: sound and movement enhanced storytelling <i>Leonardo Auri, Holly McKee, Christoph Meinel</i></p>	<p>Becoming a poetics of possibilities <i>Nicole Derikx</i></p>
15.15	 <p>Session Rita-Wed-5 Design - Engineering</p> <p>Generational Cohorts and the Evolution of Creative Development in the Prime Aesthetic Formation: A Comparative Analysis <i>Jeremy M. Bernardoni, Mary Ruppert-Stroescu</i></p> <p>Perceptions of AI-Based Team Members and Team Dissimilarity on Team Creativity: A Longitudinal Study <i>Deeviya Francis Xavier, Christian Korunka, Roni Reiter-Palmon</i></p> <p>Smart Garden Office: Enhancing Workplace Creativity and Well-being with Interactive Sound Systems in Nature <i>Holly McKee, Tim Strauch, Philipp Steigerwald, Luca Hilbrich, Julia von Thienen, Christoph Meinel et al.</i></p> <p>Future perfect: Creative practices in contemporary fashion design that propel the industry forward. <i>Mary Ruppert-Stroescu, Jeremy M. Bernardoni</i></p>	 <p>Session Claude-Wed-5 Education – Theoretical Propositions</p> <p>Cultivating Creativity, Innovation Thinking, and Resilience in Young Students by Teaching Entrepreneurship <i>Donna B. Hulsey</i></p> <p>Cultivating 21st Century Skills Through Themed-Based Astrobiology Lessons in P-12 Schools <i>Connie Phelps</i></p> <p>Lessons From a Worldwide Pandemic: Geographic Impacts on Place Based Theory, Technology and Creativity <i>Ted D.R. Green</i></p> <p>Affective-semiotic self-regulation of creative processes in free improvisation <i>Diogo Monzo, Mônica Souza Neves-Pereira</i></p>
16.15	<i>Break</i>	
16.30	Panel Creativity and the Future of Education	
17.30	MIC Best Speaker Award & Conference Closure	
18.00	<i>End</i>	

Monday, September 11th

MIC Keynote speech

Zorana Ivcevic

Beyond creative ideas: The mechanisms of creative action

Zorana Ivcevic

Yale Center for Emotional Intelligence

Decades of research provide rich knowledge about the nature of the creative potential (in terms of personality traits, motivation, and cognitive abilities) and creative products. In particular, the processes of idea generation have received much attention in creativity studies, ever since the dawn of modern creativity research spurred by J.P. Guilford in the 1950s. However, the process between generating creative ideas and actualizing these ideas in creative products or performances is less well understood. In this talk, I ask what we know and what still remains unanswered about transforming creative ideas into accomplishments. I will argue that the success of this process substantially depends on effective self-regulation. Building and extending on social psychological research on self-regulation, I define what is specific to self-regulation of creative action, offer a delineation of self-regulation of creative action in relation to metacognitive processes in creative thinking, and present emerging research on self-regulation of creativity. I conclude by discussing future directions in the study of self-regulation in the creative process from having an idea to doing something with it.

Monday, 11th September

SESSION RITA-Mon-1
AI & Creativity - Theory

Artificial Intelligence & Creativity: A manifesto for collaboration

Vinchon, F.,¹, Lubart, T.¹, Bartolotta, S.², Gironnay, V.¹, Botella, M.¹, Bourgeois, S.¹, Burkhardt, JM³, Bonnardel, M.⁴, Corazza, G.E.⁵, Glăveanu, V.⁶, Hanson, M.H.⁷, Ivcevic, Z.⁸, Karwowski, M.⁹, Kaufman, J.C.¹⁰, Okada, T.¹¹, Reiter-Palmon, R.¹² & Gaggioli, A.^{13,14}

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⁵*University of Bologna, Marconi Institute for Creativity, Bologna, Italy*

⁶*School of Psychology, Dublin City University, Ireland; and Centre for the Science of Learning and Technology, University of Bergen, Norway*

⁷*Teachers College, Columbia University*

⁸*Yale Center for Emotional Intelligence, Yale University, USA,*

⁹*Institute of Psychology, University of Wrocław, Poland*

¹⁰*University of Connecticut*

¹¹*The University of Tokyo*

¹²*Department of Psychology, University of Nebraska, Omaha, NE 68182, USA*

¹³*Research Center in Communication Psychology, Department of Psychology, Catholic University of Milan, Milan, Italy*

¹⁴*IRCCS Istituto Auxologico Italiano, Milan, Italy*

In this presentation, titled "Artificial Intelligence & Creativity: A manifesto for collaboration," we aim to explore the potential of human-AI collaboration in creative fields and propose guidelines for responsible and ethical AI usage. Our discussion will focus on four scenarios that illustrate different possible futures of human-machine collaboration in creative tasks, while providing concrete examples for each. In addition to the scenarios, we will emphasize the importance of establishing "fundamental laws

of generative AI" that address concerns such as plagiarism, harmful content generation, and competition with human creators. These laws will also advocate for transparency by requiring disclosure of AI-generated content. Furthermore, we will discuss the necessity of clear labeling and adherence to ethical standards by AI developers and users. These standards will be crucial in ensuring the responsible use of AI in creative fields, fostering a positive and harmonious relationship between humans and AI, and maximizing the potential benefits of this collaboration. Through this presentation, we seek to promote a future in which AI and human creators work together in synergy, elevating creative productivity while respecting ethical considerations and human values during the creative process.

Keywords: Artificial Intelligence, Collaboration, Creativity

Creativity and Innovation in Education in the Age of AI

Fluda, I.

Ministry of Creativity LLC

The intersection of creativity, innovation, and artificial intelligence (AI) is increasingly important in education. This paper explores the impact of AI on education and the opportunities and challenges that arise from integrating AI into the curriculum. It focuses on the role of AI in enhancing creativity and its potential to disrupt traditional teaching methods and create new forms of educational experiences. Key findings suggest that AI can enhance creativity and innovation by providing personalized and adaptive learning experiences, facilitating collaboration and communication among learners, and supporting the development of critical thinking and problem-solving skills. However, the integration of AI also presents challenges, including ethical considerations, the need for teacher training and professional development, and concerns about the impact of AI on human creativity and innovation. Overall, the paper highlights the importance of a balanced approach to integrating AI in education that considers both the benefits and challenges of this emerging technology. The methodology adopted for this study involves a scoping review of the relevant literature and an analytical discourse to understand the theoretical implications of the findings. This methodology has been chosen to provide a comprehensive overview of the current understanding and future implications of AI in education.

Keywords: Artificial Intelligence, Creativity, Education

Creativity in Virtual Environments: Aspects Promoting Creative Work Alone and in a Group Setting

Sundquist, D., Mercier M., Bourgeois-Bougrine, S. & Lubart, T.

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France*

Whereas the physical environment's effect on creativity has been increasingly studied in recent years, characteristics of virtual environments (VEs) have not yet received the same attention. We examine what types of virtual environments are best suited for creative work alone or in a group setting.

In Study 1 (N=163), 26 screenshots representing a wide sample of available VEs were rated by participants in an online survey. In Study 2 (N=279), the stimuli used were a mix of screenshots and real-life photographs of similar environments. Central categories were identified by external judges and analyzed using repeated-measures ANOVA designs. It was hypothesized that individual differences in openness, extraversion and creative self-concept would moderate individual preferences. Finally, focus groups were asked to identify aspects of the stimuli considered positive as well as negative for creative work.

Across both studies, the results show that for indoor environments and those with a moderate amount of greenery, creative work in a group setting was preferred. For outdoor environments and those with a lot of greenery, working creatively alone was preferred. The presence of furniture was considered beneficial for creative work, with the effect being stronger in a group setting. In Study 1, unrealistic environments were considered more negative for creative work, especially in a group setting. The findings were largely corroborated by the focus groups. Substantial variance was found in the judges' ratings, suggesting individual perception of VEs to be subjective. The findings might guide future design of VEs for supporting creativity.

Keywords: Creativity; Virtual Environments

A Hybrid Intelligence Approach to Training Generative Design Assistants: Partnership Between Human Experts and AI Enhanced Co-Creative Tools

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The emergence of generative design (GD) has introduced a new paradigm for co-creation between human experts and AI systems. Empirical findings have shown promising outcomes such as augmented human cognition and highly creative design products. Barriers still remain that prevent individuals from perceiving and adopting AI, entering into the collaboration and sustaining it over time. It is even more challenging for creative design industries to adopt and trust AI where these professionals value individualities and expression, and therefore require highly personalized and specialized AI assistance. Here we present a holistic hybrid intelligence approach for individual experts to train and personalize their GD assistants on the fly. Our contribution to human-AI interaction is three-fold including i) a programmable common language between human and AI to represent the expert's design goals to the generative algorithm, ii) a human-centered continual training loop to seamlessly integrate the AI-training into the expert's task workflow, iii) a hybrid intelligence narrative to address the psychological willingness to spend time and effort training such a virtual assistant. This integral approach enables individuals to directly communicate design goals to AI and seeks to create a psychologically safe space for adopting, training and improving AI without the fear of job-replacement.

We concertize these constructs through a newly developed Hybrid Intelligence Technology Acceptance Model (HI-TAM). We used mixed methods to empirically evaluate this approach through the lens of HI-TAM with 8architectural professionals working individually with a GD assistant to cocreate floor plan layouts of office buildings. We believe that the proposed approach enables individual professionals, even non-technical ones, to adopt and trust AI- enhanced co-creative tools.

Keywords: architecture, co-creativity, creativity support, generative design, hybrid intelligence

Monday, 11th September

SESSION CLAUDE- Mon-1

Creativity in Art

Creativity in Education and Museums: Partnerships in Formal and Informal Learning

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Museums hold tremendous possibilities for creative expression, exploration and discovery. During the COVID-19 pandemic, museums throughout the world closed their physical doors but created (many for the first time) engaging virtual formats to continue to provide opportunity for creative expression, exploration and discovery. These virtual formats were avenues to connect to visitors who could not physically visit. They were also used to support formal educators in their classrooms and in professional development. Once reopening, many museums began to creatively meet the needs of their formal education partners and community by hosting food banks and hosting online mental health platforms in order to have honest conversation about mental health throughout the pandemic. Taking what experiences these museums and formal education sites experienced during the pandemic, what can we learn about formal (public or private school) and informal (museum) learning partnerships going forward? One example of a recent partnership with formal and informal learning is a program called “Junior Curators” in which 63 children in grades 1 through 5 from two different elementary schools partnered with a local science museum to create their own museum exhibit. Junior Curators was piloted as a program to help prepare artifacts or specimens for an online gallery in response to the online museum content needed during the COVID-19 pandemic. Using an interest survey, these children were individually paired with a local artifact or specimen at the museum. Students then conducted research on the artifact or specimen using online resources as well as a local archeologist and museum curators. Then these students created a drawing, a model or a collage of their object or specimen and attended a field trip in which local museum educators instructed students in exhibit design and label writing. The students’ drawings, models or collages were then displayed in the museum exhibit for several months. The teacher and museum staff were surprised by how much the children responded to the opportunity outside of the public school classroom. Anecdotal

comments from the museum curators and/or children were gathered throughout and after the process.

Keywords: Covid-19, Museum, Partnerships

Developing a STEAM Education program to facilitate students’ multi-faceted understanding of history

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This study reports the outline and effects of a STEAM (Science, Technology, Engineering, Arts, and Math) education practice combining social studies and art. We focus on facilitating students’ multifaceted understanding of history. The importance of understanding a particular object or event from multiple perspectives has been pointed out in the domain of creativity studies such as studies on divergent thinking. Understanding historical events from multiple perspectives has also been valued in history courses at middle schools. Therefore, we developed a STEAM course with three history classes to achieve this goal and investigated the educational effects for 94 junior high school students. For example, students viewed a painting of Japonism in a history class. They shared their opinions about the background knowledge of the painting with each other. In this process, students expressed opinions about both Western and Japanese perspectives. We quantitatively investigated the overall effects of the project and the specific class, and the learning process in the specific class mentioned above. The relationship between these effects and the learning process was also examined. The results statistically suggest a change in the student's perspectives and attitudes toward history, a change in their divergent thinking ability, and a multifaceted understanding of Japonism. The results also suggest the possibility that the experience of sharing opinions with classmates during the class lead to these changes.

Keywords: educational practice, multiple perspectives, social studies and art

Talking to an Art Piece: Four-Year-Olds and Professional Artists

Interacting With a Work in Progress

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This study is part of a series of investigations that focused on imagination and artmaking. In this study, we hoped to discover similarities and differences in the ways in which young children and artists interacted with an artwork in progress. A team of fourteen graduate students, enrolled in a creative arts education program, received training in how to observe artmaking and how to interview children and artists about their works. Armed with interview and observation guides, ten students were sent to the school to work with twenty children during a fifteen-week period and the other four students went to artists' studios for as many visits as could be scheduled.

The observation guides focused on image size and placement, choice of materials, color selection, choice of subject, and recognition of this work's connection to previous works. The observation guide for each group was quite similar; we discovered that direct and simple questions yielded the most detailed responses from both groups. The interview guide focused on similar areas but was more open-ended in terms of eliciting more personal commentary.

In this paper, we will discuss our findings from three specific stages of the artmaking process: at the start of the project, at the peak of the creation of the piece, and once the work is completed. We will give examples of individuals describing the art piece as having a life of its own, allowing the art piece to direct the painting in progress, and describing the personal connection to the completed work.

Keywords: pre-k, professional artists, imagination, creative process, visual art

Arts and Sports Biases in Lay Persons' Perceptions of Creativity: A Preliminary Study

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It is a commonly held perception among people that arts are creative while sports are not. Are gender, educational level and personality traits associated with these biases? How do Arts and Sports Biases affect creative self-efficacy and creative engagement? The present study uses a German sample ($N = 335$; 49.6% females; $M_{age} = 30$, $SD = 11.5$) to explore these questions. The internal consistency of both bias measures assessed by the Creative Biases Scale were satisfactory. Males and participants scored higher in Neuroticism were found to be more likely to endorse both Arts and Sports Biases, while those scored higher in Openness were less likely to exhibit these biases. Educational level did not appear to have any relation to either bias. Furthermore, both biases were found to be negatively associated with creative self-efficacy and creative engagement, suggesting that creative biases are detrimental to people's creative self-beliefs and behaviors. Mediation analyses revealed that the negative relationship between creative biases and creative engagement was partly explained by lower creative self-efficacy. Interestingly, we did not find evidence for a general tendency towards an Arts Bias or a Sports Bias among the investigated participants, as indicated by the approximately normal distribution of both bias variables with their central tendency values slightly below the midpoint of a seven-point Likert scale. These findings highlight the need for further investigation into the content, criterion and construct validity of the Creative Biases Scale as well as the impact of creative biases on people's creative self-beliefs and behaviors.

Keywords: Arts Biases, Big-Five, Creative Biases, Creative Engagement, Creative Self-Efficacy, Sports Biases

Monday, 11th September

SESSION RITA -Mon-2
Creative cognition

Managing Your Muse: Exploring Three Levels of Metacognitive Control in Creative Ideation

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Creative ideation tasks are typically ill-defined and open-ended, and therefore should benefit from the use of metacognition – constant monitoring and control of the task performance. However, the structure and role of creative metacognition appears understudied, particularly with regards to metacognitive control. To better understand the metacognitive processes in creative ideation, we conducted an online study ($N=317$) exploring the relationship between divergent thinking performance and different subcomponents of metacognition. Within the newly proposed creative metacognition (CMC) framework, we delineate metacognitive control processes at three levels of granularity. First, control is involved in decisions regarding task engagement, such as whether to start and when to eventually end task engagement. Second, metacognitive control also plays an essential role in guiding task performance by selecting and eventually changing task strategies during the task. Third, metacognitive control also controls response production by deciding whether a candidate response should be reported, elaborated, or dismissed. We found that metacognitive control at all three levels (task, performance and response control) predicted DT creativity. Specifically, DT performance was related to higher task engagement, higher goal-directedness of strategies, and more selective response generation. In sum, this study provides first empirical support for the relevance of distinguishable aspects of metacognitive control in creative ideation.

Keywords: cognitive control, divergent thinking, metacognition

To defer or converge, that is the question

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Deferring judgement is the ability to hold off evaluation, including self-talk, and be in the moment to experience it fully. It has been a principle, instruction and mindset primarily used in brainstorming, which is an ideational tool. However, the problem-construction phase of the creative problem-solving process has the most significant effect on its outcome. Therefore, could there be benefits in bringing the *deferring judgement* mindset into the discovery process? Would it increase possibilities that could lead to more breakthroughs, and how could one do this? This paper explored *deferring judgement* through a *transdisciplinary* lens, examining its relationship with creativity, non-judgement and the status quo. It shares research using a creative practice-led methodology of the impact of *deferring judgement* in the discovery phase of the creative problem-solving process. It shares new approaches in holding the tension between judgement and non-judgement to create more possibilities, insights and impact.

Keywords: creativity, deferring judgement, possibilities, status quo

Inhibitory control and creative cognition: Unravelling a paradoxical relationship

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Creativity is an essential and distinctly human ability, yet the cognitive mechanisms underlying the production of creative ideas remain poorly understood. One outstanding question concerns the role of inhibitory control in creative cognition. Some evidence suggests that weaker inhibition can aid creativity by allowing spontaneous associative processes to operate more freely, while alternative evidence suggests that inhibition is crucial in creative performance, particularly in lab-based tasks. The relationship is further complicated by the diversity of tasks used to assess creativity, which include measures of divergent and convergent thinking in both visual and verbal domains. Indeed, inhibitory control comprises deliberate inhibition of motor responses and mental representations and non-deliberate latent inhibition of irrelevant stimuli. The present study examined the relationships between several measures of creative cognition (the remote associates test, the alternative uses task [AUT], and a drawing task) and inhibitory control (the Stroop task, the emotional Stroop, retrieval-induced forgetting [RIF], and latent inhibition), using factor analysis and regressions. Participants (N = 151) also completed measures of personality, intelligence, and real-world creative achievement. A principal hypothesis was that divergent thinking (i.e., AUT) would be more related to the inhibition of mental representations (i.e., RIF) than to the inhibition of responses (i.e., Stroop). We also predicted that RAT performance would not show a stronger relation to inhibition than measures of divergent thinking, contrary to its use as a measure of convergent (i.e., executive) thinking. The results support these predictions and shed light on the complex relationships between creativity and cognitive control.

Spillover Effects in Creative Thinking: Exploring the Impact of Prior Tasks on Creative Performance

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As automation advances and markets transform, creative skills have become crucial in contemporary work settings. This study investigates the effects of preceding tasks on creative thinking, emphasizing task spillover and the repercussions of one activity on subsequent creative tasks. We conducted an online experiment with 813 English-native participants (47% female, mean age = 40.3 years) to analyze the impact of tasks that elicit positive emotions due to their fun nature, such as a short online game, and more stressful tasks, such as math, on later creative task performance. Contrary to our predictions, prior engagement in games or arithmetic tasks did not notably affect creativity, indicating a multifaceted relationship among task categories, creativity metrics (originality and fluency of divergent thinking and convergent thinking), and task-switching. Individual differences in self-assessed creative self-efficacy and mindset were significant factors, with fluency exhibiting a positive correlation with creative self-efficacy and growth mindset and a negative correlation with a fixed mindset. Nevertheless, originality and convergent thinking showed no correlation with these variables. We also found that the divergent and convergent thinking task sequence affected originality but not fluency. In summary, this research underlines the intricacies of task categories, individual differences, and creative performance. Additional studies are crucial to comprehend the elements influencing creativity and to devise tailored strategies for enhancing creative potential across diverse contexts.

Keywords: enhancement, games, spillover effect

Monday, 11th September

SESSION CLAUDE-Wed-2

**Personality & Individual
Differences**

Criminal Genius or Everyday Villain? Malevolent Creativity in Prisoners and the General Population

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Malevolent creativity denotes creative ideas intentionally generated to damage others. Common examples of malevolent creativity include novel terrorism, unique warfare, or ingenious criminal enterprises, suggesting that criminals may possess greater malevolent creativity than the general population. However, empirical evidence is sparse. This study compares various indices of malevolent creativity (self-report and other-rated performance) between inmates of a maximum-security prison ($n = 140$), prison workers ($n = 103$), and adults from the general population ($n = 129$). Prison inmates reported significantly greater *malevolent creativity behavior* (MCBS) in daily life compared to prison workers and the general population, which was the case for all three MCBS subscales of hurting people, lying, and playing tricks. However, this effect could not be replicated in a malevolent creativity performance test (MCT). While there were no group differences in *malevolent creativity engagement* (willingness to produce malevolent ideas), prison inmates showed lower *malevolent creativity performance* (number of malevolent and original ideas) compared to the other groups. Regarding quality/type of generated ideas, prison inmates high in impulsiveness generated more ideas aimed at *physical/bodily revenge* compared to inmates low in impulsiveness and impulsive individuals from the general population. Independent of group, lack of self-control was linked to lower originality and lower overall performance in the MCT, while impulsiveness and psychopathy were linked to higher malevolence of generated ideas. This study highlights the divergence of self-reported and other-rated creativity in the context of malevolent creative ideation and constitutes one of the very few empirical investigations of malevolent creativity in criminal offenders.

Keywords: malevolent creativity; creative ideation; prison; offenders

Investigating Daily Inspiration and Creativity in Creative and Non-Creative Individuals

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Inspiration has long been associated with creativity since ancient Greece. Despite extensive philosophical and theoretical discussions, empirical research on the relationship between inspiration and creativity is still largely unexplored. Current theories of inspiration suggest that it is a motivational response following isolated moments of insight, however inspiration may also play a crucial role in other phases of the creative process. To address this gap, our study aimed to investigate the link between inspiration and creative behaviors across all phases of the creative process in daily life. We also examined the qualities and sources of inspiration that are most likely to act as a catalyst for bringing creative ideas to fruition. Furthermore, we compared the relationship between inspiration and creativity in creative and non-creative individuals. In our study, we recruited a sample of 300 adults, comprising of 150 creative individuals (creative professionals, hobbyists engaged in 20+ hours of creative activities per week, and students studying creative disciplines) and 150 non-creative individuals, to participate in a two-week mixed-methods daily diary study (concluding Summer 2023). Participants were asked to rate the intensity of their inspired experiences, endorse cognitive and affective qualities of their inspiration, and catalog the sources of their inspiration along with what they were inspired to create or actualize. They also tracked their daily creativity, creative motivations, degree of being inspired while creating, and identified their stage within the creative process. Hierarchical linear regression analyses and lagged multilevel models were used to examine the links between inspiration and creative behaviors, as well as the bi-directionality of the inspiration-creativity relationship. The study anticipates observing both same-day and cross-day differences between creative and non-creative individuals. Overall, this study aims to shed light on the dynamic nature of the link

between daily inspiration and creative behaviors in both creative and non-creative individuals.

Keywords: creativity, daily life, inspiration

Are magicians like everyone else? Let's study their personality

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Over the past 70 years, the personality of creative individuals has been studied in various domains (e.g., architecture, art, science, etc.). These studies highlighted certain conative and cognitive specificities associated with these different domains. But what about the creators in rarely investigated domains such as magic for example? Do magicians also have personality traits that are different from those of the general population? In this exploratory study, we compared the personality traits of 63 magicians ($M = 40$ years, $SD = 14.4$, between 18 and 73 years, all males) to 63 non-magicians ($M = 36.8$ years, $SD = 11.8$, between 18 and 76 years): the Big 5 traits (assessed with the Big Five Inventory-45), creative self (beliefs that individuals have about their own creative potential; assessed with the Short Scale for Creative Self) and narcissism (assessed with the Narcissistic Personality Inventory-16). The results show that magicians are more openness, extroverted, agreeable, have a higher creative self and a higher level of narcissism than non-magicians. In addition, we aimed to predict creative self over the entire sample including both magicians and non-magicians. The results indicate that openness is the only predictor of creative self. This study describes who are the magicians and highlights the strong predictive power of the Openness trait. Further study of the personality facets of magicians may also be considered.

Keywords: Big 5, creative self, magicians

Personality and pro-environmental behaviour: the mediating role of creative potential

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Environmental sustainability has become one of the most important aims of the research agenda worldwide. Earth's ecosystems deterioration challenges present and forthcoming generations to adopt more suitable behaviours to avoid catastrophic consequences for Earth's ecosystem. This demanding scenario has raised several questions about human activities, leading to exploring the psychological pre-determinants involved in pro- environmental behaviours (PEBs). In a sample of 146 participants ($M_{age} = 19.91$ years, $SD_{age} = 1.31$ years, 68.5 % females), the current research addressed the extent to which the Big Five personality traits, and particularly Openness, predict PEBs through the effect of fluency and creativity of divergent thinking (DT). Participants completed the Big Five Inventory-10, the Pro-Environmental Behaviour Scale, and performed at the Alternative Uses Task, by which quality (creativity) and quantity (number of uses) of alternative uses were evaluated. Results revealed that not only Openness, but also Extraversion, and Agreeableness were indirectly associated with PEBs through the full mediation of DT creativity. This study extended previous knowledge about the impact of personality on eco-green behaviours, also suggesting that people must invest in and increase their DT competencies to enhance their own disposition toward pro-environmental practices. This means that teaching DT in light of PEB should be pursued. At the aim DT could be included also in environmental education programs, in order to ensure the development of an interdisciplinary approach to eco- sustainability. Particularly, DT-centred training programs might be tailored to individuals' personality and be useful to trigger students to find green solutions to environmental problems.

Keywords: Divergent Thinking; Environmental-Sustainability; Openness

Monday, 11th September

SESSION RITA-Mon-3
Measurement

A Systematic Review of Divergent Thinking Assessment

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Divergent thinking (DT) tasks are among the most established approaches to assess an individual's creative potential. Although DT assessments are widely used, there exist many variants on how DT tasks can be administered and scored. We present findings from a preregistered, systematic review of DT assessment methods aiming to determine the prevalence of various DT assessment conditions as well as to identify recent trends in the field. We searched two electronic databases (ISI Web of Science and Ovid) for studies that have investigated creativity with DT. We then screened the resulting 2066 potentially relevant publications between 1957 and 2022 with respect to our eligibility criteria and identified 280 eligible studies within 235 articles. The coding system used for data extraction distinguished over 80 conditions regarding administration and scoring of DT tasks. Overall, many studies provided insufficient information about the exact administration and scoring procedures. Amongst others, we found that the Alternate Uses Task is by far the most commonly used DT task, task time is commonly set between 2 and 3 minutes, and responses are mostly scored individually by raters. While traditional task instructions prioritized idea fluency (“be-fluent”), more recent studies often encourage creativity and originality. Trends in scoring include response aggregation methods that account for the fluency confound (e.g., max-scoring, top-scoring) and generally an increasing instruction-scoring fit. In sum, the review illustrated some established practices and trends but also highlights substantial heterogeneity in DT assessments that poses a risk to replicability in creativity research.

Keywords: divergent thinking, assessment, creativity, systematic review

Process-Based Creativity Assessments for Faster, More Objective, and Scalable Creativity Assessments

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Creativity assessments often rely on the Consensual Assessment Technique for response evaluations, which is time-intensive and prone to issues such as subjective ratings, inadequate rater expertise, and rater fatigue. Most such creativity studies evaluate creative behavior on a response level, which keeps the outcome data lean and thus makes it more economical to rate by hand. By considering not just the final creative products (responses) of participants but their creative behavior from the perspective of the creative process, automatic or semi-automatic assessments are possible. To adapt to this new approach, data needs to be well-defined and tests need to be designed with this data in mind. This may take more time upfront than using established and validated creativity tests. On the other hand, the possibility for instant, more objective, and consistent results may outweigh these costs, particularly when considering creativity testing at scale.

We introduce a software tool that takes process-based creativity data as input and returns scores for general creativity. Then, we present the findings of novel studies which have made use of this tool as part of their creativity evaluation. An example of how to create a creativity test that produces compatible data is shown. Lastly, we discuss how traditional creative concepts such as flexibility, fluency, or originality are evident in process-based creativity traces.

Keywords: Automatic Creativity Assessment, Creative Data, Creative Process

Going beyond self-report in measuring creative self-concept: An initial exploration of the photo-prompting technique

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University of Wrocław

People's beliefs in their ability to perform open-ended and ill-defined tasks are pivotal in explaining creative behavior. Yet creative self-concept is primarily measured using self-report scales, which form well-identified obstacles. For instance, given that creativity is essential today, people often overclaim their creative skills. In this investigation, we explore the possibility of developing a non-declarative approach to assessing creative self-concept. Specifically, we present the properties of a newly devised photo-prompting technique. We collected a set of 48 photos (separate for men and women) showing different professions and activities organized around classic Holland's (see, e.g., Hogan & Blake, 1999) vocational categories. Then, participants (N = 909) filled out the Short Scale of Creative Self (Karwowski et al., 2018; Zielińska et al., 2022)—the established self-report measure of creative self-concept—and assessed the fit and preference for different activities depicted on photos using the best-worst scaling experimental method. Multivariate analyses demonstrated that a model with the best-predicting photos explained a substantial amount of variance in creative self-concept (multiple R = .40). Additionally, we examined to what extent the model differentiates between participants with low and high creative self-concept (top and low 20%, n = 357). Logistic regression and receiver operating characteristic analyses demonstrated that it effectively classifies people with high or low creative self-concept in 80% of the cases based solely on their choices of the presented photos. We discuss future steps and limitations of proposed photo-prompting technique.

Keywords: creative agency, creative self-concept

Disrupting patterns of interaction to enact creative dynamics

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Creativity is often seen as a quest for novelty led by individual minds. Such a view raises 3 main issues. First, it undermines the role of the body and the role of body – environment interactions in creative processes. Second, in sciences, arts or innovative companies, it is often a group which creates, a context in which creative processes are distributed among its members and emerge from their interactions. Finally, creative persons often seek to escape established patterns rather than search for novel ones per se. To address these issues, I propose a new theoretical framework that scales across individual and collective levels of organization, and endorses the perspectives of enactivism and dynamical systems theory. The proposed theory sees creativity as a « problem-making » activity, and takes the skillful disruptions of patterns of interaction (between persons or components of their embodied cognitive activity) as a primary step toward creative paths. The rise of uncertainty provoked by the disruption of established patterns poises both individual and groups at the edge of multiple potential forms of reorganization, where novel patterns can be discovered, explored and exploited. To support my proposition, I will present research colleagues and I have conducted and in which we relied on methodologies that involved continuous, mutually informing exchanges between first- and third-person perspectives of artists and scientists. In particular, I will present studies in the field of collective improvisation in music, dance, and free-play, that have been conducted with professionals, novices, and children.

Keywords: collective improvisation, dynamics of interaction, pattern disruption

Monday, 11th September

SESSION CLAUDE-Mon-3
Education & Development

Exploring the relation between creativity, anxiety and arithmetic word problems in primary school children

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Creative thinking is a thought modality that plays a fundamental role in mathematics education. Previous research established a positive association between creative thinking and overall math performance. However, less is known about the specific relation between creativity and arithmetic word problem solving, especially in primary school children. It is assumed that when students solve a math word problem, creative thinking would allow them to connect elements within the problem and find numerous and distinctively different ways to arrive at a solution. Interestingly, emotional factors such as specific anxieties have been shown to substantially hinder both creative thinking and math achievement. The aim of the current study was to investigate the relationships between creativity, arithmetic word problem-solving, and specific forms of anxiety in fourth and fifth graders. 110 children were tested on both domain general (EPoC; Lubart et al., 2011) and domain specific (Mathematical creativity test; Kattou et al., 2013) creative tasks, math anxiety (AMAS; Hopko et al., 2003) and creative anxiety (CAS; Deaker et al., 2019), and word problems where the solution was made more or less obvious. The solution was more obvious in problems containing relational terms consistent with the required operation (e.g., *less than* and requiring subtraction), whereas the solution was made less obvious in problems containing relational terms inconsistent with the necessary operation (e.g., *less than*, yet requiring addition). Data collection is currently underway, and the findings will be discussed in the presentation. The results could help to unravel the role exerted by different forms of anxiety in the association between creative thinking and math performance.

Keywords: creativity; mathematics; anxiety

Creativity and blackness: how black students understand the construction of their creative processes at public university

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Blackness is a topic of human, political, social, economic, and ethical interest, little faced in rich and medium-sized countries, where stories of enslavement and racism haunt people, showing the potential for perversity of our species. The black population has historically experienced atypical situations in the personal, sociocultural, political, economic, and ideological spheres, resulting from prejudices of all kinds, where racism finds fertile ground to grow and bear fruit. Patriarchy and racism, with their sinuous and subliminal movements, made the life of black people unattractive for the sciences, in general. This rescue has been carried out for some decades now, with areas of scientific research questioning the reason for this abandonment of the human issues of blacks and other social groups in a minority situation. Regarding the investigation of the creative processes of black people, there are few records of studies interested in understanding and analyzing how this group experiences and develops their creative processes. In theory, there are no differences in the basic dynamics of human development for whites and blacks, but if we practice a cultural, dialogic, and semiotic psychology, we know that development processes are profoundly affected by socio-historical-cultural conditions, which it marks the developmental trajectories of different individuals belonging to minorities of all kinds. This research is part of a larger study that has been working with the themes of blackness and the development of creativity since 2020. After conducting a literature review study in the area, the time has come to investigate how black students at a public university Brazilian, understand and signify their creative processes and the ways in which these processes are developed from autobiographical narratives and in-depth interviews with these participants. We want to analyze, in an interpretative and microgenetic way, the social interactions experienced by black students in their study spaces and experiences at the university and how the semiotic/dialogical processes I-Other-in the world mediate their creative

process. Our study starts from a sociocultural, semiotic, and dialogical perspective of the creative processes.

Keywords: blackness, creative processes, human development, racism

Interim outcomes of a 3-year, multi-level project to foster learners' creativity in 16 schools

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Funded by Arts Council England, we have developed a three-year programme of work, involving 16 primary schools, to foster learners' creativity in subjects drawn from across the curriculum. The programme comprises five interleaved streams of work: *Context, Knowledge, Agency, Pedagogies* and *Leadership* for creativity. Context for creativity focuses on identifying barriers and enablers of teaching for creativity in our participating schools. Knowledge for creativity focuses on building learners', teachers' and leaders' metacognitive knowledge of creativity. Agency for creativity focuses on supporting learners and teachers to develop their creative self-efficacy. Pedagogies for creativity focuses on developing evidence-based pedagogies to foster creativity, working with teachers, and pre-service teachers undergoing initial teacher education. Finally, leadership for creativity focuses on effective leadership, governance and collaboration strategies to grow a climate for creativity and sustainable change. To assess impact of the work streams, we have used a mixed- methods approach comprising quantitative measures (creative self-efficacy, metacognitive knowledge of creativity, confidence and efficacy to teach for creativity, mental well-being, school satisfaction), focus groups, interviews and teacher observation of creative outcomes in the classroom. To date, the quantitative measures have been completed twice, one year apart (time 1: n pupils = 1662, n teachers = 85. time 2: n pupils = 1815, n teachers = 123), allowing us to compare outcomes for schools and classes that were part of our initial intervention group with those that were not, over time. I will describe our programme of work and initial findings from our research over the first 1.5 years.

Keywords: creativity, education, metacognition

Cognitive and Creative Benefits of Lightening Up: Using Positive Humor in Education

Hulsey, D.B. & Filippini, T.

Baylor University

What is more delightful than the laughter of a happy child? Laughter can come from play, celebration, triumph, or a good joke. It can come from a burst of creative expression, and it can also come from very satisfying learning. The second-most delightful laughter? That of a creative, purposeful teacher. The Incongruity Theory states that the perception of something incongruous—something unexpected that contradicts our logical expectations and mental patterns—is the source of most humor. Embraced by philosophers such as James Beattie, Immanuel Kant, Arthur Schopenhauer, and Søren Kierkegaard, Incongruity remains the dominant theory of humor in philosophy and psychology. A teacher who uses and welcomes constructive, positive humor indicates comfort with content and curiosity, plus an openness that engages students and welcomes divergent thinking and risk-taking. Cognitive research indicates that humor elicits motivation and critical thinking; laughter releases dopamine and reduces stress, enhancing memory, facilitating learning, and promoting social development. Humor is credited for improved morale, productivity, engagement, and creativity. Gifted students in particular often have a high level of humor and connect seemingly disparate ideas or occurrences. Their humor may be subtle and clever, expressing fluency of ideas and connections. This presentation guides teachers in the modeling and cultivation of improvisation in the classroom. The Latin “improviso” means unforeseen, unexpected, sudden. The unexpected, incongruous connection that makes a punchline funny also promotes creative thinking and makes learning irresistible and memorable. It allows a safe place to explore ideas and be creative. Easy to learn, fun to practice, “improv” allows teachers and students a safe place to take creative risks and strengthen learning.

Keywords: Creativity, Humor, Improvisation

Monday, 11th September

SESSION RITA-Mon-4
Cognition & Neuroscience

The Cognitive Neural Mechanism of Knowledge Influencing Scientific Creativity and Its Application

Hu, W., Li, Y., & Li, X.

Shaanxi Normal University, Xi'an, PR 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. At the verbal knowledge level, the relationship between semantic network and scientific creativity was explored from three aspects. The result showed that the influence of semantic network on scientific creativity process is consistent at the behavioral and cognitive level. The performance of production stage has a predictive effect on the evaluation stage index. At the representational knowledge level, the cognitive neural mechanisms by which the learning of representational knowledge influences the creative idea generation was explored in scientific domain. The results showed that the flexibility and originality scores of the representational knowledge group were significantly higher than those of the non- representational knowledge group. Based on the above research results, the core concepts of disciplines and interdisciplinary concepts has been established and the content of compulsory education science curriculum has been reconstructed. High-quality science curriculum standards have been constructed for the cultivation of technological innovation reserve talents.

Keywords: Cognitive Neural Mechanism, Curriculum Standard, Science Knowledge, Scientific Creativity

Do you like your ideas? A study of the neural bases of idea evaluation in creativity

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

Paris Brain Institute

In neuroscience, creativity is defined as the ability to produce an idea that is both original and adequate. At the neural level, it mainly relies on the default mode network (DMN) and the executive control network (ECN), thought to support the generation of ideas and their evaluation. In parallel, the neuroscience of decision-making has identified that the Brain Valuation System (BVS) implements an item's evaluation - but its role in creativity remains largely unknown. Forty individuals performed a creativity task (Free Generation of Association Task - for a description of the task see) and a rating task in a 3T MRI scanner: they had to generate creative ideas and evaluate how much they liked them. Outside the MRI, they completed adequacy and originality ratings of their responses and a creative drawing task scored by experts in creativity using the consensual assessment technique. At the behavioural level, we found that individuals generated the ideas they preferred faster, which is a signature that valuation is occurring during creative idea generation. We also found that likeability ratings relied on both adequacy and originality, and that evaluation parameters correlated with performance in the drawing task. At the neural level, we found that the activity in regions of the BVS (Figure1A), the DMN (Figure1B) and the ECN (Figure1C) respectively scaled with the idea's likeability, originality, and adequacy ratings during both the rating and the creativity tasks, revealing the roles of the BVS and of preferences in creativity. Overall, this study gives a neurocognitive account of the creative process and suggests that using decision-making methods is a critical approach to studying creativity.

Keywords: MRI, decision-making, evaluation

Rethinking the Creative Process: Examining the Beginning and End of Ideation Using the Alternate Uses Task

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The Alternate Uses Task (AUT) is a well-established creativity assessment, where participants propose alternative uses for common items within a 2–3-minute timeframe. While convergent thinking may play a role, the primary emphasis is on divergent thinking. Here, we examine the significance of cue type (presenting either a word or a word overlapping an image) and the balance between divergent thinking (idea generation) and convergent thinking (idea selection). One hundred and sixty native Polish speakers randomly allocated to experimental groups were asked to suggest unconventional uses for everyday items in two situations: (1) cue word shown with or without a corresponding image, and (2) instruction to either produce as many ideas as possible within two minutes or to report a single best idea at the end of each of three 30-second ideation cycles. Human rating of produced ideas is in progress and originality rated automatically using SemDis thus far failed to show differences between conditions. In a third experiment, EEG data were recorded in Polish-English bilinguals as they performed the modified AUT (cycled method with picture-word combinations) in both their languages. Alpha (8-12 Hz) power significantly increased relative to baseline in all three cycles but did not differ between language blocks. However, lower beta (18-22 Hz) and upper beta (26-30 Hz) power decreased markedly in English as compared to Polish. Language further interacted with ideation cycle in the beta range with greater beta synchronisation in cycle 2 as compared to cycle 3 in Polish. Together, behavioural and EEG analyses will shed light on dynamic aspects of ideation in two languages during idea generation and idea selection.

Keywords: AUT, bilingualism, convergent thinking, divergent thinking

The Emotional Antecedents of Insight: A Physiological Exploration

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⁶ *Constructor University Bremen*

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Most creative ideas are based on hard work, but a good idea can also happen spontaneously by an insight. This sudden experience of a solution to a given open problem is also called “aha” experience. Previous research highlighted that an insight is followed by a self-reported emotional reaction and an increase of the skin conductance response. However, the question remains if an emotional reaction is a consequence or a signaling and preceding mechanism of an insight. Therefore, by investigating the physiological response before the behavioral response (and not after), which might signal emotional states, we are interested in distinguishing between solutions with and without insight. In the present study, 24 participants worked on a remote association task (RAT) with 24 items in 3 blocks (72 items in total). After a button press (signaling the moment of a solution), participants provided their solution and had to decide if they had an insight or not. We further asked for the emotional state at the moment of the idea. During the entire experiment physiological parameters such as heartrate, skin conduction, and electromyography were recorded. We plan to compare correct solutions with and without insights by means of multi-level modeling. We will present the first preliminary findings of this study aimed at investigating the spontaneous phenomenon of insight and its physiological and emotional antecedents.

Keywords: Insight, Emotions, Psychophysiology

Monday, 11th September

SESSION CLAUDE-Mon-4
Theoretical propositions

Pollinating Connections

Doran, B., & Larocca, P.

TD School, University of Technology Sydney

This talk shares learnings from a real-life case study of how co-creating creative practices with a community can nurture a sense of possibility to foster change. We take a transdisciplinary approach by integrating other ways of being and knowing, including tenets from the phenomenology of mind in life, systems thinking and Daoism to transcend humancentric perspectives. Drawing on the interactive community located art works of ‘Superorganism’ (a transdisciplinary art collective inspired and informed by the honey bee) we will explore how activities that invite sensory engagement and hands-on making stimulate and expand cognition, social connection and wider connections to nature. Using these community artworks as a case studies, we will consider the significance of a deferring judgement mindset as a quality that holds for shifts towards embodied and dynamically connected perception and social interactions. The session will be interactive and experiential as we co-create aspects of this creative practice to bring life a possibility mindset. The creative practices will engage with the honey bee as a catalyst and use a playful and spontaneous approach. Through these interactions we will reveal an enacted theoretical rationale for transdisciplinary ways of attending and being that affect longitudinal change in our communities as cohabitants of a living planet.

Social Semiosis: a bridge between Creativity and Communication.

Jorge, A.

Universidad Austral Argentina

Creativity and Communication have had similar conversations in different rooms. The current trends that define Creativity today, the Sociocultural Manifesto and the Participatory framework, further foster this connection. The objective of this paper is to recreate a conversation about the common denominator that defines both fields. The use of the word recreate is there to highlight the fact that the connection between both fields already exists. Both fields understand the importance of a systemic perspective and the importance to address its complexity. In addition, both fields tap on the importance of distribution of thought and the role of the material actors involved. In addition, the model of Social Semiosis is important both for the creative producer and the observer. This model highlights the fact that while there is one condition of production for each discourse, there are multiple conditions of recognition for that same discourse. This asymmetry that exists represents the complexity that unites both communications and creativity. This dialogue is important now amidst the changes that AI brings about. Communication knows the story all too well since it has gained experience with the appearance of paper, radio, photography, cinema and T.V. to name a few. Bearing in mind the common denominators between Communication and Creativity might be a step forward to understand which are the questions we need to bear in mind as we face a new process of mediatization.

Keywords: Social semiosis, complex systems, distributive thinking, AI

De Daumier-Smith and the Creative Thinking

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Academy of Sciences*

This interdisciplinary study emerged at the intersection of creativity psychology and literature, presenting a fresh and innovative approach to examining the psychological aspects of literary works. This research introduces a novel conceptual framework by employing an established theory of creativity to analyse Salinger's short story, "De Daumier-Smith's Blue Period," in a previously unexplored way. The theory employed, developed by Torrance, commences with a comprehensive definition of the creative process, followed by identifying eighteen creative thinking abilities contributing to its successful execution. These abilities include, among others, fluency, elaboration, resistance to premature closure, boundary expansion, humour, and fantasy. Their significance lies in their crucial role in generating creative outcomes, which is seen in evaluating and fostering creative behaviour, and in achieving real-life creative results (Torrance & Safter, 1999). Thus, Torrance's conceptualisation of creative thinking abilities is adopted as an analytical tool in this study to examine a genuine creation, namely a literary text. By bridging the gap between psychological knowledge about the creative process and creative thinking and the field of literary analysis, this study proposes a new approach to identifying and appreciating the creative strengths within written works. Through an extensive and meticulous analysis of Salinger's story, this research uncovers how these creative thinking abilities are embodied within the text and manifest in developing its central theme (Stoycheva, 2018). Notably, the study reveals that the details used to elaborate on the character's actions and reactions often draw attention to elements that are missing, not presented, or taken away.

Keywords: Salinger's short stories, Torrance's concept of creativity, creative thinking skills

Thinking about Creative Thinking: The 4P Framework of Creative Metacognition

von Thienen, J. P. A., Weinstein, T. J., & Meinel, C.,

Hasso Plattner Institute for Digital Engineering, University of Potsdam, Germany /

While research on creativity is well-established, research on creative metacognition is only gradually receiving increased attention. Metacognition serves many purposes, including error-correction, explaining and justifying thoughts to others and oneself, planning ahead and critically evaluating alternative options, as well as making weighty decisions in carefully pondered ways. Metacognitive competencies are therefore highly relevant in creative activity. Indeed, the role of metacognition becomes increasingly pivotal when individuals strive for high levels of creative performance, having to navigate situations that may involve repeated episodes of creative frustration. This paper presents a comprehensive theoretical framework of creative metacognition. It aims at improving the basis for comprehensive assessments of creative metacognition competencies. We identify four different areas of creative metacognition, concerning creative products, processes, people, and places. In each domain, we provide examples of creative cognition and metacognition, illustrating how high levels of metacognitive proficiency enhance the potential for creative achievements. Against this background, we propose methodologies for measuring creative metacognition more systematically, such as using experimental tasks that involve iterative explorations of problem and solution spaces, 4P knowledge tests, combinations of naturalistic observations with controlled competency tests, and physiological stress measurement.

Keywords: creativity, framework, metacognition

How senior executives improvise in response to major crises: Two unfolding paths

Villanova, A.L.I. ¹, Pina e Cunha, M. ¹, Giustiniano, L. ², & Xavier Froes, F. ³

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²*Luiss University, Roma, Italy*

³*Independent Consultant*

The COVID-19 pandemic was an unprecedented event that interrupted the ordinary course of society, leading to disruptions in most industries' routines and demanding senior executives to make decisions under uncertain, risky, and time-pressured circumstances. By adopting grounded theory strategies, we undertake a qualitative investigation interviewing fifty-four senior executives during the coronavirus pandemic. Their reports lend a fresh perspective to organizational improvisation research. We determined that senior executives respond to significant crises by enacting strategic improvisations depending on their problem-solving style and the extent of the crisis' impact on organizational environments. Based on these findings, we contribute to strategic improvisation studies in two ways: we introduce the concept of networking improvisation to describe executives' collaborative efforts in response to similar organizational challenges, and we propose that executives respond to their organization's problems and opportunities undertaking two major improvisational routes, creative and adaptive. Most senior executives focused on maintaining a sense of normality inside their organizations, enacting adaptive improvisations without significant deviation from previous practices. We argue that when executives opt for actions to maintain the organizational status quo, they may prevent the organization from identifying business opportunities and occasions for organizational learning from disruptive events. At the same time, although on a smaller scale, some senior executives leveraged the crisis' upside potential approaching tasks from unsuspecting angles, finding new avenues of solution and enacting creative improvisations that, in some cases, generated organizational innovation.

Keywords: Strategic Improvisation, Adaptive Improvisation, Creative Improvisation, Networking Improvisation, Senior Executives, Crisis, Coronavirus pandemic.

Monday, 11th September



MIC Keynote Speech

Maciej Karwowski

Creativity as Agentic, Strategic, and Purposeful Action

This keynote provides a theoretical and empirical extension of the Creative Behavior as Agentic Action (CBAA) model (Karwowski & Beghetto, 2019). Based on the recent findings from experimental, longitudinal, and interventional studies, several focal assumptions of the original model are tested and (at least partially) reconceptualized. Furthermore, a step beyond the original model is taken by integrating drivers and mechanisms of creative behavior that were either overlooked or implicit in the initial framework (e.g., purpose, self-regulation). Possibilities to strengthen creative agency and future research avenues will be delineated and discussed.

Monday, 11th September

**PLENARY
SYMPOSIUM
Mon-5**

Chairs: Giulia Fusi & Barbara Colombo

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Creativity and Health: applications and future directions

Chairs: Fusi, G. ¹ & Colombo, B. ²

¹ *Department of Human and Social Sciences, University of Bergamo*

² *Behavioral Neuroscience Lab, Champlain College*

In the last decades, creativity, in its many facets, has attracted researchers' and clinicians' attention because of its possible beneficial effect on cognition, human health, and well-being. Scientific literature has shown that, on the one hand, creative abilities and creative cognition can be enhanced with cognitive and neurostimulation techniques both in normal and pathological populations and, on the other hand, that being involved in creative activities may foster individual traits that are related to well-being such as flexibility, openness, autonomy, and playfulness. The present symposium will try to highlight both the strict link between creativity and health and how creative abilities and activities can be used not only to foster creative cognition but also to be embedded in both prevention and intervention interventions with healthy and clinical populations. Thus, the first talk will present data from different studies on healthy individuals to highlight the connecting link between creativity, health, and neuromodulation. The second talk will address two main topics: the first is about how creative abilities change during healthy aging and their possible role as a protective factor for both cognitive and psychological well-being; the second will show the results of a creative skills intervention (CREC) on both a healthy elderly population and a Mild Cognitive Impairment patient population. Finally, the third talk will review the creativity studies panorama in patients with Parkinson's Disease, highlighting the main results and implications for future interventions that promote health and well-being in this clinical population.

Keywords: creative cognition; neuromodulation; aging; neurological disease; health

Creativity, health and neuromodulation. Where is the hidden link?

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It has been proven that our brain actively copes with any form of stress and damage linked to clinical and mental health issues. One extensively studied mechanism that exemplifies this mechanism is cognitive reserve (CR). The beneficial role of the CR has been mainly investigated in the aging population but has more recently found to be a protective factor for younger populations as well. The CR has been proven to rely (at least partially) on mechanisms that overlaps with creative thinking. Creative thinking has been proven to be positively affected by neuromodulation, which is known for being successful as a basis of several promising nonpharmacological interventions for chronic and acute physical and mental health conditions. This contribution aims at presenting data from different studies to highlight the connecting link among creativity, health, and neuromodulation.

Creative cognition as a resource for health in healthy and pathological aging

Fusi G.^{1,2}, Crepaldi, M.¹, Borsa, V.M.¹, Gianni, J.¹, Zanetti, M.,³ Di Fazio, I.³, Facchi, E.³, Colautti, L.⁴, Garau, F.,⁵ Palmiero, M.⁶, Bonfiglio, S.⁵, Antonietti, A.⁴, Penna, M.P.⁵, Rozzini, L.² & Rusconi, ML¹

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⁶ *Department of Communication Sciences, University of Teramo*

Divergent thinking is a complex mental ability that is, at least partially, spared during healthy aging (Fusi et al., 2020a) and in patients in the early stages of neurodegenerative diseases, such as patients diagnosed with Mild Cognitive Impairment (MCI; Fusi et al., 2020b). Moreover, different studies have shown that higher divergent thinking abilities are correlated with a higher level of cognitive reserve, which is a known protective factor against cognitive decline. Thus, the enhancement of divergent thinking might be critical for active and successful aging and seem to represent an optimal resource for cognitive training programs both for healthy older adults and for clinical populations. The present intervention will aim to show preliminary results about: 1. the relationship between creative cognition, cognitive reserve and psychological well-being in a sample of Italian healthy elderly from different Italian socio-cultural backgrounds; 2. the beneficial effects of a 10-sessions training (CREC, CReativity in Everyday life Challenges) based on divergent thinking exercises, in a sample of healthy individuals (online administration) and in a sample of MCI patients (in-presence administration). Preliminary results showed a complex, not linear, relationship between divergent thinking, cognitive reserve and well-being. Instead, as concerns the training, CREC seems to improve participants' performance in specific cognitive domains (mainly in attentive/executive functions) and some improvements were also observed in

psychological variables. These results suggest that creative thinking could be a useful resource both for mental health and against cognitive decline in old age.

Parkinson's disease and creative abilities: what do we know so far?

Mechanisms and future implications

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Parkinson's Disease (PD) is a neurodegenerative disease that progressively impacts basal ganglia neurons and their ability to produce dopamine, leading, along with the alteration of dopaminergic pathways, to several symptoms such as motor control deficits, behavioral changes, and cognitive deficits. Despite that, several case-report studies describe a burst of artistic productivity and transformations in artistic production in a subgroup of patients. However, there are conflicting results about PD patients treated with dopaminergic drugs: in some cases, studies demonstrated enhanced verbal and visual creativity as compared to neurologically healthy controls, while other authors did not find increased creative abilities, therefore some researchers consider this burst in artistic output only an increased drive to create (Canesi et al. 2012). Moreover, to date, creative and artistic features seem to be unrelated to Impulse Control Disorders developed by some patients during the disease course; however, more studies would be needed to consistently exclude an eventual relationship (Canesi et al. 2016). The present talk will review the recent literature on creativity in PD with a specific focus on the possible brain mechanisms that undergo PD patients' changes in creative behaviour (e.g., the combination of damage and artistic production, their relationship with increased motivation and reward-seeking behaviour, the possible role of dopaminergic therapy, hyperactivity and cognitive impairment) and how these mechanisms might be exploited through creativity/cognitive training that might improve both mental and cognitive health in this clinical population.

Monday, 11th September

MIC Keynote Speech

Robert J. Sternberg

Transformational Creativity

Robert J. Sternberg

Cornell University

I used to believe that creativity was intrinsically good or advantageous. I was horribly wrong. Creativity is a source of great positive transformation, but also of extreme cruelty and depravity. Creativity can be viewed as either a singular and largely indivisible psychological characteristic, or rather as divisible into various types. This talk argues that it is important to view it multiply, as divisible into types. There are a variety of typologies, described in the talk, but one of special relevance in today's world is that between transactional and transformational creativity. Transactional creativity is tit-for-tat. It is based on exchange. One is creative in exchange for a reward. Transformational creativity seeks to make the world a better place. Both transactional and transformational creativity have false (pseudo-) varieties that appear genuinely to be transactional or transformational but are not. The pseudo- types are a means for causing harm, often, deliberately, gladly, and with pride. They pretend to be one thing, while they are really another. The talk discusses the genuine as well as the false types of transactional and transformational creativity--both their causes and their consequences.

Tuesday, 12th September

MIC Keynote Speech

Nathalie Bonnardel

**Cross-pollination in collective and individual creative situations:
Views and perspectives on some mechanisms and methods to foster it**

Nathalie Bonnardel

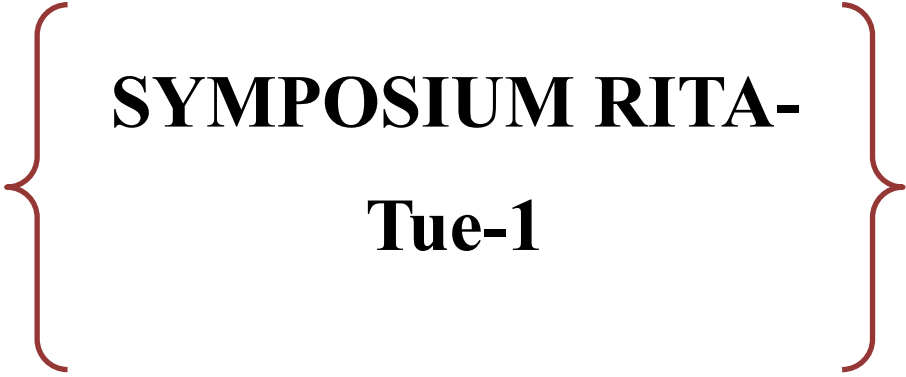
Institute on Creativity and Innovations of Aix-Marseille (InCIAM);

Psychology of Cognition, Language and Emotion (PsyCLE)

Cross-pollination can play an important role in creativity and it is a general objective that can be pursued when exposing individuals to new ways of thinking by sharing knowledge. With the aim of both analyzing and fostering cross-pollination in creativity contexts, in the first part of my talk, I will present some of the mechanisms involved in collective creative situations, and especially the elaboration of a ‘common frame of reference’, as well as processes that can be important in both individual and collective situations, such as analogy combined with constraint management, as highlighted in the A-CM model (Bonnardel, 2000). In the second part of my talk, the focus will be on methods that can be used to foster cross-pollination not only in collective but also in individual situations. I will argue that the choice of method should depend on the objective to be achieved in the short and long term. This view will be illustrated by presenting methods that appear particularly useful to reach creative ideas located on a continuum going from ideas that are more specifically adapted to the situation (e.g., based on the classical or the dynamic method of personas, Bonnardel & Pichot, 2020) to ideas that may be considered particularly novel in the problem domain under

consideration (e.g., through a combination of the persona method with the seminal creativity method "De Bono's hats" or the design fiction method). Finally, I will discuss whether cross-pollination can also intervene in individual configurations, namely by enriching the environment of individuals and providing them with resources and sources of inspiration through human-machine cooperation. It will lead to questions about what can be considered as inspiring and useful for individuals when they are in "potential cross-pollination" contexts.

Tuesday, 12th September



SYMPOSIUM RITA-
Tue-1

Chair: Kamila Urban

Creative Metacognition and Creative Regulation: from Individual to Group Perspective

Chair: Kamila Urban

Institute for Research in Social Communication, Slovak Academy of Sciences

Three studies explore the process of creative problem-solving from different perspectives, highlighting the importance of metacognition, self-regulation, and collaboration in real-life and ecologically valid situations. The first study investigates the creative problem-solving process in a high-stake ill-defined problem-solving task, providing insights into the role of creative metacognition and creative self-regulation. The second study compares the use of creative metacognition, self-regulation, and problem-solving strategies among five professional artists as depicted in their autobiographical writings. The study identified individual components of all three models in all five autobiographies, with each artist exhibiting different facets. The third study broadens the understanding of individual creative self-regulation by conceptualizing creative co-regulation and socially shared regulation in a real-life situation of professional artists in a complex creative problem-solving process. The study highlights the importance of collaboration in creative problem-solving, with successful co-regulation potentially leading to more productive socially shared regulation. Overall, the studies emphasize the cyclical nature of creative problem-solving, including planning, execution, self-reflection, and idea generation stages, and requiring both divergent and convergent thinking. They also underline the critical role of metacognition, self-regulation, and collaboration in adaptive response to challenges and uncertainties. Studies have implications for fostering creativity in different domains and offer insights into the cognitive, metacognitive, emotional, and motivational aspects involved in creative problem-solving. Studies highlight the potential for applying these concepts to real-life situations, including educational, artistic, and professional contexts, and offer a comprehensive understanding of a creative problem-solving process.

Keywords: creative metacognition; creative self-regulation; creative problem-solving

Creative Problem-Solving in Essay Writing: A Mixed-Methods Study

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Creative problem-solving is a cyclical process that includes planning, execution, self-reflection, and idea generation stages, requiring both divergent and convergent thinking. Effective creative problem-solving requires individuals to have strong domain-specific knowledge, construct the representation of the problem, accept uncertainty, and expect difficulties. In ill-defined problems, such as essays, case study analysis, or decision-making dilemmas, individuals have to create their own goals, develop task-specific procedures, or set their evaluation criteria. The present study employed an explanatory sequential mixed-methods design to investigate the process of creative problem-solving in a high-stake ill-defined problem-solving task, the final semestral essay in a social psychology course. The study comprised two separate phases. The first, quantitative phase, was used to identify participants with different levels of creative performance, their metacognition, creative self-efficacy, perceived value of creativity, and academic motivation. The second, qualitative phase, consisted of phenomenological in-depth interviews about the problem-solving process. The results of the study will provide insights into the relationship between performance on an experimental creativity task and its metacognitive monitoring, and performance on an ill-defined problem-solving task and its metacognitive monitoring. The study will also examine differences in the problem-solving process between participants with low and high metacognitive accuracy. The present study provides insights into the creative problem-solving process of an ecologically valid ill-defined problem-solving task and the role of creative metacognition in creative self-regulation in real-life creative problem-solving.

How famous artists write about their metacognition, self-regulation and creative problem-solving?

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Creative metacognition (Kaufman & Beghetto, 2013), creative self-regulation (Zielinska et al., 2022), and creative problem-solving (Mumford et al., 1991; Mumford & Martin, 2019) are three key concepts stemming from three different psychological approaches. However, all three involve planning, monitoring, regulation and self-evaluation in creative process. Therefore, the goal of the present study was to describe and compare how these three models are exhibited in the cases of five professional artists as depicted in their autobiographical writings. The authors were selected based on maximum-variation sampling to cover different artistic fields (they were Stephen King, Salvador Dalí, Patti Smith, Terry Gilliam and Arnold Schwarzenegger). Theory-driven thematic analysis was able to identify individual components of all three models in all five autobiographies, i.e., all artists employed their metacognitive and self-regulatory skills in their creative process. However, individual artists exhibited different facets more often, or they gave a higher emphasis on some of them. For example, Stephen King relied predominantly on his metacognitive knowledge to inform his idea generation, selection and content editing, whilst Patti Smith gathered information from her instantaneous experiences that were immediately translated into her idea generation. Salvador Dalí mostly focused on precise execution of his procedural knowledge, whilst Terry Gilliam strategically used his divergent thinking to create a tremendous amount of highly original ideas. Furthermore, the present study identified several aspects that were not included in the models, such as psychologically safe environment, the role of extrinsic and intrinsic motivation, and the perceived value of creativity.

The Role of Co-Regulation and Socially Shared Regulation in a Case Study of Beatles

Urban, K. ¹ & Urban, M. ²

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The creative self-regulation involves setting goals, planning, monitoring, regulation, and evaluation, with metacognition playing a critical role in adaptive response to challenges. While traditional creativity research has focused on individual metacognitive and self-regulatory processes, creativity involves cognitive, metacognitive, emotional, and motivational aspects that are embedded in a social context. Collaborative creative problem-solving therefore involves individual self-regulation together with co-regulation, and socially shared regulation, with successful co-regulation potentially leading to more productive socially shared regulation. The present study applies these concepts to a real-life collaborative creative problem-solving situation involving artistic experts: The Beatles preparing for a first live concert after a several-year-long break, as depicted in the documentary *The Beatles: Get Back*. The case study enables the study of individual and group characteristics of creative self-regulation, co-regulation, and shared regulation in a highly uncertain situation, with cognitive, metacognitive, motivational, and affective states of individual group members in interaction with others. The study highlights the differences between problem-solving and creative problem-solving, with the latter requiring the regulation of the problem-solving process and an additional stage of generating different possibilities. The study broadens the understanding of individual creative self-regulation by conceptualizing creative co-regulation and socially shared regulation in a real-life situation of professional artists in a complex creative problem-solving process.

Tuesday, 12th September

SYMPOSIUM CLAUDE

-Tue-1

Chair: Adva Margaliot

Fan for Fun: Methods for Developing Creativity through Mediate Learning Experience

Chair: Adva Margalio

Achva Academic College, Israel

Creativity is defined as the ability to see situations and generate solutions from multiple perspectives that can provide surprising insight and new connections. M.L.E - 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. This symposium is based on a professional international collaborative training program, designed for gifted teachers from the "Wind at your Back" gifted center in Zagreb Croatia in 2018/ 2019. Following this training, an innovative collaborative project was built between two gifted centers in Israel and Croatia. Along the project, the teachers applied the knowledge they acquired and led their students through a unique international journey of learning. The theoretical and practical knowledge acquired in this symposium, includes three parts:

1. Developing creative thinking and creativity among teachers.
2. Applying principles of mediate learning experience to develop and promote creativity.
3. Presenting the learning outcomes made by gifted children and the teachers that took part in this program.

The Role of Creativity in the Process of teachers' professional education.

Adva Margaliot

Achva Academic College, Israel

Creative thinking is traditionally described as detecting previously unidentified relationships and producing original and novel experiences as a new pattern, including the skill to evaluate, improve, and generate novel solutions (Yang and Zhao, 2021). Creativity comprises several different aspects: abilities, knowledge, styles of thinking, personality attributes, motivation, and especially intrinsic motivation, and environment (Sternberg, 1995). Studies in education focus on creativity as a creative potential (Barbot et al., 2011), namely the skill to produce innovative and valuable solutions. This potential may be thought of as an amalgam of intellectual and personality characteristics, among which one may count divergent thinking abilities, imagination, openness, curiosity, and independence (Anderson and Graham, 2021) and executive functions (Khalil et al., 2019).

The last era shows the importance of developing creativity in the process of teachers' education. The role of creative thinking turns to become an essential component of teachers' work (Margaliot and Magid, 2020). Under the Corona crisis, while students located away from their home schools, teachers' ability to harness their creativity and cause their students to be engaged in the learning process via ICT, becomes to be a matter of survival. The creative teacher must encourage students to be self-directed to create varied opportunities for learning and use an assortment of tools, structures, and concepts that will enable students to express themselves in a variety of ways (Craft, 2011). Mediated learning experience is one of the key factors enabling teachers to promote their Creativity and develop creative skills with their students.

Mediated learning Experience (M.L.E)

Efrat Bengio

Beit Berl College, Israel

The Mediated learning experience (MLE) is the quality of interaction between a learner and the mediator. The main mediation Categories are Intentionality & Reciprocity, Mediation of Meaning and Mediation for Transcendence where else (Feuerstein, 1979). This combination of creativity and meditation leads to meaningful learning and improves the social connections and creativity of teachers and students. In this program mediation process made it possible to promote learning during the project on all levels: in the emotional field, creating of social relationships, the development of cognitive skills, and the creativity of the participants (Bengio, Margaliot, Benaković and Hayms 2021). The next lecture presents the educational program aims at developing Creativity while applying M.L.E. to create practical educational activities for gifted students.

Tuesday, 12th September

SESSION RITA-Tue-2

**Cognitive approaches to
creativity**

The Body-Mind Connection: Interoceptive sensitivity and mode shifting in creative thinking

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There has been intense research interest in understanding the mechanisms of creativity, but almost exclusively focusing on the neural responses, while the bodily inputs have been overlooked. The brain receives constant feedback from the body across multiple physiological axes and over different time scales; this interoceptive system, which processes visceral sensations, provides a real-time representation of the body's internal state, spanning both conscious and unconscious levels. In this study, we hypothesized that interoceptive sensitivity – or subjective bodily awareness – would be positively associated with the ability to switch modes of thought between associative and analytic modes; since a flexible shifting between these two modes is a critical skill for creativity. Participants ($N = 125$) completed several self-report scales, including subjective body awareness (interoceptive sensitivity), mode shifting (propensity to switch between modes of thought), alexithymia (difficulty identifying emotions), creative ideation, inspiration, and distractibility. They also completed a variety of divergent thinking tasks, which were scored using both semantic distance and human ratings of category switching. Results regarding self-reported judgements indicate that interoceptive sensitivity predicts the inclination to shift modes of thought, and this relationship is moderated by distractibility. Also, positive associations were observed between interoceptive sensitivity and creative traits like ideation and inspiration. Moreover, alexithymia, a trait negatively correlated with bodily awareness, was similarly negatively associated with creative traits. Results regarding creative switching task performance are further discussed. These results provide novel insight into understudied links between creative cognition and interoception.

Keywords: interoception; creative switching

The way we search our memory predicts our creativity: A cognitive multiplex network approach

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Creativity is strongly related to ones' mental lexicon structure and the way they search over it. Recent computational methods allow representing the mental lexicon as a multidimensional construct, with different dimensions, or layers, representing different aspects of relations between concepts (e.g., phonology, semantics). We show how the way people "mentally navigate" through this multidimensional structure (operationalized via semantic fluency tasks) can predict individual differences in creativity. In our study, we examined how such a model classifies (into lower- and higher-creative groups) and predicts (capturing individual differences) two different types of creativity scores, one, measured with a self-report questionnaire (ICAA) and another measured with a divergent thinking task (AUT). ICAA's best classification was 82% and prediction was $r(479) = 0.47$, $MSE = 2454.74$, $p < .001$. AUT best classification was 62% and prediction was $r(479) = .17$, $MSE = 0.002$, $p < .001$. Taken together, these results provide an exciting proof for the ability to use computational tools such as cognitive multiplex networks, to study and predict complex cognitive traits.

Keywords: Prediction; Cognitive Multiplex Network; Mental Navigation

Self-Regulation Prompts Improve Creative Performance

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Creativity requires a deliberate effort. While it happens that ideas occur spontaneously, people must use executive mechanisms and control processes to come up with creative ideas. Yet, the importance of managing the creative process effectively becomes even more apparent when looking beyond ideation and exploring what is needed to implement the generated idea and transform it into a tangible product. The variety of mechanisms people employ during their creative pursuits has been recently described and empirically tested within creative self-regulation framework (Zielińska et al., 2022, 2023). In this talk, we will discuss the findings from a preregistered study that employed a between-subject experimental design to investigate whether simple self-regulation prompts can enhance creative performance. The study involved $N = 332$ participants who completed one of three randomly assigned creative tasks: designing a logo, writing a short story, or making a greeting card. The experimental group received open-ended prompts that encouraged the use of various self-regulatory mechanisms during task performance. All participants took three photos at different stages of their work, which were independently evaluated for creativity by four judges. Additionally, participants reported on their creative self-efficacy and emotions experienced during the creative process. Our analysis demonstrated that the self-regulatory prompts helped participants develop more creative products. We will discuss potential mechanisms underlying the observed prompting effect, considering the role of dynamically measured creative self-efficacy and emotions. Finally, we will conclude with theoretical and practical implications of these findings, highlighting the importance of self-regulation in creative action beyond idea generation.

Keywords: creative self-regulation, creative task performance, prompting

A Review and Meta-analysis of the Convergent Thinking from Perspectives Cultures and Neural Mechanisms

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Research is gradually becoming oriented toward investigating creativity within socio-cultural contexts. Currently, many cross-cultural studies have focused on divergent thinking (DT) but lack evidence regarding convergent thinking (CT). In this review, we summary the cultural aspects of CT, specifically studies involving the Remote Associates Test (RAT), considering variations in RAT versions, thinking styles, and control strategies. Additionally, we performed a fMRI meta-analysis of 7 studies of Chinese RAT (C-RAT) and 8 studies of English and German RAT (E-RAT) to provide evidence to support our propositions. We proposed a theoretical framework that differs from previous conclusions, which suggested that CT and DT are independent sub-components of creativity and that CT only benefits from persistence. Variations observed among different RAT sets may partially explain differences in creative performance. Western individuals benefit from a bias towards flexibility, facilitating the formation of more distant and weaker associations to promote CT. Eastern individuals, on the other hand, prioritize the usefulness of solutions and tend to engage in a holistic and zhongyong thinking to foster CT. The common neural activation regions across cultures mainly concentrate on default and emotional network, supporting the partial reliance of CT on flexibility. The extra activation observed only in E-RAT is mainly in some regions related to cognitive control, which can be attributed to individual's cognitive effort to suppress close thoughts in order to form remote associations, and reach a unique solution by the evaluation of potential candidate ideas. However, during the final stage of RAT, when a unique answer needs to be selected, a flexibility-oriented divergent approach may result in a temporary loss of focus on a single solution. Thus, the high activation of control-related regions may be attributed to the control of the attention distractibility induced by spontaneous flexibility as well.

Keywords: convergent thinking; creativity; cultural differences

Tuesday, 12th September

SESSION CLAUDE-Tue-2

**Creativity in Team and at
work**

The effect of debriefs on team creative behavior and outcomes

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Team reflexivity as a team process does not happen naturally in many cases. Early research on team reflexivity has indicated that the degree to which teams engage in the process is a predictor of team creative performance. Given that team reflexivity may not occur spontaneously and its importance for team outcomes is paramount, an important question emerges: How can team reflexivity be facilitated? In this study, one approach to facilitate team reflexivity and its effect on team creative problem solving was evaluated. The study included 34 teams, each comprised of 3 individuals. Participants completed on creative problem-solving scenario, which was followed by an intervention. For experimental teams, participants viewed a short video about debriefs, and then engaged in the debrief process relative to the creative problem-solving they engaged in. The control condition participants watched a video about writing a proper email. All teams then solved a second problem which was then evaluated for quality and originality. Engaging in debriefs has been found to improve creative problem-solving outcomes for teams engaging in debriefs. In addition, team behavior was analyzed during the problem-solving process and evaluated for creative problem-solving behaviors such as problem identification and construction, idea generation, and idea evaluation. Relationships between these processes in the debrief teams was then compared to control teams. For example, teams in the debrief condition were found to engage in more question asking and in providing feedback than control teams.

Keywords: debrief, reflexivity, teams

Team creativity: A deep dive into developing a taxonomy.

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Team creativity has become a critical aspect of business success in recent years. The ability of a team to work together creatively, generate novel ideas, and solve complex problems is crucial in today's fast-paced and competitive business environment. Scholars and experts in the field have suggested some of the key factors that are most important for team creativity. Although many scholars have worked to describe the concept of team creativity, we recognize that it is a complex concept composed of many dimensions. This study first explores and summarizes the main dimensions and criteria of team creativity. Following the PRISMA process, a Systematic Literature Review was conducted, which identified 193 relevant key references on the topic. 274 team creativity criteria were collected from these references and were classified using the Input-Mediator-Output (IMO) team effectiveness framework. A taxonomy "Creative IMOT model" (Input-Mediator-Output-Time) helps to better understand the current known criteria contributing to team creativity. Additionally, the proposed classification taxonomy reveals some interesting findings, including the specific criteria used for Individual, Group, and Team, the commonly used criteria only for team level, and their correlation, etc. This study helps provide a clearer picture of what leads to team creativity and its underlying dimensions.

Keywords: Systematic Literature Review, Taxonomy, Team Creativity

The change of perspective and point of view set by mobiles teams in psychiatry: a creative (r)evolution

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The practice of mobile teams in psychiatry makes it possible to change of location of meetings. The hypothesis stated here is that multiplicity of chosen locations of meetings facilitates changes in spatial perspective leading to changes of point of view and mobilization of mental representations. It leads, in turn, to a high level of cognitive flexibility that benefit both patients and caregivers in order to address psychic disorders and therapies in innovative ways. The caregivers develop their creativity to help patients to find themselves the most adapted responses to problems within a particular context based on their own creativity as well as on change in spatial perspectives. In this line, the mobile team can be viewed as a space-time escort allowing the transition of patients from the space-time of the crisis/emergency to the space-time of psychic elaboration. A research conducted on 690 adolescents will be presented based on clinical practice of a child psychiatry mobile team for preadolescents and adolescents in difficulty who do not have a direct request for care. This multidisciplinary mobile team is characterized by changing locations of meetings chosen by the youth and his or her family. The statistical results indicate the importance for the therapeutic process of changes in physical environment (changes of meeting locations). Indeed, changes in meeting locations are significantly associated with therapeutic engagement whereas when all the meetings take place in a single location (home, mobile bureau, or care center), a greater frequency of rupture in follow-up is observed. In most cases, the typical trajectory observed is home to mobile bureau (transitional space) to the care center. Taken together, the findings highlight the positive role of physical movement for psychic mobilization and openness toward the outside world reducing social isolation, and the importance of a plurality of representations associated with the diversity of meeting locations knowing that people do not tell the same story according to the location (home, mobile bureau, or care center). In conclusion, changes in spatial perspective and point of view associated with the change of locations facilitate the mobilization of mental representations, thus contributing to the establishment of a dynamic of change and to the therapeutic process.

Keywords: mobile team, spatio-temporal representation, new therapeutic perspectives

Enhancing Creative Ideation for New Product Innovation through Weak Signals: Ideas and Concepts

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Weak signals are early indicators of potential changes or disruptions that often go unnoticed and/or ignored by most people. These signals originate from various sources, such as emerging technologies, social trends, or new patterns of behavior. By identifying and analyzing these signals, individuals and organizations can anticipate and devise plans to adapt and prepare for future challenges and opportunities. Weak signals play a critical role in enhancing creativity and can pave the way for groundbreaking discoveries in various industries, including insurance. By being mindful of weak signals and using them as strategic subtle cues as a technique to generate availability heuristics. Individuals, with the mental short cuts, can tap into their creative potential and devise unique solutions to intricate problems from weak signals cues. These signals can manifest as emerging trends or seemingly insignificant details that others may overlook, but they are essential to unlocking creativity and amplifying ideation. This study discusses the concepts of how weak signals can be used to enhance creativity and generate innovation for new product development (NPD). Action research method case study was deployed with participants from insurance regulators, insurance companies, InsureTech companies whose goal is to increase the effectiveness of production ideation process. The participants conceptualize the ideation process with their intuitive experience to gather weak signals and apply their observation to NPD. This study aims to advance comprehension of weak signals as a crucial component of NPD through availability heuristic. Additionally, it explores how industries can creatively collaborate and adapt to change during NPD process. This research will prove advantageous for NPD teams around the world as it will enable and enhance creativity of NPD process.

Keywords: Enhancing Creative Ideation, New Product Innovation, Weak Signal

Tuesday, 12th September

SESSION RITA-Tue-3

Mini talks/Posters

Cognitive components of creativity and their structural brain correlates in frontotemporal dementia

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Although creativity is an essential cognitive function to adapt to novelty, its neurocognitive bases remain poorly understood. Current models highlight the interaction between associative and executive processes, presumably supported by the default mode and executive control networks respectively, with a key role of the prefrontal cortex, at the crossroad between these networks. Thus, behavioral variant frontotemporal dementia (bvFTD), characterized by neurodegeneration primarily targeting the prefrontal cortex, represents a unique model to study the regions that are critical for creativity. We aimed to explore the specific cognitive processes involved in verbal creativity, how bvFTD affects them, and to identify their brain substrates. We explored verbal creativity in 10 bvFTD patients and 17 matched healthy controls, using a word-association task validated by our team, the Free Generation of Associates Task (FGAT). In this task, participants are asked to provide a single word in response to a given cue-word, following 2 conditions: (i) a FGAT-First condition, aiming to assess the organization of spontaneous semantic associations, in which participants are asked to provide the first word coming to their mind in response to the cue-word, and (ii) a FGAT-Distant, aiming to assess the ability to provide creative verbal associations, in which participants are asked to answer with a word associated with the cue-word in an original, unusual, though understandable way. Using French associative norms we computed the semantic distance between the cue-words and the provided answers, and the number of unique or contrariwise typical answers. We also measured the number of unresponded trials, the number of trials with identical answers in both conditions, and response timings. We then used a principal component analysis to disentangle the cognitive components involved in the task, which were entered into a whole-brain voxel-based morphometry analysis. We distinguished four components that reflect different associative and executive processes. Patients were impaired in three components: intentional remote thinking, inhibition of dominant responses, and verbal initiation, but not in spontaneous associative thinking. Atrophy in several brain regions,

consistent with the literature, correlated with inhibition and verbal initiation. Additionally, intentional remote thinking correlated with atrophy in rostral prefrontal regions of the default mode and executive control networks. These results help to clarify the cognitive mechanisms of creativity, confirm the critical role of prefrontal regions and of the cooperation between the default mode and executive control networks, and outline the relevance of studying creativity in bvFTD patients.

Keywords: Creativity, Frontotemporal dementia, MRI, Remote thinking, Semantic associations, Voxel-Based Morphometry

Do you like your ideas? Computational account of how subjective idea valuation energizes and guides creative idea generation

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What drives us to search for creative ideas, and why does it feel good to find one? While previous studies demonstrated the positive influence of motivation on creative abilities, how reward and subjective values play a role in creativity remains unknown. This study proposes to characterize the role of individual preferences (how people value ideas) in creative ideation via behavioral experiments and computational modeling. Using the Free Generation of Associates Task coupled with rating tasks (likeability of the provided responses, as well as originality and adequacy of the responses) in 69 participants (41 females and 28 males; mean age: 25.8±4.5 yo), we demonstrate the involvement of valuation processes during idea generation: preferred ideas are provided faster. We found that valuation (i.e., how rewarding it was for a participant to find an idea) depends on the adequacy and originality of ideas and guides response selection and creativity. Finally, our computational model correctly predicts the speed and quality of human creative responses, as well as interindividual differences in creative abilities. Altogether, this model introduces the mechanistic role of valuation in creativity. It paves the way for a neurocomputational account of creativity mechanisms.

Keywords: Creativity, computational modeling, evaluation, idea generation, preferences, subjective value

Unlocking the switch: Exploring the neural mechanisms underlying creative switching

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Significant outstanding questions remain about the role of executive functions, such as switching, in creative cognition. Researchers have linked creative performance to the ability to switch between conceptual spaces, narrow and broad attentional states, and generative and evaluative modes of thought. However, it remains unclear what neurocognitive processes underlie switching in creative contexts and whether such processes overlap with those involved in executive task-switching. One plausible hypothesis is that switching in both creative and non-creative contexts requires control over working memory (WM). More specifically, creative and executive switching may both involve shifting from maintaining a set of concepts in WM to inhibiting these concepts and allowing new concepts to activate. To investigate the neurocognitive mechanisms underlying creative switching in both passive and forced-switch contexts, we collected EEG data while participants (N = 65) completed the alternative uses task (AUT), a forced-switch variant of the AUT, the forward flow task and the divergent association task. Participants also completed measures of WM updating and executive shifting. Behaviourally, we examine whether executive shifting ability relates to greater performance in forced-switch creative tasks, and more frequent switches in self-directed creative tasks. With EEG, we examine the neural signatures of creative switching, and whether these relate to those associated with executive switching, WM updating, and inhibition. We also examine whether any neural correlates of creative switching are more prevalent when participants make switches of greater semantic distance or generate more creative ideas. Implications and potential directions for future research are discussed.

Keywords: Creativity, EEG, Switching

Electrifying creativity with language: Brain dynamics of creative thinking in Polish-English bilinguals with semantic association objects

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A growing body of literature suggests a positive relationship between bilingualism and creativity, but the underlying neural mechanisms remain unclear (Van Dijk et al. 2019). Here, we investigate the behavioural and neurophysiological correlates of creative ideation in 30 Polish (L1) – English (L2) participants using a modified version of the alternate uses task (AUT). Participants will be shown a picture of an object and its name. First, they will be asked to come up with a common use of the object and type it in a designated window on the screen. Next, they will engage in three cycles of unusual use generation, 30 seconds each. During that stage participants will silently think about unusual uses of the object and upon seeing a keyboard cue they will be asked to select the single best idea they came up with in that cycle and type it in a designated window. This modified AUT procedure may give insight into the idea generation (divergent thinking) and idea selection (convergent thinking) stages of AUT. Critically, AUT items will share either many or few semantic neighbours, allowing us to investigate the impact of an item's semantic richness on idea generation. Languages will be blocked and counterbalanced. Data analyses will focus on alpha frequency (8-12 Hz) as well as idea originality. The experiment is piloted and about to be run. We hope this study will contribute to our understanding of the neural mechanisms of creative thinking in bilingual individuals and may have implications for bilingual education and language learning.

Keywords: bilingualism, semantic association, alpha power

Distracted by words: the roles of irrelevance processing and openness on creative performance

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Attention is one the key cognitive mechanisms in the creative thinking process. In particular, several studies have shown how paying attention to irrelevant information can potentially increase the creative performance in an Alternative Uses Task (AUT), if it is combined with high levels of Openness to experience (see e.g., Agnoli et al., 2015; Agnoli et al., 2018). However, past research has been mainly focused on the processing of visual irrelevant stimuli, opening up the question whether this effect can be generalized to other types of stimuli. Thus, in the present study we explored the role of the processing of (apparently) irrelevant words on the creative performance during an AUT task. Forty-five participants (M age = 22.38 years) were involved in an AUT task to produce original uses for common objects identified by target words (pretested and selected for familiarity). Each target word was displayed at the center of a screen, and it was surrounded by 8 peripheral irrelevant words. The attentional processing of the stimuli on the screen were measured through a Tobii T120 eye-tracker. In addition, we computed the semantic distance between the target words and each peripheral word. Big-5 traits and creative achievement were then measured in the participants. Results revealed that the processing of irrelevant peripheral words had an effect on participants’ creative performance (in particular on the fluency index, whereas no significant effect emerged on originality) if combined with their Openness trait and if the semantic distance between the irrelevance and the target word was taken into account. More specifically, the processing of semantically distant irrelevant words led to a higher fluency with increasing Openness. These findings help us understanding and expanding our knowledge on the cognitive and personality factors that influence ideation, particularly the relationship between verbal information and irrelevant processing.

Keywords: Creativity, Attention, Semantic Distance, Attention

Tuesday, 12th September

SESSION CLAUDE-Tue-3

Mini talks/Posters

Revolutionizing Sustainability through Creativity: An Empirical Approach to Enhancing Zero-Waste Garment Design

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At the intersection of creativity, design, and science, this study presents a systematic, empirical analysis of design development for sustainable clothing. The usefulness of designed objects in the advancement of knowledge toward important movements, such as sustainability, can appear limited. However, when designed objects are accompanied by research and analysis as defined by Bye, Chen & Lapolla in *Research through Practice*, a contribution to knowledge advancement through design takes place. The overarching purpose of this research was to create a contoured zero-waste garment. The subsequent methodical approach generated data through creating sketches, prototypes, observations, and physical documentation that were then evaluated, analyzed, and synthesized. This research meticulously documented each stage, yielding invaluable empirical data related to materials and processes. The data were then integrated into a first design that combined simple geometrically shaped pieces using the entire dimension of the fabric (therefore zero waste) with knitted panels to contour the garment to the body. Subsequent designs continued to generate data that were analyzed and synthesized. These results address complex challenges inherent in traditional zero-waste pattern cutting, where contouring is often not successfully accomplished. Entirely constructed from biodegradable fabrics, the garments are contoured by the creative placement of knitted panels, which strategically replace traditional darts, reduce waste, and simplify construction. This empirical “design as data” approach advances sustainable garment design knowledge by harmoniously integrating creativity and sustainability, ultimately underscoring the transformative power of a scientific approach to creativity in design, charting a course towards a more sustainable future in garment design.

Keywords: design data, fashion design, zero-waste

Creating or designing: What creativity and design thinking can learn from each other

Todd, E.M., Gandy, G., & Stewart, P.

Louisiana State University

Design thinking has emerged as a popular construct both in popular media and recent literature. However, there lacks consensus of its definition, process, and applications. Moreover, its relationship with creativity is often asserted and discussed; yet, there lacks construct distinctions and conceptual clarity as to how design thinking and creativity operate. The purpose of this paper is to review the creativity and design thinking literature and provide a conceptual framework of their relationship. A content analysis of 80 papers was conducted and definitional themes were identified. It was found that design thinking is most commonly discussed as a problem-solving process that is user-centered and innovation-focused. Creativity is most commonly discussed as a skill or process that is focused on generating novel and useful products. In literature examining both constructs, design thinking is most commonly posed as a process to successfully solve creative problems, and this process is distinct from models of creative problem-solving cited in the creativity literature. This suggests that design thinking may be an alternative—and better— approach to solving creative problems. However, empirical research supporting this claim is lacking. Moreover, across the literature, discrete definitional issues abound, with 68% of articles failing to define creativity or design thinking when both terms were discussed. We call for the expansion of this research, as well as draw implications of what design thinking and creativity may learn from each other, and propose topics for future research.

Keywords: design thinking, creative problem-solving, definitional issues

Religiosity: A Hindrance or Catalyst of Creative Beliefs and Achievement

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Existing literature on the relationship between creativity and religiosity yields somewhat mixed results. There are two general hypotheses or standpoints: (a) religion hinders creativity and (b) religion facilitates creativity (Liu et al., 2018). Previous research has explored the relationship either at an aggregate level or indirectly, leaving a paucity of individual-level data directly exploring correlations between creativity and religiosity. We tested these hypotheses at the individual level by exploring correlations between measures of religiosity (Huber & Huber, 2012) and creativity, as measured through creative self-concept (Karwowski, 2011), creative achievement (Carson et al., 2005), and openness to experience (DeYoung, 2015). The measure of openness to experience was included as it positively correlates with all domains of creativity and has been used as a proxy measure of creativity (Kaufman et al., 2010). Four hundred and ten participants (273 women, mean age = 30.23 years) were recruited via email and social media to complete an online survey. Preliminary results indicate a modest negative correlation between both religiosity and openness to experience ($r = -.124, p = .023$) as well as religiosity and creative achievement ($r = -.199, p < .001$). Creative self-concept had no significant correlations with the five-dimensional religiosity composite. However, the religiosity dimension of experience had a slightly positive correlation with creative self-concept ($r = .118, p = .026$). Implications of the study may inform religious pedagogies across multiple religious traditions. Additionally, as both creative achievements and religious beliefs shape cultures, understanding their relationship may elucidate both creative production and religious progression.

Keywords: Creativity, Religion, Religiosity

Creativity Quotes: Studying Quotes as reflection of lay conceptions about Creativity

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² *Cornell University*

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Twitter is one of the most prominent social media spheres. Platform users can share their thoughts through short texts (i.e., tweets), often using hashtags (i.e., words with the prefix #) as a means of emphasis, to connect with others, and/or to visibly associate themselves with topics. As such, hashtags are both semantically and socially meaningful. The present study explored the public conceptualization of creativity on Twitter through co-listed hashtags associated with #creativity. After obtaining approximately one million tweets using the Twitter API v2, we applied Exploratory Graph Analysis, a network psychometrics technique, to identify a network of semantic clusters representing topics of #creativity. The semantic clusters reflect well-known everyday creative domains focused on visual and digital arts, storytelling, and handicraft. Other clusters paid tribute to the role of mindsets, teams, and imagination, feature business and innovation, and stress the importance of creativity for mental health. In addition, we compared the resulting network to one of #innovation, which had a higher prevalence of technological clusters relating to areas of digital transformation. Using a pre-trained and fine-tuned language model, we additionally classified the sentiment of the underlying tweets. Both networks were vastly positive, suggesting that the exhibition of potential and success outweighs tweeting about obstacles and failure. Our study provides a bottom-up socio-cultural snapshot of lay conceptualizations of creativity, highlighting commonalities and differences with theorized conceptualizations.

Keywords: affirmations, myths, quotes

An overview on psychological well-being and emotional intelligence of adolescents. Is there a place for creativity?

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Psychological well-being of adolescents not only means the absence of psychopathology, but also being content with life, experiencing wide-ranging emotions, and having balanced bio-psycho-social functioning. Creativity is considered a resource having a lifelong significant impact on health and well-being as well. Moreover, studies have shown that trait Emotional Intelligence (trait EI) promotes psychological well-being via several pathways. Regarding the link between trait EI and creativity, it has been emphasized that emotional aspects of personality should be explored in creativity research. However, study on these relationships with adolescent samples is scarce. The present groundwork aims to systematically explore the literature on the protective role of trait EI in adolescent psychological well-being and then later analyse the relationship between trait EI and creativity in adolescence. As operationalization is crucial for any EI model, we focused on studies using the adolescent forms of the Trait Emotional Intelligence Questionnaire, which provides a comprehensive analysis of trait EI factors: Wellbeing, Self-control, Sociability and Emotionality. Results from 27 systematically reviewed studies relate to five different areas: gender differences, psychological constructs, parental relations, scholastic constructs and practice-oriented topics. Although the prevalence use of cross-sectional designs limits the generalisation of results, the wide coverage of topics in the reviewed literature gives insight on the dynamics between trait EI and adolescent well-being. The research project's next step will be to investigate the association between trait EI and creativity as it may provide insight on how trait EI can help creative problem-solving skills of adolescents to maintain their psychological well-being.

Keywords: adolescence, psychological well-being, trait Emotional Intelligence

Tuesday, 12th September

EXTENDED SPEECH

Indre Viskontas

Crossing Cultures: When a Neuroscientist Directs Opera

Indre Viskontas

Psychology at the University of San Francisco

In this talk, Dr. Indre Viskontas will discuss her experiences and approach to applying the tenets of creativity neuroscience when working with cultural institutions and other creatives. Trained as an opera singer, Dr. Viskontas turned to stage direction as a way of capitalizing on her unique skill set as a neuroscientist and story-teller. She has also consulted for several large cultural institutions, including the Museum of Science and Industry in Chicago on an upcoming immersive exhibit from *Notes to Neurons*, and this past year as the Osher Fellow at the California Academy of Sciences in San Francisco, investigating the impact of conservation photography on climate action. She is also the President-Elect of the Society for the Neuroscience of Creativity and the Director of Communications for the Sound Health Network.

Tuesday, 12th September

SYMPOSIUM RITA

Tue - 4

Chair: Todd Kettler

The Influence of Belief Systems on Creative Education

Chair: Kettler, T.

Baylor University

Belief systems are complex and interrelated structures that influence perception, interpretation, response, and behavior. Belief systems are not necessarily cohesive, meaning that individuals may hold contradictory or seemingly incompatible beliefs (Lombaerts et al., 2009). Moreover, belief systems tend to have stronger affective components than knowledge structures (Kagan, 1992; Nespor, 1987) making beliefs often more robust predictors of behaviors than knowledge (Pajares, 1992). This pattern of incompatible beliefs has been documented in teachers (Kettler et al., 2018; Maggioni & Parkinson, 2008) as well as pre-service teachers (Lawson et al., 2018). The inaccurate belief phenomenon has also been documented in educator's beliefs about creativity. For instance, teachers tend to believe that creativity is valued in education, but their conceptions of creativity are uninformed by contemporary theory and research (Mullet et al., 2016). Importantly, beliefs tend to predict behavior, and specific teachers' beliefs can exert substantial influence on their teaching practices (Ertmer, 2005; Staub & Stern, 2002). Thus, beliefs about creativity are meaningful variables in learning environments. For some educators, specific beliefs about creativity significantly enhance creative learning, but for others, beliefs about creativity involve myth and bias potentially limiting creativity. Furthermore, students' self-beliefs relative to creativity and learning may also enhance or inhibit their learning and creative development. This symposium focuses on belief systems, creative pedagogy, and creativity development. The papers presented highlight contemporary research on students' self-beliefs as well as educators' beliefs relative to creativity. The first paper presents a current meta-synthesis of research on teachers' beliefs systems relative to creativity and creative students. The second paper shares results from research on pre-service teachers' beliefs about creativity. The third paper explores students' creative self-beliefs and how learning contexts can influence those beliefs. The final paper offers a theoretical framework for training, intervention, and innovation in creative pedagogy.

Keywords: belief systems, creativity, teachers

Teacher Beliefs about Creativity and Creative Pedagogy: A Systematic Review

Spitsberg, T. & Ruiz, B.

Baylor University, U.S.A.

Teacher beliefs have stronger affective and evaluative components than teacher knowledge, and are influential determinants and strong predictors of teacher behavior. Lack of a universally adopted definition for creativity means that though teachers serve as influential proponents for creativity, they often are left to their own devices in defining creativity and implementing it in classrooms, meaning such personal conceptions matter deeply. Creativity researchers have engaged consistently with teacher belief systems, with three systematic reviews, Andililou & Murphy (2010), Mullet, et al. (2016), and Berezcki & Karpati (2018), surveying and thematizing the extant state of the field from 1991-2015. Collectively, these reviews analyze 119 studies from a pool of roughly 4,000 considered citations. No systematic review concerning teacher beliefs about creativity has been published since 2018, and our current project covering the years 2015-2023 began with a potential set of approximately 2,000 citations. Our research commenced with a second-order systematic review, clarifying and condensing previous findings and triangulating evidence from the three previous systematic reviews. We followed that synthesis with a first-order systematic review for the years 2015-2023. Collectively, the ensuing results provide not only a clearer view of the extant literature and its concurrences, but also an up to date field trajectory informed by what we've learned over the past decade, and illustrative of what work is most critical moving forward. Results indicate that teachers believe creativity is an increasingly important skill and should be integrated into learning designs. However, incongruities still exist between teacher beliefs and creativity scholarship.

Teacher Beliefs about Assessing Student Creativity

Atha, M.¹ & Katz-Buonincontro, J.²

¹ *Florida Gulf Coast University, U.S.A.*

² *Drexel University, U.S.A.*

What are pre-service teacher candidates' beliefs about assessing student creativity? Though the topic of teacher beliefs about creativity has been studied for decades (Berezki & Karpati, 2018), little if no research examines teacher beliefs about *assessing* student creativity. The present study aims to build upon the development of the *Beliefs about Creativity Scales* (Hass, Katz-Buonincontro & Reiter-Palmon, 2018) by modifying the items in the context of teacher beliefs about *assessing for student creativity* within a classroom. Following procedures laid out by DeVellis (2012), we first generated an item pool to measure teacher beliefs about assessing for creativity using a Likert scale format. The second stage includes feedback from a panel of experts. Next, we will test the psychometric properties of the candidate items. Our sample includes pre-service teachers enrolled in courses aligned to school-based field experiences ($n= 88$) as well as the university-based faculty who supervise them ($n= 18$) located in a five-county region in southwest Florida. In addition to examining item-scale correlations, item variances, and item means, an exploratory factor analysis will be conducted to determine dimensionality and reliability of the scale. Lastly, focus groups with each sample will provide contextual explanations of these beliefs, in a mixed methods sequential design (Creswell & Plano Clark, 2018). With this work, we propose a new research agenda to bring two important streams of research together: self-report, implicit theories of creativity and teacher self-efficacy in classroom assessment.

Creative Self-Beliefs Research in Education

Alvarez-Huerta, P.

Mondragon Unibertsitatea, España

Self-beliefs lead many of our decisions and actions. In recent years, evidence has been collected that highlights the important role that creative self-beliefs play in creative behaviour. Such beliefs that affect our creative development can be nurtured through different approaches, which makes their study especially relevant in the educational context. Recent research studies show that it is possible to influence students' creative beliefs through different interventions. This presentation aims to provide an overview of how different learning contexts can influence students' beliefs about their creative abilities and about creativity in general. A review of such studies suggests that educational contexts that provide opportunities for creative work, create a safe emotional context for experimentation, foster interactions that encourage viewing problems from multiple perspectives, and in which students receive supportive feedback from teachers have a positive impact on students' creative self-beliefs. Students in such learning environments are more motivated to spend time and effort cultivating their creative potential, which, in turn, positively affects the beliefs they hold about themselves. Creative self-beliefs are not only related to student creative growth but also to variables closely related to their future academic, social and professional development. Consequently, identifying the factors that affect students' creative self-beliefs provides institutions and educators with relevant information to promote educational programs that help students unlock their inner potential.

Supporting and Sustaining Creative Pedagogy: The Importance of Teacher Belief Systems

Kettler, T.

Baylor University, U.S.A.

Creative pedagogy is generally thought of as teaching for creativity, creative teaching, and creative learning. Generating ideas, solving problems, and designing solutions tend to be the core processes of creative pedagogy, and deep learning with an emphasis on application and innovation is the outcome of creative pedagogy. Our research suggests that the precursors to creative pedagogy are complex and interactive. While teachers' knowledge and skills are fundamental to creative pedagogy, so too are teachers' belief systems. Thus, we are applying the theory of belief congruence to teachers. Teachers tend to value new beliefs in proportion to the degree those beliefs are congruent with their existing belief systems. In the theory, congruence means both the aligned similarity of the beliefs as well as the aligned importance of the beliefs. Consequently, when teachers are asked to implement creative pedagogy, they evaluate it on a continuum of congruence with (a) their beliefs about the relative importance of creativity, (b) their beliefs about how teaching and learning should occur, and (c) their beliefs about the very nature of creativity and creative people. This presentation highlights our lab's research illuminating the variables that influence how teachers implement creative pedagogy. Our theoretical model provides insight on how to train and support teachers as they are confronted with increasing demands of creative and innovative learning environments. We are exploring ways to change teacher belief systems to increase belief congruence about creative pedagogy in order to increase the prevalence and effectiveness of students' creativity development.

Tuesday, 12th September

SYMPOSIUM CLAUDE

Tue - 4

Chair: Joyce Miller

Using Children's Books that Inspire Creativity and Innovation in Young Girls to Teach SEL skills

Chair: Joyce Miller

Robinson S. ¹, Miller J. ², Phelps, C. ³, & Brazzolotto, M. ⁴

¹ *Poised For Success Learning Academy*

² *Texas A & M University-Commerce*

³ *Emporia State University*

⁴ *Centro Didattica Talenti*

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. There are many social and emotional skills that are embedded within each of these books. CASEL (The Collaborative for Academic, Social, and Emotional Learning) identifies five social and emotional competencies as self-awareness, social awareness, self-management, responsible decision-making, and relationship skills. In this presentation, the participants will explore the 10 books. A brief summary will be shared revealing facts about the women depicted and details about how they used creativity and innovation to contribute to society. The participants will then learn how to identify the characteristics of CASEL's 5 SEL competencies within the 10 books using excerpts from the books. Afterwards, the participants will engage in activities to accompany the books that can be used to teach social and emotional learning skills and inspire creativity and innovation.

Keywords: bibliotherapy, SEL, STEM, books, children's books, creativity, education, gifted education, girls, innovation, picture books, social and emotional learning

Phelps, C. & Brazzolotto, M.

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 children 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 children 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.

Brief description of how characters from books use creativity and innovation to solve problems and contribute to society

Katherine Johnson was a gifted mathematician who helped Apollo 13 return home after an explosion in space by calculating the ship's route.

Sophie Germain was a gifted mathematician who invented a formula that predicted the patterns of vibrations which influenced the building of skyscrapers, the Eiffel Tower, and many other buildings we see today.

Sophie Kowalevski was a gifted mathematician who wrote three original theses to earn her doctorate in mathematics which ultimately led to her being the first female to become a full professor at the University of Berlin.

Raye Montague was a gifted mathematician who created the first computerized ship design for the U.S. Navy which led to ships being able to be built faster.

Temple Grandin is an animal welfare advocate with autism who created many inventions to help farmers reduce the amount of slaughtered livestock on their farms.

Elizabeth Friedman was a cryptanalyst that helped decipher codes during the World Wars which led to capture of spies.

Mary Golda Ross was an aerospace engineer and the first female native-american engineer who created designs to travel to other planets in space.

Hedy Lamarr was an Austrian actor who invented the frequency hopping technology which helps keep our contents in technology private and inaccessible to hackers.

Maryam Mirzakhani was an Iranian mathematician who was the first woman and Iranian to win the Fields award for her contributions to the mathematics field.

Dr. Ellen Ochoa was an astronaut who was the first Hispanic woman to travel to space.

Tuesday, 12th September

MIC Keynote Speech

Vlad Glaveanu

Who let the bees out? The cross-pollination revolution of Possibility Studies

Glaveanu, V.

School of Psychology, Dublin City University

This talk will discuss the birth and development of Possibility Studies as an explicitly multi- and trans-disciplinary field of theory, research, and practice that includes creativity research and connects it with work done in other fields, disciplines, and domains of knowledge. As a paradigm that emerged over the past few years - including through a previous keynote at WCCI/MIC 2019 - Possibility Studies brings together the social, human, natural sciences as well as the arts to expand our understanding of how we, as individuals and collectives, become aware, explore and enact (or not) possibilities in psychological, social, material, cultural, technological and/or political terms. Given its wide scope, this new paradigm explicitly aims to create a dialogue between researchers and practitioners working in various fields and across disciplines, on topics such as agency, creativity, imagination, innovation, improvisation, counterfactuals, curiosity, wonder, serendipity, pretend play, anticipation, futures studies, utopias and dystopias, etc. This talk will consider how exactly cross-pollination takes place between so many, intrinsically diverse literatures, and will take the example of the sociocultural theory of the possible as an illustration of a theoretical development that started in creativity research but soon turned into a broader social and human science perspective on self, others, and world.

Keywords: Art making, Historiometry, Inspiration

Wednesday, September 13th

MIC Keynote speech

Neil Maiden

Co-creative AI tools: Codifying creativity knowledge to augment human creative thinking

Neil Maiden

Bayes Business School at City, University of London

New, more scalable and reliable AI technologies mean that digital tools that augment human creativity have begun to emerge in different markets. However, open questions remain about to design these co-creative AI tools in order to effective and acceptable to users, especially those engage in professional work. This keynote will introduce multi-disciplinary design research that codified knowledge about established creative thinking techniques and developed algorithms to reason about this knowledge in new co-creative AI tools to be used in sectors including design, journalism and sports coaching. It will also report barriers to the uptake of these tools - barriers such as professional identity and creative self-belief - that have led the design of these tools to evolve. It will end with an outline agenda for empirical design research to explore the introduction and impact of new co-creative tools in different work contexts.

Wednesday, 13th September

SESSION RITA-Wed-1
Creativity in Organizations

Creativity Predictors in Organizational Contexts: An Empirical Study in Creative Ecosystems

Zamana, F.

LaPEA - UPCit 

Creativity is an incredibly complex phenomenon, explored from multiple fields and in an array of perspectives across time. With the increasing complexity of possible perspectives to address it, some researchers proposed a model to synthesize creativity as a whole system made of different components (Rhodes, 1961; Glaveanu, 2013; Lubart, 2017). Gruber (1981) said that “without any one of a number of vital organs, the individual dies; without any one of a number of vital components, an argument fails” (p.5). So, what are the “vital organs” of creativity? Considering creativity as a dynamic “set of distinct components with specified relationships” (Stahl & Brower, 2020, p.464), four components for creativity according to the Evolving Systems Approach (Gruber, 1988), Investment Theory (Sternberg & Lubart, 1991), and Componential Theory (Amabile, 2013) were analyzed. The purpose of this investigation was to examine the contribution of these components, namely Knowledge, Motivation, Environment, and Affect, needed for creativity in the work environment and its possible effect on creative outcomes (Gruber, 1981; Amabile & Kramer, 2007). To test it, the Experimental Vignette Methodology (EVM) (Aguinis & Bradley, 2014; Atzm ller & Steiner, 2010) was adopted to manipulate the variables. The EVM consists of presenting participants a questionnaire with carefully designed descriptions of realistic scenarios (vignettes), to assess dependent variables including intentions, attitudes, and judgments, while allowing researchers to manipulate and control independent variables. The vignettes were prototyped using a fictional co-worker within a professional context that can be judged by participants as either high or low (two components per vignette), and the chance of a possible creative outcome in each scenario. Finally, the results are analyzed according to Necessary Conditions Analysis (Dul, 2016) to uncover the ideal amount of each component for creativity development. The study concludes with possible consequences and future perspectives for creativity in work environments.

Keywords: creativity; predictors; creative processes; sociocultural perspective.

Creative processes in a hybrid work environment: A case study

Tønnessen, Ø & Flåten, B-T.

University of Agder

This study explores creative processes in a hybrid work context where employees work partly from an office location and partly from home. The widespread adoption of hybrid work requires organizations to rethink how to foster creative collaboration to remain competitive and innovative (Amigoni, 2021; Babapour Chafi et al., 2022; Aalbers & Whelan, 2021). Hence, the present study aims to explore and understand creative processes in a hybrid work context. To explore these processes, a single case study design was adopted. The research design is underpinned by an interpretive approach, which assumes that understanding social processes involves “getting inside the world of those generating it” (Orlikowski & Baroudi, 1991, p. 15). For our study, IT professionals were selected given their experience in using digital tools for collaboration tasks, as well as opportunities for remote and hybrid work practice (Kinsella et al., 2021). Data were collected from one of the world's largest information and technology companies. A purposeful sampling technique was used to select the case study participants (Patton, 1990). With our aim of exploring individuals' experiences in a distinct context, in-depth interviewing was chosen as the primary data collection method, in addition to access to relevant documents and direct observations. 31 individuals (N=31) across units, disciplines, roles, and hierarchical levels in the company were interviewed. After completing the interview transcription, all raw data were imported into the qualitative analysis software HyperRESEARCH 4.5.4 and analysed thematically. A three-phase model for group creative processes was applied to identify which work mode is most appropriate in each creative phase. Previous literature has suggested three common core phases: problem identification, idea generation and idea evaluation (Murugavel & Reiter-Palmon, 2023; Reiter-Palmon & Illies, 2004), and each phase of the creative process is associated with its own critical success factors (Caniëls et al., 2014). Our study contributes to the creativity literature and emerging research stream on hybrid work. We have adopted the three-phase creative process model, which we empirically confirm to be applicable in a post-pandemic hybrid work environment. The findings suggest that face-to-face interaction

is most critical during the initial problem identification phase of the creative process. Idea generation is preferable to be conducted either fully digitally or fully face-to-face. Surprisingly, idea evaluation is the only phase in which the study participants propose a synchronous hybrid work mode. Furthermore, we identify psychological safety, social interaction and knowledge sharing as critical to hybrid collaboration, linking these concepts to group creative processes. Our findings suggest that the features of all three essential elements may be developed digitally when working remotely. However, the current study shows that digitally mediated social cues can never replace physical interpersonal interaction. By highlighting the crucial role of informal face-to-face interaction during distinct creative process phases, the findings provide new understanding where existing knowledge falls short in explaining the phenomenon. Consequently, to promote hybrid creative collaboration, we encourage managers to embrace technologies that allow for more spontaneous interaction virtually. Simultaneously, companies should develop a dynamic physical office space that serves as a hub for building psychological safety and creative culture.

Keywords: Creative process, Knowledge sharing, Psychological safety, Social interaction

Spurring Inclusive Entrepreneurship through Creative Cross-Pollinations

Baldacchino, L., & Mangion, M.,

The Edward de Bono Institute, University of Malta

The ever-changing employment landscape presents various challenges for job-seekers. Entrepreneurship is often touted as an alternative to waged employment, but this requires particular competences and conditions that are not uniformly distributed across the population. Notably, most entrepreneurs are ‘core age men’ (30-49 years old), who tend to be better skilled, financed and connected than groups who are under-represented in entrepreneurship, such as women, youths, migrants, seniors, persons with disability, and the unemployed (OECD, 2021). In view of these circumstances, inclusive entrepreneurship, which refers to self-employment among disadvantaged and under-represented groups, has attracted increasing interest from scholars and policy makers. Research indicates that different groups have skill-sets that would be useful but incomplete for entrepreneurship. For example, youths have digital skills that many seniors are lacking, seniors often possess business management skills that youths and persons with disability are missing, while migrants may benefit from language and cultural integration skills which the other groups may have. Although each group is heterogenous and the above are generalisations, there may be inclusive entrepreneurship opportunities through creative cross-pollinations between groups. This conceptual paper contributes to the literature by being the first to propose Glaveanu’s (2013) Five A’s of creativity as a framework to spur inclusive entrepreneurship, whereby: (1) individuals from under-represented groups are the Actors; (2) collaboration between Actors in entrepreneurial activities are the Actions; (3) products or services brought to market are the Artifacts; (4) customers are the Audiences; and (5) any support needed for the above to materialise are the Affordances.

Keywords: creative agency, five A’s of creativity, inclusive entrepreneurship

Wednesday, 13th September



SESSION CLAUDE-Wed-1
Creativity & Technologies

The effect of avatars and contextual cues in virtual environments on creative performance

Liu, J.¹, Burkhardt, JM.¹, & Lubart, T.²

*Université Paris Cité*¹

*Université Gustave Eiffel*²

Virtual environments are digital spaces in which people can engage in creative activities individually or collectively with fewer physical (e.g. gravity, distance) and social (e.g. appearance, anonymity) constraints than in the physical environment. This presentation aims to present a literature review of recent research examining the creativity-boosting effects induced by digital user representations (i.e. avatars) and digital contextual representations in virtual environments. More specifically, we will introduce how diverse types of humanoid avatars such as self-similar avatars, creative avatars, and avatars with social identity cues help enhance creative performance with different mechanisms. We will also introduce the creativity-boosting effects induced by virtual contexts such as the priming effect and embodied metaphorical effect. Moreover, we will present studies examining how creativity is positively influenced by immersion which is one important feature of virtual environments. Finally, a focus will be placed on the roles of embodiment and presence, two psychological states which are highly influenced by immersion, in the relationship between creativity, digital representations, and virtual environments with different levels of immersion, which is still unexamined with experimental studies.

Keywords: Creative performance, Immersion, Virtual environment

Avatarize Your Creativity: Exploring the Power of Avatars in Boosting Innovative Divergent Thinking

Toumi, K., Bonnardel, N., & Girandola, F.

Aix-Marseille University, PsyCLE & InCIAM, France

Different studies have shown that self-affirmation, which is the process of bringing salient features of one's self-concept to awareness (Steele, 1988), can improve performance in different tasks, including creativity tasks (Dutcher, 2010; Lee et al., 2016). Value-essay writing is the main paradigm typically used to manipulate self-affirmation (e.g., McQueen & Klein, 2006). However, some authors (e.g., Napper et al., 2009) have questioned the ecological validity of such an approach, especially in online settings. In this context, Park et al. (2022) recently showed a significant improvement in online participation following a self-affirmation knowledge activation through the customization of a self-value reflected avatar. The latter is hypothesized in the current study, to increase creative performance in a divergent thinking task, in comparison to “face-to-face” through a webcam. To do so, we conducted a study in an online setting, in which 160 participants were assigned to three different conditions: (a) a self-affirmation condition through a self-value reflected avatar, (b) a self-affirmation condition through value-essay writing (standard technique), and (c) a no self-affirmation condition (control condition). All conditions took place within a videoconference context with the objective to revealing how avatars can support online communication and alleviate some of the disadvantages associated with online platforms that can hinder creative performance such as Zoom anxiety (Ming et al., 2021). Our pilot results have yielded a promising trend, indicating that participants who activated self-affirmation via avatars tend to exhibit more creative fluency by generating more ideas that are unique than the participants in the other two conditions. In an original way, our findings replicated and extended to the case of creative divergent thinking the boosting effect of the customization of self-value reflected avatars.

Keywords: Avatars, Creativity, Self-affirmation

#Creativity: Exploring Lay Conceptualizations of Creativity with Twitter Hashtags

Ceh, S. M. ¹, Christensen, A.P. ², Lebuda, I. ^{1,3}, & Benedek, M. ¹

¹ *University of Graz*

² *Vanderbilt University*

³ *University of Wroclaw*

Twitter is one of the most prominent social media spheres. Platform users can share their thoughts through short texts (i.e., tweets), often using hashtags (i.e., words with the prefix #) as a means of emphasis, to connect with others, and/or to visibly associate themselves with topics. As such, hashtags are both semantically and socially meaningful. The present study explored the public conceptualization of creativity on Twitter through co-listed hashtags associated with #creativity. After obtaining approximately one million tweets using the Twitter API v2, we applied Exploratory Graph Analysis, a network psychometrics technique, to identify a network of semantic clusters representing topics of #creativity. The semantic clusters reflect well-known everyday creative domains focused on visual and digital arts, storytelling, and handicraft. Other clusters paid tribute to the role of mindsets, teams, and imagination, feature business and innovation, and stress the importance of creativity for mental health. In addition, we compared the resulting network to one of #innovation, which had a higher prevalence of technological clusters relating to areas of digital transformation. Using a pre-trained and fine-tuned language model, we additionally classified the sentiment of the underlying tweets. Both networks were vastly positive, suggesting that the exhibition of potential and success outweighs tweeting about obstacles and failure. Our study provides a bottom-up socio-cultural snapshot of lay conceptualizations of creativity, highlighting commonalities and differences with theorized conceptualizations.

Keywords: Creativity, Exploratory Graph Analysis, Innovation

Zeitgeist - participatory, real-time interface for Flow stimulation

Rahman, S., & Gingrich, O.

Zeitgeist, developed by the researcher/artists Dr Shama Rahman and Dr Olive Gingrich, uses AI-classification to indicate creative 'Flow' mental states, turning a participatory artwork into a digital interface of creative collaborative practices. Zeitgeist measures audiences' Flow mental state, a state of increased creative stimulation, reduced stress and increased engagement, using deep-learning classification of brainwaves. Zeitgeist represents and encourages Flow via visual cues to participants in real-time— a process called 'nudging'. Lighter colours and more complex forms represent a heightened state of Flow. and vice versa. These visual cues indicate to participants, their creative stimulation as in her PhD, Dr Rahman found the Flow state biomarker within experimental paradigms of creative performance. Using creative engagement to enable collective Flow, can help people socially connect, reduce stress and loneliness, and attain greater wellbeing.

User studies at the Royal College of Nursing and Somerset House engaged with a series of participatory creative activities, whilst visualising Flow states in real-time. Pre- and post intervention surveys, as well as interviews and observation point to insights into key factors attaining Flow. Whilst people seem to respond differently to different types of participatory engagement, Flow states seem to be easier reached by participants with a degree of knowledge of meditative practices which have a cross-over in open-monitoring. Exercises include humming, hand percussion improvisation and word-play. Joy and a degree of cognitive challenge including speed seem to contribute to Flow. Participants reported deeper social connectedness post intervention, as compared to conventional ice-breaker activities.

Keywords: Flow, creativity, neuroscience

Wednesday, 13th September

SESSION RITA-Wed-2

Mini talks/Posters

Decoding poetic creativity: The moderating role of expertise and personality traits

Chaudhuri, S., & Bhattacharya, J.

Goldsmiths, University of London

Poetry is possibly the most creative expression of language, but how we evaluate the creativity of a poem is not properly characterized. The same poem could elicit different subjective experiences across individuals, subsequently influencing their overall creativity judgment. The present study investigated the role of various subjective qualities in predicting the creativity judgment of a broad range of English poems. Participants ($N=129$) rated poems on six characteristics: clarity, aesthetic appeal, felt valence, felt arousal, surprise, and overall creativity. Aesthetic appeal, which refers to the aesthetic appreciation of any artwork, is widely studied in visual art, music, and poetry. However, how aesthetic appeal influences the judgment of *creativity of a poem* has not been studied yet. In this study, linear multilevel analysis showed that aesthetic appeal was the best predictor of poetic creativity, followed by surprise and felt valence. Expertise in English language moderated the effects of these predictors on creativity. These effects were also moderated by personality trait openness, followed by curiosity and awe proneness. The study concurrently captured the surprise-evoking line(s) as chosen by the participants. Finally, using SemDis, an automated scoring approach of verbal creativity (Beaty & Johnson, 2021), we computed the semantic unrelatedness of the surprise-evoking line(s) with respect to the two preceding lines. We provided some objective validation of the subjectively chosen line(s) of surprise in the poem in predicting poem's creativity. Altogether, our findings suggest a parsimonious model of the creative evaluation of poems and how it is shaped by expertise and personality.

Keywords: creativity, evaluation, poetry

Designing a creative contemporary dance program for non-dance majors to facilitate “dancing without realizing”

Nakano, Y. & Okada, T.

The University of Tokyo

How can we inspire non-dance majors' dance creativity? The purpose of this study is to propose the new dance approach that designs educational content to empower non-dance majors to dance creatively. The aim of this approach is to naturally relax the cognitive constraints of participants, such as creativity myth in dance creation, preventing them from dancing and to encourage them to explore their creative expressions. Based on design-based research on dance courses for non-majors, Nakano & Okada (2022) discovered that interaction with the environment and communication with others actively stimulate dance creation among non-dance majors. In collaboration with Ryohei Kondo, an accomplished Japanese dancer and choreographer, we designed a dance-creation course (220-minute duration for each class for a total of seven classes) implementing such interaction with the environment and communication with others. We analyzed its educational effects using two types of data: questionnaires at the beginning and end of the course, and follow-up interviews conducted four to six months after the course. The results of the questionnaire surveys showed that through the classes, participants' preconceptions about dance creation, such as the belief that assertiveness is required and that they are incapable of doing it, weakened. As their resistance to dance decreased and their interest piqued, they began to devise and explore new dance expressions. Furthermore, the results of category analysis of the follow-up interview data showed that the participants deepened their understanding of “self” and academic pursuits and became far more aware of different forms of communication in daily life.

Keywords: Contemporary dance, Creation, Dance education

Exploring Changes in the Multimodal Behavior of Actors in Acting Training

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The University of Tokyo

The present study aims to analyze the multimodal behavior of participants in a communication scenario during acting training. Using deep learning-based pose estimation, we extract gesture and movement information, as well as accompanying utterances, from video recordings of actual acting training courses to track changes in participants' communication patterns throughout the training. Acting training has gained popularity in general social communication programs due to its potential to equip actors with the ability to interpret various characters and adapt to different social relationships in theatrical settings. However, the reasons behind the enhancement of participants' communication skills and social understanding through acting training remain unclear, and there is limited research on the changes in the creative behavior of professional actors during such training processes. This study adopts a perspective of social behavior analysis and utilizes informatics techniques to focus on behavioral changes of actors in actual training scenarios. It explores the creativity of performance, specifically how actors assume their roles and influence each other within the scene, at the process level.

Keywords: acting, interactive role-making, multimodal analysis

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

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Previous research suggests that music training relates positively to executive functions that are considered domain-general cognitive skills – far transfer effects – and to creative achievements in domains other than music. However, it remains unclear whether music training can offer self-regulation skills (the mother component of executive functions) beyond playing songs. In addition, findings from music psychology suggest that the family plays a significant role in the development of musical motivation of young music learners. The present research will examine whether psychological support by the family moderates the relationship between music training, self-regulation skills, and creative achievement in domains other than music. To explore these relationships, a survey study will be conducted, aiming at recruiting 400 adult music learners who reside in the Netherlands and have at least one year of instrumental experience. The far transfer effect will be measured by the *Creative Activities and Achievements Questionnaire* (Diedrich et al., 2018). Self-regulation will be measured by the *Creative Self-Regulation Questionnaire* (Zielińska et al., 2022). Family's psychological support will be measured by three scales that refer to the general relationships between music learners and their parents (or other guardians) and the communication and emotional support they receive from their parents. It is expected that self-regulation will fully and positively mediate the relationship between music training and creative achievement. The level of parental support will indicate how strong and positive the mediating effect will be on music learners' self-regulation skills and their ability to transfer them to other domains.

Keywords: music training, family support, far transfer

Creativity and education: a proposal for the development of classroom creative processes

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UnB*

The research aimed to investigate conceptions and development of creative processes in the context of the classroom, based on narratives and practices of teachers and students with a view to co-building a body of potent activities for the development of creativity. These activities emerged from empirical experience and were worked on in the context that generated them. The study took place in a public school in the Federal District - Brazil, with the following participants: (a) the school community, and (b) an elementary school teacher and her 30 students. Nine research meetings were held, five for observation of the school community, two for the development of focus groups and two for the co-construction of activities that promote creativity, proposed by teachers/students/researchers. The results showed beliefs and values about creativity conveyed in the classroom, such as: (a) creativity as a phenomenon linked to artistic making; (b) creativity emerges as a phenomenon often associated with learning; (c) association of meanings between creativity and play.

Keywords: creative processes, education, development of creativity

Wednesday, 13th September

SESSION CLAUDE-Wed-2

Mini talks/Posters

Japanese self-reports on their creativity conception, creative activities and achievements

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Empirical research on creativity has examined individuals' creative beliefs, activities, and achievements by developing psychometric scales. Translating these scales into different languages will help us understand how creativity differs among countries. Thus, these two studies clarify the characteristics of creativity myths/facts and creative activity/achievement among Japanese people by developing Japanese versions of the scales. Study 1 translated the Creativity Myths and Facts Questionnaire (Benedek et al., 2021) into Japanese and surveyed Japanese participants (N=3101). The results indicated that the approval rate of creativity myths was higher in Japan than in other countries (Austria, China, Georgia, Germany, Poland and USA), as a previous study reported (Benedek et al., 2021), whereas the approval rate of creativity was lower. Study 2 translated the Inventory of Creative Activities and Achievements (Diedrich et al., 2017) into Japanese and conducted an online survey to examine its measurement validity and reliability. Two web-based surveys were conducted with 1190 adults as the little-c sample and 412 adults (who had received professional education or worked as professionals in visual art or music) as the pro-c sample in music and art. The results showed that the construct, concurrent validity, and reliability almost replicated those of the original inventory. Moreover, both the little-c and pro-c samples in the Japanese population scored similar to previous studies on creative activities, but the scores for creative achievements were lower than those in previous studies in both sample groups. Future studies should use these scales to directly compare Japanese with Western and other Asian populations.

Keywords: creativity myth, creative activity, creative achievements, stereotype

Aesthetics and Sustainable Design Through Reconstruction/Redirection: Moving Fashion Forward

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² *University of North Texas*

Creativity in fashion exists in both the fashion product and the making process. The fashion system, where replacement is not required by obsolescence but desired, is at a critical moment; unchecked production, consumption and waste of fashion products contributes 10% to global greenhouse emissions. Yet, self-expression through fashion is basic to human behavior and the fashion industry is a strong economic driver. We must mediate this dichotomy. Fashion and aesthetics are linked, and fashion products often reflect a contradiction between aesthetic qualities and sustainable production. The aesthetic experience, or the pursuit of beauty, leads to the need for aesthetic nourishment. This search for pleasure through beauty is significant for sustainable fashion, particularly in the wasteful context of fast fashion, because sensorially stimulating objects can also trigger attachment, leading to less waste. A field can advance creatively in different ways (Steinberg et.al, 2001). To explore dimensions of fashion creativity that contribute to the planet's preservation for future generations, we ask, which designers advance the field creatively to promote aesthetic nourishment with sustainable practices? We conducted case studies of fashion designers who demonstrate a reconstruction/redirection of the fashion field, working toward more sustainable practices and who enable aesthetic nourishment. Our purposive sample from the 2023 spring fashion week participants in New York, Paris, Milan and London, revealed creative contributions that reduce clothing consumption, textile waste, water consumption, and greenhouse emissions. The creative contributions of these designers are redirecting the fashion system toward a sustainably creative pursuit of aesthetic nourishment.

Keywords: fashion design, innovation, sustainable fashion, textile, waste

Baylor mathematical creativity test

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Although there is a rapidly growing interest in mathematical creativity from an early age, there are not enough valid and reliable scales to evaluate students' creativity in these areas. It is very important to determine the creativity areas of the students for an adequate education program for their individual needs. New and useful ideas that occur in specific or appropriate environments are related to creativity. Creativity involves thinking in a way that is flexible, authentic, fluent, and different. Mathematical creativity is finding new and original solutions by using these thinking skills in mathematical problems and creating new models and theorems through mathematical connections. It is important to determine the mathematical creativity of children at the elementary school level and to train them accordingly in order to raise very good problem solvers in different fields in the future. For these reasons, valid and reliable scales of measurement are necessary for determining elementary school students' mathematical creativity. For this purpose, mathematical creativity tests currently applied for different age groups were examined. Different from these tests, questions were created for fluency, flexibility, and originality dimensions in the context of mathematical creativity. Expert opinions on this subject were obtained from educators working in this field. The main aim of the study is to develop a valid and reliable test of math creativity for use with elementary school students. This test was developed for elementary school students in the 9-11 age group. Pilot studies of the test were also implemented in Turkey. The pilot study's sample consists of 90 elementary school students who attend 3rd and 4th grades. After the pilot application, data analyzes were made and the test questions were rearranged. This test will be especially helpful for students and educators in elementary schools. Details about this test will be shared in the presentation.

Keywords: Creativity, mathematical creativity, mathematical creativity scale

Non-Conformist Achievers: Investigating the Role of Conscientiousness in Scientific Creative Achievement

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Personality traits linked to conscientiousness, such as being organized and self-disciplined, have been shown to have a positive impact on academic success. However, studies examining the influence of conscientiousness on scientific and intellectual creative achievement have yielded mixed results. Some studies report minimal or no effect, while others indicate negative consequences for creative performance. This highlights the need for further investigation into the potential moderating effects of this relationship. To address this gap, we investigated the relationship between conscientiousness and scientific creative achievement (i.e., mechanical, scientific, and scholarly creativity) by considering the possible impact of people's desire for acceptance and belonging, with 698 German-speaking participants. Our findings revealed that conscientiousness displayed a positive correlation with mechanical/scientific creativity when individuals had a low need for belonging. However, when the need for belonging was high, conscientiousness had a negative impact on mechanical/scientific creativity. Additionally, we observed a positive association between conscientiousness and scholarly creativity among individuals with a low need for belonging. Therefore, individuals with higher levels of conscientiousness who work in the mechanical/scientific or scholarly fields can be characterized as having a stronger internal drive to achieve their goals without depending on external validation or acceptance for fulfillment. Further research is necessary to investigate the mechanisms through which conscientiousness fosters scientific and intellectual creativity.

Keywords: conscientiousness, need to belong, scientific creative achievements

Wednesday, 13th September

SESSION RITA-Wed-3
Embedded and Embodied
Creativity

The Body-Mind Connection: Interoceptive sensitivity and mode shifting in creative thinking

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Goldsmiths, University of London

There has been intense research interest in understanding the mechanisms of creativity, but almost exclusively focusing on the neural responses, while the bodily inputs have been overlooked. The brain receives constant feedback from the body across multiple physiological axes and over different time scales; this interoceptive system, which processes visceral sensations, provides a real-time representation of the body's internal state, spanning both conscious and unconscious levels. In this study, we hypothesized that interoceptive sensitivity – or subjective bodily awareness – would be positively associated with the ability to switch modes of thought between associative and analytic modes; since a flexible shifting between these two modes is a critical skill for creativity. Participants ($N = 125$) completed several self-report scales, including subjective body awareness (interoceptive sensitivity), mode shifting (propensity to switch between modes of thought), alexithymia (difficulty identifying emotions), creative ideation, inspiration, and distractibility. They also completed a variety of divergent thinking tasks, which were scored using both semantic distance and human ratings of category switching. Results regarding self-reported judgements indicate that interoceptive sensitivity predicts the inclination to shift modes of thought, and this relationship is moderated by distractibility. Also, positive associations were observed between interoceptive sensitivity and creative traits like ideation and inspiration. Moreover, alexithymia, a trait negatively correlated with bodily awareness, was similarly negatively associated with creative traits. Results regarding creative switching task performance are further discussed. These results provide novel insight into understudied links between creative cognition and interoception.

Keywords: interoception; creative switching

The heart's role in creative ideation performances in daily life: Insights from ambulatory monitoring

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A.R.

University of Graz

The vagus nerve connects the brain and the heart and the interaction of both can be monitored in everyday life. The vagally mediated heart rate variability (vmHRV) can easily be assessed in everyday life situations by state-of-the-art sensors. This study aimed to investigate if vmHRV (indicating brain heart interaction) can predict creative ideation performance. To answer this, we assessed the ECG signal of 157 young participants (54 men; mean age of 23.27 years; $SD = 3.74$) five minutes prior to solving verbal (i.e., AUT) and figural (i.e., TTCT) creative ideation tasks in an everyday life context (e.g., at home, on the way, at work, etc.) to predict the originality of verbal and figural ideas. The originality of ideas was rated by four independent raters. Additionally, confounders such as body position, HR, momentary smoking, caffeine intake, and alcohol intake were assessed. We found that the creativity domain moderated the association between vmHRV and the originality of ideas. Decreased vmHRV was associated with higher verbal but lower figural creativity and increased vmHRV showed no significant difference. This finding indicates that different physiological states of the heart-brain interaction are associated with the originality of ideas in the verbal and figural domain in everyday life situations. This pattern of findings mirrors neuroscientific research indicating a specific brain activation pattern for verbal and figural creativity.

Keywords: Parasympathetic activity; ecological momentary assessment

From Lab to Life: Physiologically Informed Creativity Research in Naturalistic Settings

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The study of creativity has been a topic of interest for psychologists and neuroscientists for a long time. However, it remains challenging to identify physiological markers of creativity in naturalistic settings, particularly when using consumer-grade devices for data acquisition. This presentation discusses novel analysis approaches to identify markers of creativity in physiological data captured with cost-effective, unobtrusive technologies. In a sample study, participants wrote creative stories individually and in pairs, providing self-reported data on creative performance and experience, while physiological parameters were captured with consumer-grade technologies such as the Muse 2 EEG headband. The analysis of the EEG data presented challenges such as low temporal resolution and extreme artifacts, which were addressed by appropriate preprocessing techniques. Power spectral densities (PSDs) were calculated to investigate task-related power changes in the alpha and theta frequency bands which are established markers of idea generation. The time-frequency representation of the PSDs show activation in the alpha and theta bands in some subjects which correlates to their subjective reports of creative experience. The findings are further validated by analyzing the stories written by the participants based on various creativity metrics. These features are then used to train machine learning models to predict creative states from physiological data.

Keywords: Consumer grade EEG, Creativity Research, Naturalistic settings

Show us what you got! A cross-cultural comparison of mindset presentation in “...Got Talent!” TV shows

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People’s beliefs about abilities don’t always consciously align with current scientific knowledge. Nevertheless, these beliefs have a significant impact on everyday decisions and behaviors. A vital source that shapes and reflects these beliefs is the media. One of the most popular TV and online program formats are *talent shows*, where people showcase their skills in front of an audience and are assessed by a panel of celebrity judges. This kind of media content is rich in information about the presumed nature of abilities through the utterances of those who are involved. In the presentation, we show how mindsets—implicit theories regarding the innate or malleable nature of abilities—are expressed in talent shows in three countries differing in individualism and collectivism. Through quantitative thematic analysis of 82 semi-finalist performers from the 2020 season of “... *Got Talent!*” in China (n = 20), Poland (n = 40), and the USA (n = 22), we discovered significant cultural differences in the prevalence of each mindset (fixed, growth, and mixed) among the participants, judges, and other individuals appearing on the shows. Participants from China emphasized the growth mindset most strongly, while those from the USA expressed it the least. On the other hand, the fixed mindset was primarily articulated by judges in the Polish version of the show. We discuss these findings in the context of collectivism/individualism and modernization theory.

Keywords: fixed and growth mindset; cross-cultural comparisons, media

Wednesday, 13th September

SESSION CLAUDE-Wed-3

**Individual Differences in
Childhood**

Mood and Creativity in Children: Differential impacts on convergent and divergent thinking.

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Mood has been consistently related to creative thinking, and the effects of mood induction on divergent thinking have been largely studied in adults. The main findings of the meta-analysis conducted by Baas et al., (2008) showed that emotional states (or mood, or affect) impact performance in creative thinking tasks. The authors found that after a positive mood compared to a neutral mood, people are generally more original, fluent, and flexible in their responses to different types of tests of creative thinking. Nevertheless, few studies studied mood effects on creative convergent thinking, and almost none, to our knowledge, have been conducted on children. The present study compared the effects of positive vs. neutral mood inductions on both convergent and divergent creative thinking among elementary school children. We hypothesized that after the mood induction, children in the positive mood condition compared to their peers in the neutral condition would (1) perform better in a divergent thinking task for all performance criteria (fluency, flexibility, and originality); (2) perform better in the creative convergent thinking task; and (3) produce more positive elements in their drawings. Results showed that the positive mood condition group had higher divergent thinking scores for originality and creative convergent thinking scores, but no effects were found for fluency or flexibility. Also, there were no differences in the valence of the children's drawings across mood condition groups. These findings provide a better understanding of the impact of different emotional states on children's creative thinking. The limitations of the study are discussed; only happy (pleasant/activated mood) was induced and compared with neutral mood. Research with adults points to

the importance of both valence and activation and therefore future research with children should induce moods that differs in combinations of valence and arousal (positive/activated, positive/deactivated, negative/activated, negative/deactivated) and examine them both in relation to creative divergent and convergent thinking. Baas et al. (2008, p. 796) have concluded that, “to make a difference in creative performance, manipulating mood states is not very effective and is unlikely to produce clear and visible changes in creativity.” Although this is the case with adults, especially when the goal is creativity that results in real life products, we propose that mood inductions could be more helpful with creativity in children, especially in school contexts in which creative thinking can come in brief bursts that benefit from (short-lived) mood inductions.

Keywords: children, creative thinking, mood

Profiles of Creative Potential in Children: Findings from Slovenian Adaptation of EPoC

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EPoC is one of the latest tests to assess the creative potential of children and adolescents. The presentation is based on a validation study conducted with the EPoC test in eight Slovenian elementary schools and one preschool institution. The normative sample included 707 children aged 5 to 12 years in the Slovenian educational context ($M_{age} = 9$, $SD_{age} = 1.8$; 52% female) who had to solve eight tasks in two creativity domains: graphic-artistic and verbal-literary, including two thinking processes, convergent-integrative and divergent-explorative. The results show that the Slovenian version of the EPoC is internally consistent ($0.7 \leq \alpha < 0.9$) and structurally valid ($\chi^2 = 17.12$; $DLL = 14$; $p = .25$; $\chi^2/df = 1.22$; $RMSEA = .01$; $CFI = 1.00$; $TLI = 1.00$) measurement instrument. Using latent profile analysis (LPA), five subtypes of creative profiles were identified based on the interaction of four independent indicators that are simultaneously "domain-specific" and "thought process-specific": low potential, homogeneous, high potential, integrative and divergent. The results are discussed from a developmental perspective in the Slovenian educational context and possible educational implications are addressed.

Keywords: creative potential, latent profile analysis, multifaceted creativity

Creativity, mind wandering and mindfulness: An exploratory study in Chilean students

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Pontificia Universidad Católica de Chile

Since mind wandering (MW) favors the incubation of new ideas, and mindfulness (MF) strengthens metacognitive processes, there is a growing interest in exploring the relationship between these dispositions and creativity. Thus, we carried out a correlational study between creativity and attentional and metacognitive dispositions in 170 high school students and 130 university students from Santiago, Chile. Participants took a Remote Associations Test (RAT), an Alternative Uses Test (AUT), and a Drawing Test (TCT-DP). They also answered a Daydreaming Frequency Scale, an MW and Emotional Valence Scale, the Five Facet Mindfulness Questionnaire (F-FMQ), and scales adapted from the Motivational and Attentional Strategies Questionnaire (MSLQ). All the tests and scales were reliable measures. University students presented higher levels of creativity than high school students and higher scores on the Observing and Describing facets in addition to a metacognition scale (Independent Thinking). In the sample of university students, the RAT correlated positively with Daydreaming and the FFMQ Observing, Describing, and Non-Reactivity facets. Using a multiple linear regression model, we found that the only scales that significantly predicted the TAR score were Non-reactivity and Daydreaming. Also, the AUT correlated positively with Describing. In the sample of secondary students, the RAT presented negative correlations with the FFMQ Non-judging and Acting with Awareness facets and with Positive MW. The AUT correlated positively with Observing and Daydreaming. Also, we report the associations between the creativity tests and the metacognitive scales, which varied between both samples. The Drawing test only had positive associations with the metacognitive scales. The results suggest that the relationships between attentional dispositions and creativity differ in secondary and university students. Understanding these differences requires assessing how attentional dispositions relate to the phases of the creative process across human development.

Keywords: Creativity, mind wandering, mindfulness

Creative problem-solving as a multilevel regulatory process in Child-Robot-Interaction

Romero, M.

Université Côte d'Azur

Child-robot interaction (CRI) in creative problem-solving (CPS) tasks involves a complex and multifaceted process that demands overcoming the constraints of general models of problem-solving. Thus, it is important to understand the limitations of these models before examining CPS as a process. Analysing the learners' regulation in CRI-CPS, we combine the level of CPS task regulation, the CPS strategies (exploration/exploitation), and the phases (divergent/convergent) of the thinking modalities arising during the CRI-CPS tasks. This study focuses on investigating the CRI-CPS process, specifically examining the interaction between children and modular robotics (Cubelets) integrated into an ill-defined task (CreaCube). We aim to study children's regulation and divergent thinking during the CRI- CPS task. During the divergent and convergent thinking stages, this model accounts for the fact that certain processes, such as the implicit exploratory process and the tacit process that regulates their selection, can be consciously controlled. Intentional creative behaviour could be considered a component of system 2 reasoning (Kahneman, 2011), which is slower, more effortful, and more controlled than non-creative behaviour based on preexisting actions and knowledge (system 1). Creative activities require more effort to maintain than non-creative, conservative actions. We examine the Augello et al. (2015) dual-process model of creativity, which "takes into account the different interaction mechanisms involving both the S1 and S2 systems as well as the generative and evaluative processes" (p. 7). In this study, the dual-process model of creativity is examined by engaging 20 middle-level learners in the CreaCube task. In this study, the learners are engaged individually in playing CreaCube, a CRI CPS task. The children's actions are evaluated in relation to the divergent thinking components (fluency, flexibility, originality), but also the convergent thinking actions and the regulatory processes during the activity. The children's actions are evaluated in relation to the components of divergent thinking (fluency, flexibility, and originality), convergent thinking actions, and the regulatory processes observed during the activity. Qualitative

data is collected through observation and video recordings, allowing for detailed analysis of the children's behaviours, strategies, and interactions with the modular robots. Additionally, quantitative data is gathered through the CreaCube research framework to analyse the modular robotic configurations across the task. The results show important interindividual differences in the divergent thinking components, which can be explained by the time-on-task engaged in CreaCube but also by the regulatory actions observed during the CRI CPS activity.

Keywords: Child-robot interaction, convergent thinking, creative problem-solving, divergent thinking, educational robotics

Wednesday, 13th September

MIC Keynote Speech

Giovanni E. Corazza

Creative Cross-Pollinations: The Dance of Surprising Ideas

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Selected themes from MIC Conference 2023 speeches are picked-up and cross-pollinated in this closing keynote speech.

Wednesday, 13th September

SESSION RITA-Wed-4

Arts & Writing

Thinking on Paper”: exploring the role of journalling during the creative process of screenwriting

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Journalling, as a reflective practice, allows us to express thoughts and feelings about our experiences and developmental processes. It is a well-known psychotherapeutic strategy that uses writing to access higher levels of psychological functioning by channelling disparate thoughts into one stream, unfolding deeper levels of self-analysis while allowing keeping progress records. However, scientific literature on the impact of journalling on the creative process of screenwriting is scarce. Aiming to contribute to filling this gap, we designed a mixed-methods research project to explore how journalling may foster the development of creativity and contribute to enhancing levels of self-regulation and self-awareness in screenwriting. We hypothesized that journalling can act as an effective tool to promote creativity in screenwriting, contributing to increased levels of creative self-efficacy(CSE) and creative self-regulation(CSR). This study involved 40 students in a second-year Australian university screenwriting course, scaffolded by the Creative Metacognitive Framework and delivered in intensive mode over 4 weeks. Throughout the course, participants created digital journals and were encouraged to focus on their creative process of writing a screenplay. These were analysed through thematic analysis to identify common overarching themes regarding emotions, challenges and successes experienced during the creative process. To assess CSE and CSR levels, we used Karwowski’s SSCS and Zielinska et al. CSR scale, pre and post-test. Preliminary findings will be discussed, hoping to shed light on the potential future implications of using journalling to foster the creative process of screenwriting and overall creative development.

Keywords: journalling, creative process, screenwriting

Promoting perceived creativity in the prospective behavior: Benefits of design-fiction

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This contribution aims to clarify what we can expect from design-fiction as a method of prospective ergonomics. Prospecting refers to the process of representing and thinking about possible future states of the world. It is based on our knowledge and experience, leading us to initially adopt a rather logical line of reasoning (probable futures), reflecting our understanding of how the current world works (preferable futures). This mode of reasoning has a reductive effect on the prediction of potential future problems, and on the space for creative solutions (design fixation). However, futuristic perspectives need to take into account both realistic and unrealistic possibilities, using imagination and other modes of thinking such as creative thinking, counterfactual thinking or critical thinking. All these factors underline the need to focus on the creative processes involved in prospecting. The results of our studies, using design-fiction, a prospective method based on science-fiction imaginaries and the proposal of an artifactual representation, have shown that a context that is temporally, spatially and conceptually remote is a fertile ground for more elaborated solutions and argumentative exchanges. On the other hand, our studies underline that prospecting is in reality based on ill-defined problems, and without an evaluable solution in the sense of a creative product, for which value and adaptability, or even feasibility, are assessed. In this sense, we propose to discuss creativity evaluation practices in a prospective design context, by proposing to look not only at the originality resulting from the creative process, but also at their associated cognitive-behavioral roles, such as choices of behaviors to avoid or adopt, epistemic curiosity and the planning of specific actions.

Keywords: design-fiction; creativity assessment; perceived creativity; prospecting

The effect of creative drama on the creativity process

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Creativity is the ability of a person to think in a new, innovative, unexpected, and high-quality way about a task or problem. Creative drama is a process of reflection that involves activating an individual's intellect through words, music, and objects. Drama is a reflection process that involves group work and improvisation to study an individual's relationship with others and cases. Participants in creative drama perform acts based on their own thoughts, inventions, and knowledge. There is no written script. The tests are designed to assess fluency, originality, and flexibility. The number of responses to a stimulant is fluency. Flexibility is the different categories that the responses can fall into. Originality is measured by the number of responses that are rarely seen in the range of applications. Researchers today consider the three criteria listed above as the foundation of creative thinking. They also recognize that creativity can be measured in everyday situations. In education, creative drama can be used to develop divergent and inventive thinking, cognitive skills, and communication abilities. This study aims to determine how creative drama activities with elementary school children (14 elementary school students participated) affect the creative process. To achieve this, students' creative processes were observed and evaluated during the entire activity. In addition, at the end of the activity, open-ended questions were asked from the students and educators, and they were also evaluated with the content analysis method. According to the results of the research, elements that support the creative process were highlighted and educators were given suggestions in this regard.

Keywords: Creativity, creative drama, creativity techniques.

Embodied Sound Generation - Introducing the unexpected: sound and movement enhanced storytelling

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We explore the potential for AI technologies to act as a component of the creative process introducing unexpected variation, driving the human creative agent to novel and unanticipated states. This research is situated at the intersection of electronic musical instrument design, electroacoustic music, practical application of AI and embodied creative processes. With modern technology, any sound can be taken out of its original context and used musically. Additionally, sound production by traditional acoustic instruments is bound to the physical properties of the instrument itself, while an electronic instrument is unbound in this sense. The field of musical instrument design aims to find interfaces that facilitate the re-contextualization of sounds, infusing them with meaning. AI has the potential to reduce the dimensionality of the vast array of possible sounds. We introduce Sound and Movement Enhanced Storytelling (SMES), a prototype that uses an AI system to map a person's movement in space to sound. Users generate sound by moving hand-held motion controllers through space. A feedforward neural network maps controller inputs to the parameters of an existing sound system, for example a synthesizer. Sound snapshots chosen by the user are mapped to points in space. Interpolating between mapped points gives rise to new, possibly unexpected, sound textures, enabling a fluid translation of movement into sound. In this context, we consider the connection between body motion and creative performance, a well-researched area especially in the realm of divergent thinking. In a pilot study (n=5), SMES evoked reactions ranging from fluid to grand expressive movements. When researchers were asked to describe their work while using SMES, they were more playful with the descriptions, involving more and unexpected metaphors, and using their bodies and the sounds generated to emphasize their statements. We intend to conduct a comprehensive qualitative and quantitative study, comparing the usage of SMES with a manually calibrated movement-controlled instrument, along with interfaces that promote whole-body spatial interaction versus those requiring only minimal movements. Participants will be engaged in a creative

task while completing the study. Through interviews with participants, we aim to uncover unexpected variations in the creative process and experienced states. We anticipate that both the AI-based SMES system and the increased movement requirement will positively correlate with the occurrence of novel, unexpected creative states. Moreover, in our future work, we plan to investigate the impact of combining gesture and sound during a communicative task on the expression of ideas and the emergence of unexpected associations.

Keywords: AI-Enhanced Creativity, Sound-Motion Interaction, Spatial Sound Design

Wednesday, 13th September

SESSION CLAUDE-Wed-4

Miscellany

Activation of Metacognitive Monitoring in Creative Ideation

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To succeed in creative challenges, people need the ability to monitor their performance and adequately discern the creative quality of their ideas. These abilities are an essential component of metacognitive monitoring. Metacognitive monitoring at response level (idea evaluation), enables people to make informed decisions regarding the dismissal, elaboration, or sharing of ideas. However, it is not clear how and when metacognition influences (interferes with or improves) people's creative performance during the ideation process. Interruptions to divergent thinking can increase the originality and fluency of generated ideas (e.g., Eliav & Miron-Spektor, 2015), and people prompted to reflect on the quality of their work produce more creative ideas (Hao et al., 2016; Wetzstein & Hacker, 2004). However, self-evaluation can also interrupt the flow of idea generation and hinder performance (DeCaro et al., 2011; Hennessey, 2000; Norman, 2020). Therefore, we investigated how the activation of metacognitive monitoring in different phases of creative ideation (during AUT) affects performance and the assessment of own ideas. In a preregistered online study (N = 441, 57% female, age 18-24, $M_{\text{age}} = 33.2$), participants were randomly assigned to one of three conditions: constantly assessing the creativity of their ideas immediately after generating them (idea-by-idea), assessing their ideas after the pool of responses is produced, or generating ideas without assessment. We found that activating metacognitive monitoring differently didn't affect ideas' originality. Interestingly, ideas became less original with time, however not when the assessment was constant. Based on our findings, we discuss whether these conditions impact idea generation's originality and fluency, the perception of idea quality, and how these effects relate to individual differences or task characteristics. Finally, we interpret results in the context of cognitive mechanisms and various methodological approaches.

Keywords: discernment, idea generation, metacognitive monitoring

Perceived Embodiment and Creativity in Digital Art

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The recent proliferation of AI-based generative tools has resulted in widespread discussions of AI's impact on creative fields. Still, there has been relatively little attention paid to the role of embodiment in perceptions of creativity for technologically-generated artworks. Our contribution aims to fill this gap by investigating the under-explored role of embodiment in co-creative scenarios involving humans and technology. In particular, we will discuss the results of a large online survey ($n=500$) which demonstrate a relationship between perceived creativity and perceived embodiment in the context of digitally-native artwork. In our survey, we presented participants with two videos which rendered visible the embodied human process behind a software-generated artwork and a human-drawn illustration: participants were shown both a clip of artist Daniel Berio programming a generative artwork and a clip of illustrator Gal Shir drawing on a tablet. After each video, participants responded to a series of questions that elicited their perceptions of creativity and embodiment for the artwork in the respective videos. Definitions for the terms 'creativity' and 'embodiment' were not provided to participants, as they were encouraged to respond according to their own interpretations of each term. We found a highly significant positive correlation between perceived embodiment and perceived creativity ($p < .0001$). Interestingly, we also observed a positive correlation between perceived embodiment and increased confidence in attributing authorship of the artistic output to a collaboration between the human and technology ($p < .0001$). As AI technologies take on an increasingly significant role in the creative process, it is evermore important to understand how perceptions of authorship and creativity are impacted by technologically-mediated workflows. The results of this study provide valuable insights to inform the design of future Human-AI co-creation systems, such that that embodiment is prioritized as a key component of technologically-mediated artistic processes.

Keywords: embodiment; digital art; human-technology co-creation

Board Games and Creativity: The Mediating Role of Playfulness

Mercier, M., & Bourgeois-Bougrine, S.

Université Paris Cité

Games play a big part of our life, regardless of age. Similarly, creativity is and continues to be a significant aspect of our everyday life. Recent studies have started showing relationships between these two concepts: playing more to games seems to be associated with higher creativity. However, few studies have attempted to explain this relationship and the potential mediators that could be implicated. This paper attempts to bridge that gap. This study examined whether board games habits is positively related to two creativity measures: creative self-concept and creativity in the workplace. Furthermore, it was hypothesized that playfulness would have a mediating effect between board games habits and creativity outcomes. Data was collected from 327 French workers using online recruitment through social networks, with self-reported measures of creative self-concept, creativity in the workplace, adult playfulness, and board game playing habits. Results show that board game playing habits are positively correlated with both creativity in the workplace and creative self-concept. Furthermore, adult playfulness dimensions of fun-seeking motivation and uninhibitedness mediate the relationship between board game playing diversity and both creativity in the workplace and creative self-concept. Playing to more types of board games is associated with higher playfulness, which in turn is associated with more creativity in the workplace and higher creative self-concept. These findings suggest that encouraging board game playing, notably playing to a broader range of board games, could help foster playfulness and thus improve creativity.

Keywords: board games, creativity, mediation, playfulness

Becoming a poetics of possibilities - Using Art Interpretations to Reverse-Engineer the Creative Act and Mind

Derikx, N.

House of Art and Agency

Poetics, from Greek *poiesis*, means "making," and refers to the becoming of what was non-existent before. The blooming of the blossom for Heidegger; a two-way process for Bachelard, formed by material "images" in a double play of re-creation that carries an oscillating tension going against the dichotomies between subject and object, mind and matter, active and passive. These traditional and extreme juxtaposition are resisted because they should be considered inseparable as the imagination is simultaneously receptive and creative, just as artworks and their interpretations are. By its own admission, the field of creativity research is currently best served by fundamental research and a wider set of methodologies, (and stimuli), else how do we know what we know about creativity? Because it helps to better understand the phenomenon by exploring how it operates, this call to pursue creativity's underlying mechanisms empirically. Abduction is a practical tool of reasoning that works in reverse, from effect to cause, and a combined set of methodologies (e.g., Bayesian inference, grounded theory, process theory, theory-theory, perhaps also game theory) could in turn expand theorizing about creativity. To arrive at performance specifications in the empirical assessments of transformational capacities, potentially operationalizable parameters were filtered from various frameworks and branches of, among others, aesthetics, anthropology, film and literary science, evolutionary biology, philosophy, psychology, and physics, overlapping with and complementary to concepts from creativity research. In particular, "abracadabra," agency or propulsion, bribes, broken symmetry, inspiration, interpretation, surprise, transformation, and, perhaps amazingly, "taste, and tackiness," surfaced first from these.

Keywords: Agency, Art, Reverse-Engineering

Wednesday, 13th September



SESSION RITA-Wed-5

Design - Engineering

Generational Cohorts and the Evolution of Creative Development in the Prime Aesthetic Formation_ A Comparative Analysis

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¹ *University of North Texas*

² *Washington University in St. Louis*

In the realm of fashion, creativity often takes root in generational experiences, yet little is known about sensitive moments in human development affecting dress aesthetic preferences. Considering this lacuna, this study combined qualitative, exploratory methods (Neuman, 2011) with an inductive approach (Creswell & Poth, 2018), to examine the influence of tactile versus digital experiences on the creative development of the Prime Aesthetic (cumulative Aesthetic Dress Preferences imprinted during emerging adulthood) (Bernardoni et al., 2022) across two generational cohorts: Modern (birth years on or before 1945) and PostModern (birth years on or after 1946). Thirty female participants, representing each cohort equally, were interviewed to assess how their Prime Aesthetic was shaped. Analyzing with constant comparison (Strauss & Corbin, 1998), we parsed data into units of meaning. Resultant themes suggested a clear shift in creative influences across cohorts. The Modern cohort's Prime Aesthetic development was largely influenced by hands- on, tactile experiences such as sewing garments or selecting patterns in physical stores. In contrast, the PostModern cohort demonstrated a stronger reliance on visual and digital influences, such as online fashion trends or digital media, to shape their Prime Aesthetic. These findings highlight the evolving nature of creative development in fashion and suggest the need for inclusive understanding of different aesthetic influences in fashion education and industry. The research underscores the importance of recognizing shifting patterns for marketers and designers in any area of design, who must adapt to changing generational preferences. Future research should aim to include a broader demographic spectrum to validate these findings.

Keywords: Aesthetics, Fashion, Generational Cohorts

Perceptions of AI-Based Team Members and Team Dissimilarity on Team Creativity: A Longitudinal Study

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¹ *University of Vienna*

² *University of Nebraska at Omaha (UNO)*

This study investigates the perceived impacts of artificial intelligence (AI)-based team members and team dissimilarity on team creativity over time. We define team dissimilarity as the degree of variance in team members' skills, experiences, and perspectives, hypothesizing that increased dissimilarity correlates with heightened team creativity (H1). In this context, the focus is on the perceptions of AI-based team members, rather than their actual integration. These perceptions, shaped by the understanding of AI's capabilities in large-scale data analysis and problem-solving, could significantly influence team dynamics and creativity (H2). It's crucial to study these perceptions as they can precede and shape actual interactions with AI, thus affecting team performance even before actual AI integration. Using a mixed-methods approach that combines both quantitative and qualitative analyses over time, we observe real-life teams longitudinally. Team members provide individual perceptions of how an AI-based team member might contribute to their team, capturing both collective team dynamics and individual perceptions within the same context. A third hypothesis (H3) proposes that the perceived influence of AI-based team members on team creativity is more pronounced in teams with high dissimilarity. This study stands out by longitudinally examining the perceived roles of AI-based team members within diverse teams, an area seldom addressed in current literature. The findings could inform organizations on managing expectations and perceptions when integrating AI team members while fostering diversity. The anticipated findings could have broad implications across societal sectors, including business strategies, education practices, and healthcare innovation. Thus, this study contributes uniquely by exploring how perceptions of AI team members and team diversity might influence creative performance over time.

Keywords: Artificial Intelligence (AI), Team Creativity, Team Dissimilarity

Smart Garden Office: Enhancing Workplace Creativity and Well-being with Interactive Sound Systems in Nature

McKee, H. ¹, Strauch, T. ², Steigerwald, P. ², Hilbrich, L. ², von Thienen, J. ¹, Meinel, C. ¹, & Arnrich, B. ¹

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Creativity and well-being are highly susceptible to the type of environments a person finds themselves in or is exposed to. Nature is considered one of the most creative forces - exposure to natural environments has been shown to yield recovery of cognitive processes, enhance divergent creative thinking, and promote well-being. We explore the possibility of immersion in nature and its soundscapes to synchronize remote collaborators, utilizing multiple senses with a flexible focus of attention instead of the strict focus on a computer screen with visually presented information during computer-mediated work. With the concept *Sonic Scopes* – a multi-speaker setup that provides a dynamic sound field based on the user's position, tracked via radar coupled with vector-based amplitude panning – effects on collaborative creativity are tested. In this setup, input shifts from being dominated by visuals, as in widespread videoconferencing tools for virtual collaboration, to spatial auditory input, encouraging the worker to move freely in their environment. The system records local audio data and transmits it in real time, allowing for an online collaborator to experience the same soundscape overlaid with the voice of one's remote team partner. The environments of two different sound scopes are compared, one experienced in the environment that to which the soundscape belongs and the other is a neutral room, devoid of ambient sound. The experiment is conducted in diads, with one participant immersed in a nature (a local pine forest), equipped with an unobtrusive microphone, through which the soundscape is recorded and transmitted to the *Sonic Scopes* setup in an indoor space. The collaboration partner is thus spatially immersed in the same soundscape, as they engage in a verbal brainstorming task. This is tested experimentally, with 10 diads (N=20), using heart rate and EDA as metrics for synchrony as well as self-perceived creativity and collaboration and mood scales.

Keywords: multi-sensory collaboration, nature exposure, spatial audio

Future perfect: creative practices in contemporary fashion design that propel the industry forward

Ruppert-Stroescu, M. & Bernardoni, J.

Washington University, St. Louis

This study explored creativity within the contemporary fashion industry, seeking to ascertain whether designers are genuinely advancing the field and, if so, the mechanisms driving this progression. Through a rigorous content analysis of the creative contributions made by select designers within the framework of Steinberg's Propulsion Theory of Creative Contributions, we scrutinized and categorized the manifests of creative fashion. Our research spanned a broad spectrum of creative practices, from the incorporation of cutting-edge technology to the refinement and application of traditional trade skills and handcrafts. The culmination of our investigation is an emerging typology that provides a detailed overview of creative contributions that propel the fashion industry forward. This typology delineates the contribution of inspirations fueling innovation in both process and products and interprets the unique blend of novel and traditional approaches in contemporary fashion design. It encompasses a range of practices, revealing an industry where creativity can thrive in the liminal space between the past and future, thus challenging the conventional dichotomy of innovation versus tradition. Our research offers an enriched understanding of the current creative landscape in fashion design, defining types of creative contributions to the field. Indeed, it provides invaluable insights for industry practitioners, scholars, and educators by illuminating underpinnings of creativity in the fashion industry. This study contributes to broader discussions about the role and manifestation of creativity in contemporary society and advocates for a more nuanced appreciation of the complexities and potentialities in the realm of fashion design and potentially other design fields.

Keywords: Fashion Design, Innovation, Propulsion Theory of Creative Contributions

Wednesday, 13th September

SESSION CLAUDE-Wed-5

**Education – Theoretical
Propositions**

Cultivating Creativity, Innovation Thinking, and Resilience in Young Students by Teaching Entrepreneurship

Hulsey, D.B.

Baylor University

Entrepreneurship has been defined, described, and studied from multiple viewpoints. Most research literature has focused on business and economic outcomes. Case studies explore the lives, behavior, and environments of individuals who have achieved success as entrepreneurs. A small number of studies explore what individual abilities and personality traits lead to optimal learning, perseverance, and entrepreneurial success, and then consider what aspects of inventiveness, innovation, and risk-taking can be taught. This proposed exploratory study aligns most closely with this third category. Using a creative problem solving framework and mixed methods research design, this study examines the effects of a program of problem-based entrepreneurship education for young students ages 6-17. There is little research on teaching entrepreneurship to students younger than college level. This study tests best practices for fostering creativity and innovation by leading students through invention or innovation of a product, process, or business; presentation of the benefits of said invention; criteria-based critiques of the inventive stages; and both self-assessments and teacher/professional assessments of the student's response to the overall program. To date, data collection from a group of 30 students ages 8-14 in week-long inventor classes has included pre- and post-study measures of perceived engagement, inventiveness, risk-taking, and confidence via self-reported student surveys, teacher observations, and student interviews. Students' concepts of themselves as creative innovators and inventors increased significantly. Taking this short-term study as a proof of concept, the researcher anticipates that a longer, mixed-methods program (minimum 3 months) in the fall of 2023 is likely to yield outcomes including evidence of high levels of engagement; increased self-confidence and facility in the activities of innovation thinking and creativity; increased identity as a creative person; increased resilience to failure and setbacks; and increased willingness to take risks.

Keywords: Entrepreneurship, Innovation thinking, Resilience

Cultivating 21st Century Skills Through Themed-Based Astrobiology Lessons in P-12 Schools

Phelps, C.

Emporia State University

From *The Brick Moon* (Hale, 1869) whimsical Earth-orbiting inhabited space station to *The Martian* (Weir, 2011, 2014) artificial habitat, space gardening represents real-world creative problem-solving projects conducted aboard the International Space Station (ISS). Deep space expeditions require growing food sources that provide both physiological and psychological benefits for survival. Astrobotany connects the study of terrestrial plants and space environments to study the effects of microgravity in the NASA Vegetable Production System (Veggie). Space farming cultivates fresh food for astronaut cuisine previously based on dehydration, freeze-drying, reconstitution, and irradiation technology. Earth-based teachers in P-12 schools can design theme-based instruction on space gardening for diverse students as interdisciplinary studies ranging from math and science to social studies and language arts to media and technology. The Schoolwide Enrichment Module (SEM; Renzulli, 1976; Renzulli & Reis, 1985) represents a curriculum model to enrich learning by introducing disciplines (Type I), practicing real world skills (Type II), and conducting in-depth investigations (Type III). The online Renzulli Learning System enhances learning for all children by designing tiered enrichment activities based on the SEM and individualized through The Profiler. The Profiler differentiates online instructional activities based on student strengths, interests, and learning and expression style preferences. As a field participant in the *Thinking Like Mathematicians* Javits Grant, the paper includes the “Growing Hydroponic Potatoes of the Red Planet” as an astrobiology themed-based differentiated instruction for grade three students. The interdisciplinary enrichment study features creative instructional approaches to simple fractions with accurately marked number lines using authentic mathematical tools.

Keywords: Schoolwide Enrichment Model, Thinking Like Mathematicians, astrobiology

Lessons from a Worldwide Pandemic: Geographic Impacts on Place Based Theory, Technology and Creativity

Green, T.D.R

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The worldwide pandemic altered the way we teach, deliver instruction and create outcomes for our students. Instructors were forced to pivot creating a new mindset around virtual learning and creativity. According to Runco and Jaeger (2012), creativity “requires both originality and effectiveness”. Professors were tasked to deliver outcomes with technology that would be innovative and meet their students’ needs (Green, 2022). What caused the students to activate their growth mindset and creativity to cause transformative experiences? This paper analyzes the transitions between Place Based Learning (PBL) Theory, (Powers, 2004), and technology to create virtual reality learning in a creative way. PBL calls for hands on learning and local engagement in a social setting. Tenets of Constructivism provide the students with meaning making while using artifacts and tactile sensations to attach new meanings to previous schema. Because geographic limitations were enacted in Williamsburg, Virginia, USA and in Leiden, The Netherlands students were prevented from these live PBL experiences in their field study courses. Students used these setbacks as opportunities to build new skills, activating their creativity through a Growth Mindset (GM), (Dweck, 2019), that caused creative outcomes and resilience in an anxious world. Students compensated for their lack of geographic reality with virtual PBL activities. The aim of this analysis is to explore the challenges and positive impacts the pandemic forced upon these students and instructors. Using tenets from Place Based Learning, creativity, Growth Mindset and technology, student output is analyzed through the lens of observations, discussions and student work samples.

Keywords: Place Based Learning Theory; creativity; Growth Mindset

Affective-semiotic self-regulation of creative processes in free improvisation

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¹ *UNIRIO – Federal University of the State of Rio de Janeiro*

² *University of Brasilia, UnB*

The present work will discuss the development of creative processes, in musical performances of free improvisation, from theoretical cultural and dialogical bases of human development and creative processes. The cultural perspectives that study the creative processes understand its development as a phenomenon that occurs from the same dynamics of other psychological functions, however, with its specificities. The emergence of the new is analyzed from the I-Other social interactions (in action in the cultural world), through shared activities and impregnated with cultural messages that are internalized by the subjects through semiotic and dialogical processes. These devices organize the hypergeneralized fields and act as affective-semiotic regulators of human behavior. In this perspective, psychology and music intertwine with the purpose of understanding how the musicians' creative processes develop, especially in free improvisation performances. This musical modality maintains characteristics very close to those that we consider favorable for the emergence of creativity. We will discuss free improvisation based on the interactions and different actions of the subjects that go beyond musical aspects. Our purpose is to analyze the specific relationships between musicians performing in a collective context and understand how they are affected by the encounter with peers, the musical task performed, and the meaning processes involved in these social interactions. The subjectivities of the musicians dialogued intensely, as well as their cultural repertoires, creating a musical context full of new possibilities.

Keywords: dialogic psychology, creative processes, free improvisation, semiotic-affective self-regulation

Wednesday, 13th September

PANEL



Chair: Todd Lubart

Creativity and the Future of Education

The panelist will explore what research tells us about Creativity in Education, by getting the practitioners perspective on how research can shape policy and practice in education systems. Also, barriers and challenges to bringing more creativity into education systems will be discussed, as well as practical tips about how researchers can help practitioners to support their aims, and vice versa.

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