MEi:CogSci Conference 2022

Zagreb, Croatia

Proceedings of the MEi:CogSci Conference 2022

The conference took place at the Faculty of Humanities and Social Sciences, University of Zagreb, Croatia, on 23-25 June, 2022

Welcome!

Dear Coxies, dear MEi:CogSci partners and friends, dear guests,

Welcome to our 16th MEi:CogSci Conference; this year hosted by the University of Zagreb.

The past study years brought many constraints and challenges to our personal and academic lives. It also brought opportunities: to rethink the ways we study and teach, the ways we do research, and the ways we live our lives in a globalized world. We all first-hand experienced the impact of technology on our learning and working behaviours. The effects of reduced possibilities to meet and collaborate with others deeply affected our everyday social interactions and forced us to adapt to radically new circumstances. These topics are explored within the field of cognitive science and are also reflected in the contributions for this conference. We are proud to contribute to this field in its variety of interdisciplinary domains. MEi:CogSci aims to educate not only experts in cognitive science, but also humans acting in an ethically and socially responsible manner.

We are very happy that we can again share our knowledge in the real-life setting of a physical conference this year.

We want to express our gratitude to the Faculty of Humanities and Social Sciences of the University of Zagreb (especially the Dept. of Information and Communication Sciences, Dept. of Phonetics, Dept. of Psychology, Dept. of English, Dept. of Ethnology and Cultural Anthropology, and the Center for Teacher Education) as well as the Faculty of Electrical Engineering and Computing for hosting the conference this year. We thank all student volunteers, faculty, and staff of the University of Zagreb, who helped to support this event. A big thank you to Renata Geld, who took over the overall organisation of this conference in Zagreb!

We want to welcome our invited speakers Predrag Pale (University of Zagreb, Croatia), Brigitte Römmer-Nossek (University of Vienna, Austria), and Toma Strle (University of Ljubljana, Slovenia). Thank you for joining us this year and for sharing your knowledge with us.

We also welcome our graduates, who join this event and provide insights into possible careers after MEi:CogSci. Thank you for supporting MEi:CogSci even after graduation!

We thank Ana Špacapan for creating the cover art for the conference proceedings.

Thank you, Igor Farkaš, for organising the publication of these proceedings under an ISBN number.

We also want to thank all reviewers and supervisors, who provide the foundations for this event.

And last but not least, it is you, Coxies, who make this conference happen. Your posters, talks, and initiatives will make the MEi:CogSci Conference 2022 an exciting and joyful event!

Thank you all for coming! Enjoy the 16th MEi:CogSci Conference!

María Arias Sutil, Evelyn Gasiorek, Lena Müller-Naendrup, Martyna Meyer, Mariette Soulat,

Elisabeth Zimmermann

Editor's Note

We, the editors, thank all MEi:CogSci students/authors for submitting their work to the MEi:CogSci Conference 2022. We are happy to present your work in the conference proceedings and to contribute to the field of cognitive science by covering such a variety of interesting topics.

The MEi:CogSci conference and its proceedings are a joint effort. The editors ensure that the work submitted to the conference is in accordance with the conference guidelines for authors. Thus, the editors revise the submissions in respect to formal criteria and formatting issues. Participating students/authors are expected to adhere to good scientific practice and to honour the regulations relating to good academic conduct. The students'/authors' responsibilities include the usage of references and citations in a transparent, precise, and correct manner, as well as issues regarding style, spelling, and grammar of their abstracts. Despite our best efforts to meet our responsibilities as editors, the MEi:CogSci Conference 2022 proceedings may contain errors and we apologise for any inconveniences.

Thank you all for allowing us to represent MEi:CogSci and our programme's understanding of cognitive science through your submissions of original work.

Sixteenth Middle European Interdisciplinary Conference in Cognitive Science (MEi:CogSci Conference 2022)
Zagreb, Croatia
23 -25 June, 2022

MEi:
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Middle European
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master's programme in
Cognitive Science

MEi:CogSci Conference 2022

Thursday, June 23, 2022

09:00 – 13:00	**Pre-Conference Workshops**
	A) Interdisciplinarity Beyond the Buzzword **[A 105]** *Peter Hochenauer*
	B) User Experience Design **[A 123]** *Bipin Indurkhya*
13:00 – 14:00	**Registration**
14:00 – 14:30	**Welcome & Conference Opening [D-7]**
14:30 – 15:30	**Plenary Talk: Why We Will Never Figure Out How the Human Mind Works [D-7]** *Predrag Pale (University of Zagreb)*
15:30 – 15:45	**SHORT BREAK**

	Track A: [D-7]	Track B: [D-1]	Track C: [D-3]
15:45 – 17:00	**Track A: [D-7]** Computational Modelling	**Track B: [D-1]** Clinical & Ageing	**Track C: [D-3]** Experience
	Computational Modelling of Cognition as a Tool for Cross-Pollination Between Two Cognitive Science Paradigms *Christina Light*	Determinants of EEG Peak Alpha Frequency in the Elderly *Tisa Pavlovčič*	What Do We Observe When We Observe Experience? *Neža Brezovnik*
	Generative Traits of Universal Bidirectional Activation-Based Learning *Zuzana Halgašová*	Differentiation of Dementia Phenotypes Based on Spectral EEG Parameters *Adja Ogrin*	The Sense of Self and Its Relation to Agency: A Phenomenological Study *Matúš Brziak*
	Concept Learning in Logic Tensor Networks *Clara Swaboda*	A Pilot Study on Haptic Aubert-Fleischl Phenomenon in Parkinson's Disease *Klara Popelar*	The Cognitive Penetrability of Perception in an Integrative Framework *Yara Katnik*

17:00 – 17:30	**COFFEE BREAK**
17:30 – 19:00	**Poster Session 1**

Friday, June 24, 2022

9:00 – 10:30	**Track A: [D-7]** Stress Management & Well-being	**Track B: [D-1]** Clinical Applications	**Track C: [D-3]** Technology & Society
	Employee as a Whole Person: Personal Life and Well-Being Support at Workplace *Veronika Stepanova*	Comparison of Negative Effects of R- and S-ketamine in Wistar Rats *Katja Rašl*	The Evolution of Techno-Social Systems: From the Clock to the Cyborg *Rohil Jethmalani*
	Stress Management Technology in the Workplace: The Extended Cognition Perspective *Selma Berbič*	Identifying Neurophysiological Markers of Movement Quality Progress in the Context of BCI Post-Stroke Rehabilitation *Lucija Mihic Zidar*	Privacy Paradox: A Predictive Processing Approach *Mateja Kalan*
	The Impact of Breathing Techniques on the Experience of Stress in Adolescents *Severin Hutinski*	Treating Developmental Dyslexia Using tDCS *Timotej Savelli*	Refugees' Perceptions of Digital Privacy *Eva Dodič*
	Review: Mindfulness Meditation Techniques and Brain Stimulation *Uršek Slivšek*	Phenomena of Parasocial Interaction as the Main Element of Stereotypical Behaviour and Its Influence on Theory of Mind in Individuals With Autism Spectrum Disorders *Veronika Mattová*	Mutual Impact of Politics and AI in a World of Developing Populist and Authoritarian Regimes *Bilge Timür*
10:30 – 11:00	**COFFEE BREAK**		
11:00 – 12:15	**Track A: [D-7]** Stress	**Track B: [D-1]** Healthcare	**Track C: [D-3]** Internet & Information
	Linking Macroscale Resting- State Functional Connectivity to Acute and Chronic Stress *Agata Patyczek & Elias Reinwarth*	Future Digital Health Crisis Management and The Covid-19 Pandemic *Miha Knific*	Understanding Opinion Formation: A Horizontal Map of Current Epistemological Landscape *Emil Zvarík*

	Linking Macroscale Resting-State Functional Connectivity to Acute and Chronic Stress *Agata Patyczek & Elias Reinwarth*	Assisted Suicide in Austria: Attitudes, Experiences, and Support Needs of Palliative Care Nurses *Arzu Petersen*	ADHD Truths and Myths: A Qualitative Exploration of Reddit's /r/ADHD Community *Marek Bodinger*
	Effects of User Interface Assertiveness on Acute Stress and Performance in a Takeover Request *Vanessa Kraut*	Intelligent Assistive Technology and Family Caregivers of People with Dementia: Does It "Work"? *Klara Dečman*	Psychological Interventions Against Susceptibility to Fake News About COVID-19 *Beáta Sobotova*
12:15 – 14:00	**LUNCH BREAK**		
14:00 – 15:00	**Plenary Talk: Faking Emotions and a Therapeutic Role for Robots and Chatbots: Ethics of Using AI in Psychotherapy [D-7]** *Bipin Indurkhya (Jagiellonian University in Krakow)*		
15:00 – 15:15	**SHORT BREAK**		
15:15 – 16:00	**Track A: [D-7]** Visual Memory & Imagination	**Track B: [D-1]** Cognitive Performance	**Track C: [D-3]** Extending Cognition
	Memorability: Differences Between Children and Adults *Maruša Sirk*	The Impact of Availability of Monoaminergic Precursors on Human Cognition *Martin Konečný*	About the Second Brain and Its Citizens *Elias Lemmel*
	Aphantasia: An Interdisciplinary Introduction to Blind Imagination *Adrian Lüssing*	Effects of Heat Stress on Cognitive Performance *Sara Podgornik*	The 4E Approach to Behavior Change *Yilan Liu*
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Saturday, June 25, 2022

9:00 – 10:15	Track A: [D-7] Sounds, Learning & Perception	Track B: [D-1] Depression	Track C: [D-3] Human-Computer Interaction
	Inside Voices: Studying the Maternal In-Nest Vocalisations of The Kea Parrot (Nestor Notibilis) *George McClelland*	Human Gut Microbiome Biomarkers for Prediction of Depression *Maša Primožič*	Human-AI Interaction: History and Design *Elisabeth Delgado Mas*
	Phonaesthetics & Familiarity: The Influence of L1 on Language Perception *María Silva Azúa*	Classification of Forum Questions About Depression with Machine Learning *Anja Stiplovšek Terglav*	Human-Robot Interaction: The Role of Presence and Gaze *Kassandra Friebe*
	Effects of Soundscapes on Cognitive Processes in Education *Andrej Filipič*	Using Personalized Network Models to Differentiate Between Unipolar and Bipolar Depression *Anja Levačić*	What Makes a Robot? Understanding Perceptions of Robots Using a Draw-A-Robot Task *Jan-Ove Wiesner*
10:15 – 10:45	**COFFEE BREAK**		
10:45 – 12:15	**Alumni Panel [D-7]** Asena Boyadzhieva (University of Vienna) Peter Hochenauer (University of Vienna) Lenart Motnikar (University of Ljubljana) Lena Müller-Naendrup (University of Vienna) Aleš Oblak (University of Ljubljana) Xenia Poslon (Comenius University Bratislava)		
12:15 – 14:00	**LUNCH BREAK**		

14:00 – 15:15	Track A: [D-7]	Track B: [D-1]	Track C: [D-3]
	Visual Perception	Mental Health	Social Learning
	Creating Stimuli for the Natural Viewing Task (NVT) *Anja Javorič*	Computational Investigation of Phase Transitions in Mental Health *Primož Šiško*	Preschoolers' Social Network Structures and the Employment of Joint Attention Requests *Guilherme Lima Marques Silva*
	Passive Viewing of Emotional Stimuli: An fNIRS-EEG Study *Teja Štrempfel*	Phenomenology of Identity Disturbance and Affective Instability in Borderline Personality Disorder *Jaanika Malla*	Social Attention and Social Reinforcement Learning *Nina Širec*
	Gaze Differences Between Analogue and Digital Cinema Screening *Ina Ferlan*	On Being *With* a Traumatized Subject *Magdalena Sedmak*	Dominance and Social Learning in Kea (Nestor Notabilis) *Lucie Gudenus*
15:15 – 15:45	**COFFEE BREAK**		
15:45 – 16:45	**Plenary Talk: Nudging Choice? [D-7]** *Toma Strle (University of Ljubljana)*		
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Plenary Talks

Why We Will Never Figure Out How the Human Mind Works

Predrag Pale

University of Zagreb

Intensive development of electronics yielded a plentitude of devices and methods that give substantial insight into human brain. Scientists are now tracing connections of every single neuron and observing chemical activities of brain cells in real time. Does that mean that the day when we will understand human mind is coming?

In parallel, machine-learning algorithms are boosting artificial intelligence implanting it into every aspect of our lives. Is this mathematics going to help us understand the wonders of human mind?

In this lecture prof. Pale will try to depict complexity intelligence requires and argue that completely different approaches are needed for deciphering the mind, if this is possible at all.

Faking Emotions and a Therapeutic Role for Robots and Chatbots: Ethics of Using AI in Psychotherapy

Bipin Indurkhya

Jagiellonian University in Kraków

In recent years, there has been a proliferation of social robots and chatbots that are designed so that users make an emotional attachment with them. Such robots and chatbots can also be used to provide psychotherapy. In this talk, we will start by presenting the first such chatbot, a program called Eliza designed by Joseph Weizenbaum in the mid 1960s. This program did not understand anything, but relied on keyword matches, and a few simple heuristics to keep the conversation flow and provide an illusion of understanding to the user. At that time, Weizenbaum was taken aback by the intensity of emotional attachment users felt towards this program, prompting him to highlight this negative aspect of technology in his thought provoking book "Computer Power and Human Reason".

Nowadays, Eliza-like systems and interfaces are used often in social robots and chatbots. We will look at some such systems and argue that they can have a positive and therapeutic effect on the user, and that in some situations at least this kind of robot-human interaction transcends human-human interaction. However, developing and deploying such systems raise a number of ethical issues, some of which we will discuss in this talk.

Nudging choice?

Toma Strle

University of Ljubljana

Various decision-making sciences, such as psychology and behavioural economics, show that the process of decision-making is susceptible to a number of biases and influences that can, in certain contexts, lead to erroneous judgments and disadvantageous choices. Based on such view, several strategies have been proposed to improve human decision-making, such as educating decision-makers (e.g., debiasing), supporting or entrusting decisions to algorithmic systems, or changing choice environments. In my talk, I will focus on the last strategy, in particular the nudge programme and similar interventions. First, I will present the basic presuppositions and tenets of the nudge programme, which aims to steer people's choices in welfare promoting directions through making changes to choice environments (or architectures) without eliminating the freedom of choice. Next, I will consider some of the possible threats to individual autonomy that such steering might entail. Finally, I will briefly explore the question of whether intentionally steering people's choices might also influences the very effects decision nudges were meant to exert on decision-makers.

Talks

Stress Management Technology in the Workplace: The Extended Cognition Perspective

Selma Berbić

University of Ljubljana

Introduction

Stress in the workplace can negatively affect our body, mood, and behavior, leading to poorer work performance, absenteeism or bad relationships with co-workers [1]. In order to prevent such negative consequences and to improve employees' quality of life, organizations have been adopting *stress management interventions* at different *levels*: *primary,* directed at preventing stress from occurring; *secondary*, reducing stress that has already occurred; and *tertiary*, aimed at maximizing performance under experienced stress and minimizing negative impacts on health. My research is about clarifying the role of technologies employed to this end.

Aims and Methods

I aim to *scientifically* evaluate the effect of stress management technologies from the standpoint of *extended cognition*. Extended mind theory argues that our cognition is not located within the boundaries of our brains, but rather extended into the environment [2]. Interaction between technology and employee creates a new cognitive system that is situated in the work environment; resulting in the technology becoming a *constituent* of the cognitive processes of this new cognitive system, rather than always remaining a *distinct entity* to be operated in an objectively defined manner [2].

I will conduct a *systematic review* of these technologies by categorizing them by the *levels* of interventions they support. My focus is on two types of technologies: *information technology* that is meant to reduce cognitive demands by changing the environment; and *persuasive* technology aimed at changing the person, by *motivating* the adoption of new behaviors and attitudes.

Alongside, I may conduct an *interview study* to help identify best practices, effects, and consequences of practical applications of such technologies, and to contextualize my own findings.

Expected Results

This work should provide insights regarding the significance of stress management technologies for employees' well-being; and an understanding of extended cognitive systems in the work environment.

References

[1] D. Holman, S. Johnson and E. O'Connor, "Stress management interventions: Improving subjective psychological well-being in the workplace," in Handbook of well-being, E. Diener, S. Oishi and L. Tay, Eds., DEF Publishers, 2018.

[2] S. Gallagher, "The Extended Mind: State of the Question," The Southern Journal of Philosophy, vol. 56, pp. 421-447, 2018.

ADHD Truths and Myths: A Qualitative Exploration of Reddit's /r/ADHD Community

Marek Bodinger

Comenius University in Bratislava

ADHD as a Disease

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder affecting around 5% of children and adolescents globally. With symptoms declining in age, still, around 2.5 to 3% of adults are impaired by the disease. ADHD has been mostly associated with poor skills in paying attention combined with impulsivity and hyperactivity. However, the latest research offers us the extended behavioral model that primarily describes ADHD as a disease with "developmental impairments in the brain's cognitive management system", particularly executive functions. As described by Brown, this extended symptomatology includes activation (organization, estimation of the time, prioritization, starting the work), focus (sustaining it, shifting it to the task), effort (regulation of alertness, effort sustenance, adequate speed of processing), emotion (frustration management, emotion modulation such as "anger, worry, disappointment, desire"), memory (working memory impairments), action ("monitoring and regulating self-action")[1].

The Role of the Internet and ADHD

Nowadays, the internet plays a key role as an information source about ADHD. While increasing awareness about the disease, making coping strategies accessible, and breaking the stigma about mental health, it also creates confusion about whether the content is posted by a content creator or an expert, oversimplifies the disease, while creating a health risk and perpetuating stereotypes and stigmas [2].

A Canadian study found that on TikTok 52% of the videos related to ADHD were misleading, 27% personal experience, and only 21% useful [3].

The Study

The goal of the study is to qualitatively explore a non-specific number of top-rated posts in /r/ADHD community on Reddit. The posts containing descriptions of lived experiences will be extracted in a form of various "claims". A psychiatrist specializing in the disease will rate the collected claims and decide whether they are the symptoms according to the current diagnostic criteria. Also, ADHD and non-ADHD participants will be assessed by a questionnaire created from the claims. The objective is to compare what experience is exclusive to the ADHD group, and how does it differ from the current symptomatology.

References

[1] L. A. Rohde, J. K. Buitelaar, M. Gerlach, S. V. Faraone (Eds.). "The World Federation of Adhd Guide", World Federation of ADHD, 2019.

[2] C. V. U. Williams, "TikTok is my therapist: The dangers and promise of viral #mentalhealth videos", Attitude. https://www.additudemag.com/tiktok-adhd-videos-self-diagnosis-support/ (accessed: May 10, 2022).

[3] A. Ng. E. Yeung & E. Abi-Jaoude, "TikTok and Attention-Deficit/Hyperactivity Disorder: A Cross-Sectional Study of Social Media Content Quality", The Canadian Journal of Psychiatry. SAGE Publications, 2022.

What Do We Observe When We Observe Experience?

Neža Brezovnik, Urban Kordeš

University of Ljubljana

Introduction, Method and Results

Subjective experience is a research domain with a distinctive characteristic: the act of observing experience is another experience. This means that we cannot even presume to be able to understand experience as 'it is'; we can only speak about the experience as it is manifested through gesture of observation. In other words, a way how we attend to experience in a reflection affects what ends up being observed. A sum of characteristics of the gesture of reflection is called the horizon [1]. Since itself also forms an element of experience, it can be phenomenologically investigated [1]. We believe that in order to understand experiental reports (and especially in order to compare reports from different individuals), it is essential to understand through what kind of horizon they were manifested. In our ongoing research, we are aiming to identify individual-specific horizons of reflection.

The presupposition behind our research design is that experiental modalities most frequently (habitually) attended by an individual can present a good indication of an individual's horizon of reflection. In the study, we included 12 (6 women) students of Cognitive science at the University of Ljubljana. All the participants attended a First-person research course, which means that they were at least minimally familiar with the techniques of reporting on experience. During the four-month longitudinal research, 60 experiental samples were gathered according to the descriptive experience sampling method [3]- participants were sampled at random times and instructed to record experiences the last moment before the sampling. We conducted qualitative analyses in which we tried to identify habitual experiental modalities, most often resorted to by each individual. The results were surprising. We found out that most of the participants, when asked about their experience tend to check out the experiental quality of their thinking – the experiental modalities mainly analysed by R. Hurlburt and therefore often discussed in lectures of the course.

Discussion

The conclusion can be drawn that the particular method used in the research and discussed during the course had a major impact on the way participants reflect on their experience. We, therefore, didn't so much identify particular horizons of reflection but more the horizon of DES method. We find gathered results potentially useful for future empirical phenomenological research. Namely, further work in identifying horizons of different methods could enable us to compare now very dissipated data; and build a unified repository of human experience.

References

[1] U. Kordeš and E. Demšar, "Horizons of becoming aware: Constructing a pragmatic-epistemological framework for empirical first-person research," Phenom Cogn Sci, vol. 20, 2021.

[2] N. Depraz, F. Varela, P. Vermersch, "On Becoming Aware: A pragmatics of experiencing," Advances in Consciousness Research, vol. 43, 2003.

[3] R. T. Hurlburt, "Investigating Pristine Inner Experience," 2011.

The Sense of Self and Its Relation to Agency: A Phenomenological Study

Matúš Brziak

Comenius University in Bratislava

The aim of this thesis is twofold: First, a phenomenological investigation of the sense of self and a state called nonduality and their relation to the sense of agency. Second, to propose a design of an empirical experiment examining the sense of self under normal and non-dual conditions, to the sense of agency.

There exists a fairly strong consensus in the phenomenological literature about the sense of self as an intrinsic feature of primary experience. Experience happens for me in an immediate way, implicitly marked as *my* experience (it is *like* something already). In this way, we talk about pre-reflective, non-observational and non-objectifying self-consciousness (Alternatively: minimal self, core experience, or ipseity). Development in an interpersonal and societal context shapes, since early childhood, the creation of self as a narrative construction.

Sense of agency is a sense that I am the one who is causing or generating an action. Agency enters intentional action in two ways: First, through an experiential sense of agency at the first-order, pre-reflexive level of consciousness (at the level of the minimal self). Second, through a reflective attribution of agency ("Yes I did that"). The sense of agency is fully embodied and situated, involving bodily movement, the peripheral nervous system, and affective and intentional aspects. Relevant to the investigation of the self is view offered by predictive coding. The brain generates predictive models not only about the world but also about the "most likely to be me". Phenomenal content being identified as 'mine' is then seen as nothing more than the most probable cause. [1]

A state of non-conceptual awareness, without the subject-object division, is achievable occasionally spontaneously, through meditative practice, or drug use. Characterized mainly by its self-evident existence, non-reification, ineffability, bliss, and an overall reported experience of interconnectedness and well-being. I will argue that the description of this state is strikingly similar to the characteristics of the minimal self, and discuss implications of the possibilities to access this state. [2]

In first-person studies, we encounter a problem of the so-called *excavation fallacy*: Examining experience alters and even constructs the phenomena. Subjects need to be trained in the ability to become aware of their experience in the first person. Methods for this training differ, but the general agreed necessary "target" state is known as epoché (suspension of judgement). Epoché contains three intertwined components: suspension of beliefs about the world, redirection of attention to the interior, and letting go and accepting experience. Subjects then work iteratively under guidance to hone the skill of verbally reporting their experience. [3]

References

[1] S. Gallagher and D. Zahavi, "The phenomenological mind", Abingdon, Oxon: Routledge, 2021.

[2] Z. Josipovic, "Nondual awareness: Consciousness-as-such and non-representational reflexivity", Progress in Brain Research vol. 244 pp. 273–298, 2019.

[3] N. Depraz, F. J. Varela, and P. Vermersch, "Becoming aware: A pragmatics of experiencing", Benjamins Publishing Company, 2003.

Intelligent Assistive Technology and Family Caregivers of People With Dementia: Does It "Work"?

Klara Dečman

University of Ljubljana

Introduction

Assistive technology shall promote independence; quality of life; and safety [1]. *Intelligent* assistive technology (IAT) aims at personalization; providing services under varying circumstances; and handling unpredictable or novel situations. In the case of dementia, assistance can address the caregiver's increasing involvement as the condition progresses, with consequent changes in the assistance called for. In my thesis, I aim to *identify contributions of cognitive science of practical impact for attempts to alleviate the burden of family caregivers of people with dementia through IAT*. My guiding questions are: How can IAT address the needs of people with dementia and their carers? What (cognitive) contributions do the users (have to) make, and how can these be identified (i.e., are there tacit ones)? (How) is their cognition changed? How can success be verified, and robustness and safety guaranteed? In short: *(How) does such IAT "*work*" in practice,* and *is it worth it?*

Theoretical contextualization

I research this topic of high importance through the lens of the *4E* (embodied; embedded; enactive; and extended) *cognition*. According to this view, cognitive processes extend beyond the brain and body and are *embedded* in the environment [2]; in particular, they span *into* and *across IAT*.

Method

In my critical survey, I try to clarify the notions of "assistance" and "intelligence" of IAT, and of the "mind" and "intelligence" of the caregivers. I aim to identify explicit and implicit references to cognitive concepts and paradigms within and across the conception, development, and deployment of such IAT.

Expected Results

I expect my desk research to find that most of the used IAT fail to adapt to the changing cognitive abilities of people with dementia and overall circumstances, resulting in family caregivers adapting to the IAT instead. This may be neither useful nor efficient, requiring a user to *redo* steps for activity completion *more* assistance from a caregiver [3], and can also happen outside of user awareness, raising ethical issues.

References

[1] J. D. Lynn, J. Rondón-Sulbarán, E. Quinn, A. Ryan, B. McCormack, and S. Martin, "A systematic review of electronic assistive technology within supporting living environments for people with dementia," Dementia, vol. 18, pp. 2371–2435, 2017, doi: 10.1177/1471301217733649

[2] D. Vernon, Artificial Cognitive Systems: A Primer. MA and London, England: The MIT Press, 2014.

[3] A. Mihailidis, J. N. Boger, T. Craig, and J. Hoey, "The COACH prompting system to assist older adults with dementia through handwashing: An efficacy study," BMC Geriatrics, vol. 6, no. 1, 2008, doi: 10.1186/1471-2318-8-28

Human-AI Interaction: History and Design

Elisabet Delgado Mas

University of Vienna

Human-AI Interaction is a multidisciplinary field of study concerned with the design of interactive artificial intelligence for human use and the interfaces that mediate it. As a research topic, it is situated at the intersection between applied computer science, design, linguistics, media studies, psychology and other behavioural sciences, given that the quality of these interactions depends on multiple factors.

Since the beginnings of what would later become known as artificial intelligence, humans have tried to interact with these systems. Pioneering examples range from the psychotherapeutic chatbot Eliza (MIT), designed for a terminal screen back in 1966, to state-of-the-art, hyper-realistic affective robots such as Ameca (Engineered Arts), neurorobotic agents with a biologically inspired model of emotions like BabyX (Soul Machines) [1] and artificial companions running on sophisticated neural network machine learning models for open-ended conversations (Replika). As AI advances, models of simulated humans are becoming increasingly realistic [1]. Some studies seem to claim greater realism is likely to improve the user experience, and others alert that having a human likeness continuum paired with atypical features can relate to eeriness [2]. Human-computer interaction (HCI) literature has not fully explored this area and guidance on conducting research on digital AI-driven experiences is needed [3].

This exploratory research will first make an overview of the history, evolution, tendencies and state of the art of human-AI interaction to gather the perspectives and approaches that will enable a deeper understanding of its factors, and how the socio-cultural context of each period and interindividual differences contribute to the user experience of human-like interactive AI systems.

Secondly, we will see how this can be applied in the design of those systems and what the best practises, principles and heuristics to design these interactions currently are, and if they require adaptation to different cultures and individuals.

In summary, the desired outcome of this theoretical work is to provide an informed basis for facilitating the design of favourable experiences during human-AI interactions with AI systems that have human-resembling responses, which will become increasingly common in our societies in the forthcoming years.

References

[1] A. Knott, M. Sagar, and M. Takac, "The ethics of interaction with neurorobotic agents: a case study with BabyX", AI Ethics, vol. 2, no. 1, pp. 115–128, 2022.

[2] T. J. Burleigh, J. R. Schoenherr, and G. L. Lacroix, "Does the uncanny valley exist? An empirical test of the relationship between eeriness and the human likeness of digitally created faces", Computers in Human Behavior, vol. 29, no. 3, pp. 759–771, 2013.

[3] C. Kliman-Silver, O. Siy, K. Awadalla, A. Lentz, G. Convertino, and E. Churchill, "Adapting User Experience Research Methods for AI-Driven Experiences", in Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems, New York, NY, USA, pp. 1–8, 2020.

Refugees' Perceptions of Digital Privacy

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It is more difficult for refugees to successfully protect their digital privacy than it is for the general population. Refugees are often forced to give their personal data to governments, who can then use it against them in order to vet, profile and categorize them [1]. Several regulations and protections exist to give refugees some control over their data, however, refugees may be unaware of their rights and options [2]. Digital migration studies (DMS) primarily focus on exploring refugees' information communication technology (ICT) *usage patterns*, without asking critically important questions regarding how refugees *perceive digital privacy*. The aim of this master thesis is to research the digital privacy perceptions of refugees in hope that the findings will enable us to better understand how perceptions drive behaviours and allow us to propose privacy protective socio-technical solutions, which will contribute to empowering them.

Methods

Systematic literature research has been conducted on the topic and will be used as a theoretical basis of the master thesis, while surveys will be carried out among refugees as an empirical part of the thesis. Questions in the survey are grouped into the following categories: Demographics, online activity, device usage, knowledge of ICTs and privacy, privacy management behaviour, trust in privacy policies, covid questions, social and economic consequences and personal data scenarios.

In order to obtain approval for conducting research on vulnerable populations, various ethical considerations will be taken into account. A preliminary pilot study will be carried out to test the survey. Upon improving the study design according to the participants feedback, a full-scale survey will be conducted. The empirical findings will be explored within the frameworks of mental models and affordances, using the paradigms of privacy paradox and digital agency.

Current Status and Expected Results

The hypotheses, frameworks and paradigms are still being revised. Due to the exploratory nature of DMS and lack of previous research on this specific topic, the results are difficult to predict.

Several challenges are specific to DMS research. For example, it is difficult to generate representative samples of mobile populations and our access to survey respondents will depend on several NGOs. Another limitation is typically lower response rates among refugees due to PTSD, depression or trauma [3]. Therefore, methodological compromises, such as snowball sampling, will be necessary.

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Gaze Differences Between Analogue and Digital Cinema Screening

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Introduction

Within the realm of cinema, the question of *analogue or digital* approach evokes divided opinions. Prior research mainly deals with the psychological aspects and it has been found that analogue screening methods elicited stronger emotional responses [1]. The current study will focus on the physiological perspective of one of the significant distinctions between the two methods, the judder, a visually unpleasant effect generated by difference in frame rates, more evident in digital screening. It appears as a non-smooth, jagged motion depicting trajectory of horizontal camera movement. The issue will be addressed empirically by investigating viewers´ eye-movements. It has been found that while viewing a moving stimulus, the involuntary eye movement - optokinetic response, is induced in order to provide a stabilised, clear image and consists of alternating longer (slower) eye gazes following the direction of the moving stimuli and shorter (faster) saccades directed backwards [2]. The current study aims to find whether the length of saccadic movements within the optokinetic response varies depending on the type of screening.

Methods

The study will be conducted in a cinema with a professional analogue (35mm) and digital (DCP) projector for both types of screening. The selection of film clips (stimuli) will be limited to the footage that exists in both forms - analogue and digitalised. A set of mobile eye-tracker glasses will be used to collect data on physiological metrics. The participants will be divided into two groups, each group will be presented one (analogue or digitalised) version of the stimuli. Each participant will be viewing stimuli individually, from the same seat, located in the middle of a hall.

Expected Results and Implications

The aim of the study is to find a statistically significant difference in lengths of saccadic movements during the optokinetic response, with digital viewing expected to result in shorter saccades and hence more frequent eye movements, which would shed light on arguments regarding the digital screening being more tiring (and less pleasant) to the human eye. The expected results will hopefully provide some more insight on how visual perception varies according to different media and broaden the scope in free viewing research, specifically the complex interactions between moving images and the gaze.

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Effects of Soundscapes on Cognitive Processes in Education

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Introduction

The role of music in educational processes has been researched from three main perspectives: the short term, performance-boosting effects of music, immediately prior to a cognitive task; the long term effects of learning music on other cognitive functions; music as background for other cognitive processes [1]. Our research focuses on the last perspective and includes a broader conceptualisation of music as soundscapes (i.e. including, besides music, also noises, nature sounds, etc.). Previous research suggests background music can affect learning processes, but such studies have most often focused on simple cognitive processes (e.g. memory and recall), while there is a lack of research on complex cognitive processes (e.g., problem-solving, skills learning, metacognition) [2], which are exactly the focus of our research. Soundscapes (e.g., even traffic noise) are often inevitable parts of our learning environments and it is therefore imperative we understand their effect on learning processes, to more effectively teach.

Methods

We will collect demographic data on music skills, behavioural data on cognitive task performance, phenomenological data about how a soundscape is experienced, the perception and liking of the soundscape (e.g. valence, arousal, salience, familiarity), and emotions relevant to the learning process. The correlation will be checked between these, and objective soundscape parameters (e.g., loudness, tempo). If possible, physiological data will also be collected (e.g., heart rate) and analysed for correlation with soundscape parameters.

Expected Results

We expect to find significant correlations between distinctive types of soundscapes and better performance at specific cognitive processes, as well as changes in the emotions of participants. We expect to find a more salient presence of music in the phenomenal experience of musically skilled participants compared to less skilled ones. A pragmatic outcome should be a list of which, if any, soundscapes can be used to directly stimulate or indirectly facilitate distinctive cognitive processes within learning experiences, and on the other hand, which distinctive soundscapes, if any, hinder specific learning processes - this would give a teacher the knowledge to appropriately manipulate the soundscape of a learning environment, depending on the needs of the learning process.

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Human-Robot Interaction: The Role of Presence and Gaze

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The way a robot is presented has several effects on human-robot interaction (HRI). In particular, research suggests that robots that are co-present in the same environment are evaluated more positively and provide better interaction outcomes than robots presented via a screen [1]. However, how the physical presence of a robot affects simple social attention mechanisms has not been thoroughly investigated. Gaze cueing [2], the process of using someone else's eye movement as information of what they are attending to and shifting one's own attention accordingly, is a well-studied phenomenon in human-human interaction and is beginning to be of interest to the HRI community [3]. The present work aims to establish the link between gaze cueing and physical presence in HRI and to contribute to filling the current research gap.

Methods

We conducted an experiment (N = 42) to investigate the influence of the physical presence of a robot and its gaze behavior on the reaction time of subjects in a gaze cueing paradigm. Participants were randomly assigned to one of two robot presence conditions (copresent robot: physically present iCub robot; virtual agent: screen version of the same robot) and were asked to locate the appearance of a target stimulus that was either congruent or incongruent to the location cued by the robot's gaze. After the experiment participants rated their perception of the robot by judging its anthropomorphism, animacy and likeability.

Results

Participants showed a consistent gaze cueing effect irrespective of the robot condition they were assigned to. Against our hypothesis, the way the robot was presented had no effect on the strength of this effect. Additionally, in contrast to findings from previous studies, no differential effect of robot presence on ratings of the robot could be found. The results suggest that gaze cueing as a basal phenomenon of human social cognition can also be found in interactions with humanoid robots. Against theoretical assumptions, the different ways of presenting the robot did not seem to alter the strength of the gaze cueing effect. Together with our results implicate that simple social HRI can be performed as well with a copresent robot as with its virtual equivalent, providing opportunities to make HRI research and development more accessible.

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Dominance and Social Learning in Kea (Nestor Notabilis)

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Introduction

Social learning describes learning through observing another individual, which can be facilitated by different mechanisms (e.g., stimulus enhancement, emulation learning, imitation) [1]. It was already shown that Kea, a highly social parrot endemic to New Zealand known for its distinctive exploratory behavior, which has had the opportunity to observe a conspecific performing a specific task, subsequently exhibited higher efficiency in performing the same task compared to individuals without prior demonstration [1]. However, animals should be selective about who and when they copy to get the most effective social learning outcome [2]. To date, no study has been conducted on the effect of dominance rank on social learning in Kea. The present master's thesis aims to answer this gap in the literature and provide new insights into the strategies used in social learning.

Method

Based on an experiment with a captive group of Kea it is investigated whether the in-group dominance rank of a demonstrator has an influence on social learning behavior of an observer. After determining the hierarchical structure of the group within a tournament design, the most dominant and most subordinate Kea are chosen as demonstrators for two test groups respectively. The demonstrators are trained to solve a task. The learning task consists of a test box with a simple opening mechanism which requires one action (pulling the correct string) to gain access to a reward. In the observational sessions, the test group individuals observe the respective demonstrator taking the correct actions to solve the task. Immediately after observation, the subjects receive a test trial with the box. In the analysis of the data, latency to approach, manipulate and solve the box, as well as opening success are used. The results are compared between the two test groups and to a control group, which had access to the test box without prior demonstration.

Discussion

As this is an ongoing study, no results have yet been obtained. We predict that social learning will be most successful with a dominant demonstrator. Previous studies, e.g., with laying hens, suggest that individuals learn more effectively from higher ranked demonstrators than from lower ranked ones [3]. The outcome of this study will contribute to the understanding of learning mechanisms and transmission bias.

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Generative Traits of Universal Bidirectional Activation-Based Learning

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Introduction

The most prominent supervised learning rule in artificial neural networks, the error backpropagation (BP), is considered biologically implausible. Therefore alternative learning rules were proposed. Since learning in the brain is based on local interactions between presynaptic and postsynaptic neurons, these models use only local activation as well. One of these models is the GeneRec, proposed by O'Reilly. In this model, neuron activation is propagated bidirectionally.

Activation in the brain is backpropagated via separate synaptic weights as opposed to GeneRec, where the same synaptic weights are used [3].

Our Model

Built on similar principles, Universal Bidirectional Activation-based Learning (UBAL) was proposed. It is a bio-plausible alternative to BP. In contrast to GeneRec, UBAL uses separate weight matrices W and M for each direction of activation flow [2]. UBAL enriches the GeneRec with an internal echo mechanism that enables self-supervised learning. It is essentially a heteroassociator and approaches every task, including classification as a bidirectional mapping. An emergent property of UBAL is that it generates images from the data that it learns to classify, without being trained to do so [2]. These images can be seen as the network's imagination.

Research

The model was tested on the most prominent benchmark for classifying—MNIST, a database of handwritten digits commonly used for training various image processing systems. UBAL's classification succession rate on the test set is about 96%, which is comparable to models. Preliminary results from this database suggest that these images differ among network initializations and are different from the computed averages of all images in the dataset [2].

Hypothesis and Future Research

We hypothesize that images drawn by UBAL can be used to create adversarial examples. Adversarial examples are images designed to fool trained neural networks, created using noise or the error gradients from the network [1]. The additional aim is to observe when MNIST adversarial examples are input for UBAL, whether he classifies them correctly or as noise.

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The Impact of Breathing Techniques on the Experience of Stress in Adolescents

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Introduction

The aim of the master thesis is to address the problem of young people's experience of stress in the educational process. School is the most common source of stress in young people, as it represents a large part of their everyday life. Because the education process has changed significantly over the last two years, stress levels have also increased. As researchers have noted, younger generations are much more vulnerable to social change, especially when it interferes with limiting social contact, so learning techniques to recognise and control stress is crucial.

In a study by Jahan et al., 2021 [1], breathing techniques were used to try to change adolescents' response to experiencing stress and found improvements by comparing well-being before and after the use of breathing techniques using a standardised questionnaire. As these tests are usually conducted in an unnatural environment and use scales to record well-being at a specific moment in time, rather than long term, they often have poor ecological validity. Therefore, in this study we will focus on how individuals experience stress and whether they have noticed any change in themselves during the process.

Methods

For the qualitative research, we will use a descriptive method called descriptive experience sampling (hereafter DES), where individuals record their experiences in different moments of the day (when alerted by a random beep or alarm), followed by in-depth interviews about their records [3]. Individuals aged 18–21 years, with an equal distribution of M and F (N=20) will be invited to participate. Inclusion criteria for participants are exclusion of any diagnosed mental disorder, and only basic or no knowledge in breathing techniques. Participants will be divided into two groups: (1) in the first group, they will record DES and perform the breathing exercises; (2) in the control group, participants will only record DES without performing the breathing exercises. Participants will record their experience for the first 10 days, followed by a breathing intervention in the first group. For the next 10 days, group 1 participants record DES and daily perform breathing exercises, while the control group remains unchanged. During Phase 1 and 2 we will also conduct in-depth interviews.

Expected results

We will do a qualitative analysis of the data from the interviews, code them and try to form categories. We expect a change in well-being in both groups, perhaps more significant in group 1.

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Creating Stimuli for the Natural Viewing Task (NVT)

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Introduction

Understanding the human brain has been a research focus for a century. In fMRI studies, that developed into task-based paradigms with highly structured stimuli and instructions to elicit one specific process [1]. In contrast, resting-state (RS) studies observe functional connectivity (FC) of unconstrained cognition with virtually no stimuli or instructions.

Both task and RS studies have offered us important new insights but face several drawbacks. Task stimuli cannot be found in daily life, so these paradigms face poor ecological validity, risk misunderstanding instructions etc., while RS often includes undesired microsleeps and due to the unconstrained nature of it, makes it hard to separate the signal from noise (e.g., motion) and makes it an unreliable baseline measure to task paradigms (e.g., [1, 2]), which limits the drawn inferences [2].

To curb the drawbacks, naturalistic paradigms have been gaining momentum. These include audio and/or visual narratives (e.g., videos or audiobooks) to which subjects attend as they would at home, for example. Among other improvements, their use does not depend on understanding instructions, increases ecological validity, and avoids active stimuli manipulation as well as unconstrained cognition. They have also been shown to successfully evoke several different cognitive processes, thereby offering a valuable complementary approach [3]. With the increasing use of this approach, there is a need for a set of stimuli that have been shown to reliably elicit specific cognition. Creating a set of such stimuli will be the focus of my thesis.

Methods

We will identify several target processes (e.g., emotion, motor, language) and prepare several audio-visual clips to elicit each target process (e.g., feeling of sadness). On separate samples of 20 healthy participants, we will use phenomenological interviews, a questionnaire (e.g., ReSQ) and fMRI to check how successfully processes were elicited across participants.

Expected Results

A set of clips that will most consistently elicit the target cognitive processes across participants will be chosen to constitute the NVT. NVT will be further validated in a following fMRI pilot study. This could offer an important contribution as an alternative to task and RS studies and aid the development and use of naturalistic paradigms.

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The Evolution of Techno-Social Systems: From the Clock to the Cyborg

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Technology is often considered to be a tool. Being something that it is neutral and lacks its own inherent values and biases. Through this thesis, I posit that technology and the values of the individuals or groups that created it are inseparable. Every technology, whether new or old holds some implicit assumptions about how human societies ought to function. Additionally, technologies are embedded in society; that is they are shaped by societal values and also shape them in return. Thus, as is revealed in the title of my thesis, technologies must be studied as techno-social systems that go beyond the framework of 'technologies as tools'. To do this concept justice, I look at the evolution of one important historical technology, on which much of human society today, depends upon. This is the evolution of linear time, or more precisely the science of timekeeping through the use of various clocks. Today, we take for granted that our days are comprised of 24 hours of 60 minutes each, etc. It was not always that we ordered our days/ months/ years in this way. Time itself might be thought of as an objective phenomena, but its measurement by humans makes it a human construct - laden with human values [1]. The techno-social system of timekeeping is composed of technologies, individual horologists, timekeeping institutions, religious establishments, governments and so on.

I extend insights gained from the study of timekeeping to a more modern techno-social system - the internet of things. Apart from studying these two technologies as techno-social systems, I also study their impact on human cognition. Human cognition is extended through the tools we use. These tools belong to larger techno-social systems, influence and mould our cognitive abilities. I argue that the type of tool used to extend cognition must also be considered. For instance, using an atomic clock to measure the time of day versus using the sun's movement through the sky have differing effects on cognition. Both of these are effective at getting us to the end result of bringing order to our day. While we may achieve bringing order and predictability to the passing of time, the tools we use to do so affect the way we cognize and interact with the world.

I conclude by exploring the assumption that technology can provide the solutions for various problems or challenges we find ourselves in. I question whether better technology can mitigate global issues like the environment, economy, happiness and improvement in cognition. I underscore ethical dimensions of these new technologies, along with philosophical questions that are both timeless and prescient. My intention with this thesis is not to proselytise a particular point of view or moral perspective, but rather to open up further discussion on these important topics.

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Privacy Paradox: A Predictive Processing Approach

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Introduction

With people's increasing dependence on digital products and services on one hand, and the increasing complexity of the mechanisms that power them on the other, the need to protect one's privacy is also becoming increasingly important. While individuals generally express concerns regarding the protection of their digital privacy, their attitudes usually fail to translate into their behaviour – a phenomenon known as the privacy paradox [1]. Although many research efforts have addressed the privacy paradox [2], existing approaches provide limited explorations of the cognitive mechanisms that shape our perception and drive action in the context of digital privacy. Streaming from the advances in Cognitive Sciences, I aspire to shed new insight into the privacy paradox by applying a predictive processing approach. More precisely, I will explore how the inference between sensory input and prior knowledge within the generative hierarchical model of cognition manifests through privacy attitudes and behaviours [3]. This aim is supported by the following research questions: (1) How can predictive processing theory inform the privacy paradox?; (2) What is the relationship between prior knowledge about digital privacy and attitudes towards digital privacy? and lastly, (3) What is the relationship between sensory cues about digital privacy and digital privacy behaviour?

Methods

The first research question will be addressed through a theory-based development of a predictive account of the privacy paradox. The empirical part, aiming to assess the validity of the theoretical account, will likely consist of a survey and a web-based experiment. The survey will investigate how prior knowledge, experiences and beliefs connect to privacy attitudes, while in the experiment, an individual's decision to consent to or decline the collection and processing of personal data will be observed in relation to either being or not being exposed to sensory cues about digital privacy prior to making the decision.

Expected Results and Implications

Due to the novelty of the research approach and lack of consistency in results streaming from previous research [2], the results are difficult to predict. Nonetheless, insights gained from the thesis aim to not only inform the phenomena and approach in question but also contribute practical insights for the development of digital privacy protection policies, aimed at empowering individuals within the digital landscape.

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The Cognitive Penetrability of Perception in an Integrative Framework

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The cognitive penetrability (CP) thesis argues that our expectations, fears, wishes, beliefs and knowledge can influence our perception. This influence is taken to be a radical one, meaning that it does not merely pertain to mechanisms prior to or after perception, such as attention or judgement effects. Instead, higher-order cognitive processes are argued to influence perceptual experience itself.

From a phenomenological perspective, CP is typically defended by means of the phenomenal contrast method. This method consists of a thought experiment in which two individuals or the same individual at varying points in time are presented to have different sensory experiences as a result of a difference in their prior outlooks. A pervasive issue with this method is that both proponents and skeptics of CP tend to explain these scenarios in ways that back up their initial views [1].

Scientific evidence on CP also remains limited. Studies in the field of experimental psychology are often not replicable and do not control for trivial kinds of influence that are not entailed by CP. Further, evidence from neuroscience mainly focuses on the primary visual cortex (V1) as a sign of early vision modulation, whereas the exact function of V1 is still debated and the demarcation line between early and late vision is not clearly established [2].

Recently, attempts have been made to relate CP to predictive processing/ coding theory. This framework essentially argues that our perception is mostly constituted by top-down predictions rather than by bottom-up stimulus-driven processes. MacPherson [3] offers a highly nuanced account of the ways in which various readings of the CP thesis may fit together with different versions of the predictive coding account. She states that different forms of predictive coding are either (1) consistent, (2) entail or (3) do not entail CP. In the third case, the rejection of CP usually comes back to not being able to make sense of the problem CP poses since radical accounts of CP do not differ between perception and cognition as modularly distinct processes to begin with.

In my thesis, I aim to evaluate and integrate theoretical perspectives and empirical evidence on CP by means of conceptually analysing current literature in this field of research. In doing so, I distinguish ways in which thinking may influence perceiving and answer which of these ways are plausible instances of CP. The broader research problem is whether disciplinary contributions towards the CP thesis is integrable in a meaningful manner. At the current stage of the project, I am therefore primarily concerned with laying out translation issues between the disciplines involved.

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Future Digital Health Crisis Management and The Covid-19 Pandemic

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Introduction

The spread of COVID-19 has been challenging the world since late 2019, when it was first detected in Wuhan, China, resulting in a global pandemic and worldwide lockdowns, causing a paradigm shift in how world leaders and health systems manage public health risks [1]. Even though countries all over the world faced the same transboundary crisis which effortlessly exceeded geographical, policy, cultural, public-private, and legal boundaries [2], the country-specific impact and response to the crisis varied, leaving the best and the worst of national and international leadership was exposed. The world and research shifted toward new digital technologies used in crisis management process. The implications of digital health crisis management are crucial for the creation of a critical, relevant, and ethical cross-cultural management practice that may help with new real-world problems in the future [2].

This research consists of two parts. Firstly, the following research questions are explored via a systematic literature review of the relevant journal articles: 1) How can digital tools be used in improving digital public health crisis management? 2) What are the existing challenges of digital health management? Secondly, a survey of citizens of Vienna is going to be conducted to provide insight into perception of locals regarding digital health crisis management of COVID-19 pandemic.

Methods

An integrated literature review will be completed with the goal of offering new findings based on the gathered literature. To ensure replicability, we searched for relevant peer reviewed research and journal articles written in English, published in 2020 and 2021, searching for three phrases: 1) covid crisis management, 2) covid digital health, and 3) covid digital technology, in each of 11 databases visited. For each search, the 10 most relevant sources were added to Zotero, if that many were available. Out of 315 gathered reports, 116 were selected for review, using an online screening tool, Covidence, following the PRISMA protocol. Qualitative analysis is being performed using QDA miner to code the relevant text.

Expected Results

We expect to offer new finding on digital tools (mHealth, eHealth, etc.) used in crisis management and their known challenges, the results of which will be used as guidelines to make and conduct a survey researching the population with the goal of improving and creating a holistic human-centric model for digital health crisis management.

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The Impact of Availability of Monoaminergic Precursors on Human Cognition

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Introduction

Monoamines are a group of biogenic amines which contain an amino group connected to an aromatic ring and serve as neurotransmitters or neuromodulators in the human central nervous system (CNS). Molecules included in this group are dopamine, epinephrine, and norepinephrine (catecholamines); serotonin and melatonin (indolamines); and histamine (imidazolamine). As neurotransmitters, they form monoaminergic systems, which play a major role in the CNS signalling, including functions such as mood regulation, executive function, certain types of memory or learning. Consequently, they are crucial in the pathogenesis of many neuropsychiatric or neurodegenerative disorders, and are a target for several drug treatments. They are synthesized from their respective amino acid precursors, whose availability can be experimentally manipulated by a targeted short-term dietary depletion or loading. The aim of this systematic review is to critically evaluate the role of availability of the precursors of monoaminergic neurotransmitters. It includes published empirical studies that employ manipulation of availability of precursor molecules from which monoaminergic neurotransmitters are synthesized, and also investigate their impact on human cognition or neural processing. Although this particular area has been researched for several years, there is very little consensus about specific effects of manipulation of monoaminergic systems. For example, many experiments use different tasks to measure the same concepts (e.g. both Continuous Performance Test and Stop Signal task are thought to measure response inhibition), or employ slightly varying methodological approaches. Reasons such as these might explain some of the seemingly conflicting results, and systematic review can therefore provide unique insight into this research area. With a better understanding of these crucial systems lies the possibility to create new drug treatments, improve diagnostic tools, and further our knowledge about both normal and pathological states.

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Effects of User Interface Assertiveness on Acute Stress and Performance in a Takeover Request

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While intense warnings can be lifesaving for drivers by evoking fast responses, they may startle them and lead to dangerous braking behavior [1]. In automated vehicles, the management of mental stress is decisive for safe takeovers. Drivers may experience mental underload when automation is activated but are expected to safely navigate critical situations after a takeover request. Excessive acute stress decreases their ability to assess the situation, resulting in worse driving performance [2]. While assertive signals are thought to be more effective at evoking immediate response, resuming full control over the vehicle can take up to forty seconds [3]. It is unknown if the initial effectiveness of assertive signals might be offset by the increased stress response.

Methods

We will evaluate assertiveness levels of abstract auditory takeover requests in a pilot study. In addition, the performance measures to be included in the main study will be selected. Possible variables include distance to collision, steering wheel variability, braking reaction time, lateral control as well as traffic rule compliance [1], [3]. The main study will be using a between-subject design, in which subjects will drive a conditionally automated car in a simulator and receive high or low assertive takeover requests. Dependent variables include driving performance and the physiological measure of stress, assessed via heart rate variability which strongly correlates with mental stress [2]. For each takeover, subjects will also rate their perceived stress level.

Expected Results

The results will model how the stress response and driving performance evolve from the takeover request to the driver resuming full control of the vehicle. Previous findings suggest that high assertive warnings are expected to result in a longer distance to collision and faster braking and steering reactions [1]. Overall, high assertive signals will result in worse lateral performance, higher stress ratings and lower heart rate variability, indicating increased mental stress. Ultimately, these insights can inform the design of a takeover system, that mitigates the effects of suboptimal mental driver state on road safety and user experience [2].

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About the Second Brain and Its Citizens

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The Microbiota-Gut-Brain Axis

The human intestinal tract contains roughly as many bacterial cells as there are human cells in the entire body. It has been shown that some gut bacteria are able to produce neurotransmitters that can modulate the concentration of these chemicals in the brain.

In addition to that, recent research found a direct neural connection between the gut lumen and the brain through specialized epithelial cells, the so-called neuropods. [1] These are cells that, on one hand, create receptors towards the gut lumen capable of sensing a variety of different metabolites and, on the other hand, form synapses to neuronal cells. [2]

To draw the whole picture: Bacteria can produce metabolites which are sensed by neuropod cells. In turn, the gut can excrete compounds that can interact with the bacteria, thus forming a closed circle of communication.

A Movie Starring Bacteria

The aim of this work is to get more insights into the interaction between the brain and the gut microbiota by investigating their changes over time.

Longitudinal sampling of gut microbiome composition and brain function in a single individual will serve as data for this project. It consists of a collection of microbial DNA from stool samples, fMRI brain scans, and physiological and psychological measures that were collected within a period of two years. Physiological data were collected with the help of smart watches worn by the individual. Psychological data were assessed with diaries, questionnaires, and cognitive tests. Hypothesis about the possible interaction of these variables will be formulated as a first step. Following that, the data will be processed and said hypothesis will be tested with the help of bioinformatic pipelines and statistical procedures. [3]

Potential Outcomes

Possible findings could point towards the importance of considering the role of microbiota when investigating cognition. It could also show the relevance of targeting microbiota as a mean of psychological therapy.

Viewing the gut lumen as external to the body, the influence of the gut bacteria on the brain could have interesting implications for the extended mind theory (EMT).

Lastly, the insights might raise questions related to phenomenology: Do the sensing of bacteria and their metabolites constitute a distinct sensory modality which we yet must learn to interpret?

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Using Personalized Network Models to Differentiate Between Unipolar and Bipolar Depression

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The so-called integration problem in psychiatry (i.e., how to create a unified model spanning biological, phenomenological, and sociological levels of description) hinders current understanding, research and treatment of psychiatric disorders [1]. It has been proposed that all relevant phenomena can be grouped into four dimensions that need to be integrated to gain relevant insight into the disorders: (1) Experiental dimension; the way we experience, (2) biological dimension; physiological processes of the brain and body, (3) sociocultural dimension; our relationships and environment and (4) existential dimension; reflexive stances we take towards our experience.

So far, explanatory models of psychiatric disorders that span multiple levels of analysis are rare. A proposed solution is the so-called Personalized Network Model (PNM) approach, a theoretical framework that integrates all 4 areas in a non-hierarchical and non-reductionistic way.

PNM is a network model that serves as a simplification of a complex dynamical system that represents a person. It is made out of nodes representing the relevant factors from all 4 dimensions that contribute to or alleviate the psychiatric problems of an individual and connections between the nodes that show the direction and strength of the relationship between factors.

In our research, we will create PNMs of our participants and treat each one as a separate case study. We will follow 6–8 participants that can be placed on a spectrum from normative population to expression of mood disorder symptomatology. Once per month for a year, qualitative data will be gathered for each person using Descriptive Experience Sampling (DES) method [2], followed by a micro-phenomenological interview. For data about the biological dimension, besides the participants' reports on sleep, nutrition, and use of psychoactive substances, an EEG micro-state analysis will be made at regular intervals.

Our main research question is: can we observe a difference between expressions of unilateral depression, better known as major depressive disorder and bipolar depression, a mood disorder characterized by depressive-manic episodes. What are the differences between the two is still a relevant question in psychiatry as current ways of differentiating are not satisfactory, and misdiagnosing bipolar patients as unipolar can be dangerous as recommended treatments for the disorders differ. For analysis we will use a bottom-up approach on a larger data set than just our participants as we are working as a subset of a larger data gathering project that uses the same methods.

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Computational Modelling of Cognition as a Tool for Cross-Pollination Between Two Cognitive Science Paradigms

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Context

In the evolution and coexistence of paradigms in cognitive science, emergent and cognitivist approaches to cognition are seen as growing and promising paradigms. To develop and validate theoretical concepts, researchers of both paradigms make use of computational modelling (in particular: cognitive architectures) [1]. While at times presented as mutually exclusive and competing for interpretational sovereignty, some researchers advocate the integration of paradigms [2]: *Hybrid* cognitive architectures are the materialization of attempts of such integration practice [3]. This brings about the three questions for research: 1. How is this integration of seemingly competing theoretical standpoints realised? 2. Which philosophical consequences do arise from such realisations? 3. How are these mirrored in the philosophical discourse?

Method

To develop my answers, I conduct a structured literature review consisting of two sub-quests: For the first one, concerning questions 1. and 2., I choose a few (2-4) hybrid cognitive architectures to compare at a conceptual level. The criteria for comparison developed so far encompass: weighting/ dominance of the paradigms; degree and strategy of integration; scientific reception; applications and practical success; impact within the cognitive systems and cognitive science communities; and philosophical implications. To answer question 3., I will study reference works thematising the development of cognitive science paradigms and look for signs of cross-pollination: These results will be compared and related to my findings from sub-quest one.

Aim

The aim is to ready the *practical* take-aways gained from different strategies in building hybrid cognitive architectures for feeding back into the philosophical discourse about cognitive science paradigms. Through that, my research should showcase how computational models not only help with clarifying ideas about isolated phenomena, but also are a useful tool for philosophical questioning. Complementing traditional thought experiments, computational modelling could present new questions and possible ways of developing the integration of paradigms and frameworks.

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Preschoolers' Social Network Structures and the Employment of Joint Attention Requests

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Introduction

Social network analysis of preschool peer groups is highly interdisciplinary, combining the methodology and conceptual perspective from distinct fields. The strongest focus of these studies has thus far been on the connection between socio-ecological factors and adaptive group features within ethological frameworks. However, very few studies have explored the relationship between well-established socio-cognitive constructs (e.g. mentalization processes) and social network features.

Contrastingly, Dunbar and colleagues [1] provide a distinct perspective on social network theory. These authors propose that humans' complex social life is cognitively costly and agents must selectively employ cognitive resources in order to efficiently manage social relationships. This selectivity, in turn, constraints individuals' social network size and structure [1]. Moreover, Dunbar and Stiller [1] propose, for example, that humans' social networks are composed of one innermost layer of closest friends (i.e. support group), followed by an outer layer of frequent interaction partners (i.e. sympathy group) and (in adults at least) several additional layers. The authors claim that the size and relative proportion of the support clique can be predicted by the individual's capabilities to employ mentalization processes efficiently, whereas the size of the sympathy group is only predicted by an individual's memory capacity [1].

Research Questions and Hypothesis

It is, however, not yet clear whether the same relationship exists in young children. Therefore, I will investigate (2) if these network structures can be found in preschool children's social networks and (2) if the number of children's affiliative relationships (within the sympathy group) is predicted by an individual's successful employment of socio-cognitive resources (i.e. joint attention requests instances).

Methods

In contrast to asking children about their number of friends [1], I will employ an ethological approach, composed of behavioral observation of peer proximity within an ecologically relevant setting (i.e. free play) in order to analyse the social network structure of 66 preschoolers. Following, I will investigate the relationship between these structures and the individual's use of joint attention requests (i.e. individual's frequency of pointing gestures) as an age-appropriate proxy for the successful employment of socio-cognitive resources [2].

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The 4E Approach to Behavior Change

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Less drinking, more exercise, less food wastage, more public transportation—we confront the challenge of *behavior change (BC)* in pursuit of a better life/ planet on both individual and collective levels. As such a central topic, BC has been extensively studied in different fields [1]. However, existing theories and models tend to anatomize processes and factors into dichotomies (e.g., rational vs. irrational, conscious vs. nonconscious, internal vs. external), and assume a linear, additive relation among them. This approach does not reflect the complexity of human behavior and cognition. BC still remains hugely challenging, particularly in the long run [1].

The present thesis tackles this challenge from a different angle. Behavior lies where the brain, the body and the environment meet, serving as an interface between the cognitive agent and its environment. Thus, it makes sense to examine behavior from a cognitive science point of view. Following this line of reasoning, the thesis approaches BC through the lens of the 4E conceptions of cognition, emphasizing a holistic, processual, and relational view towards behavior. Guided by the 4E conceptions, the project provides new perspectives in search of enabling mechanisms that drive long-term BC. Ultimately, it hopes to gain valuable insights that could benefit diverse fields and aspects of human wellbeing.

The present project is solely theoretical. After reviewing classical BC theories and methods, including their main constructs, development, and limitations, it introduces briefly the key neural mechanisms underly behavior and motivation. Following this, it analyses the extended, embedded, embodied and enactive nature of behavior, proposing a set of *novel perspectives*, which lead to *new elements* for investigating BC.

For instance, an *embedded perspective* requires a behavior to be studied in its context instead of in vacuum, thereby adding to the framework the elements of *behavior scenario (BS)*—how, when and where it occurs, and *behavior web (BW)*—depicting key interconnections with other closely related behaviors. An *extended, holistic perspective* requires extending the *unit of investigation (UOI)* from the single agent to include the parts of the environment crucial for emergence of the target behavior/ BC. An *embodied, enactive perspective* treats the environment as a *field of affordances,* with the goal of creating an *enabling environment* that helps induce and sustain long-term BC.

From the agent's *internal perspective*, intervention schemes include off-loading BC related cognitive efforts from the agent onto the environment, as well as inducing internal motivations to alter the perceived salience of affordances, so that they become more effective in triggering the desired BC.

Finally, based on these new perspectives and elements, a conceptual model and a set of guidelines for intervention strategies will be presented. These will then be elaborated with the help of two examples, one individual- and one group-oriented BC cases put into context.

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Aphantasia: An Interdisciplinary Introduction to Blind Imagination

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Introduction

Is Visual Imagination Necessary for Cognition? Many scientific debates gather around the question whether visual imagination is necessary for cognition or not. However, the recent scientific research on the cognitive phenomenon *aphantasia*, in which subjects report no visual imagination, supports my research hypothesis that visual imagination is not necessary for cognition. Since 3–4 % are globally affected, it seems to be no disorder, also, due to maintained (or even enhanced) cognitive performance.

Theoretical Background: A Psychology and Neuroscience of Aphantasia

Psychological research revealed that aphants do have impoverished autobiographical and episodic memory [1]. Here, 26.22% report a multi-sensory imagery reduction. Their recalling of objects is negatively affected while, on the contrary, their spatial memory of objects is slightly better, as well as their ability to concentrate. For not relying on introspection only, further studies show that aphant's pupillary response does not differentiate between imagining a bright or dark triangle. Four triangles increased pupillary response, but equally in both conditions.

Moreover, a skin conductance test showed that fearful propositional input did not produce any stress response. This was strengthened by a binocular rivalry test in which aphant's perception was not primed by visual imagination tasks. Lastly, aphants were also more likely to be protected from pseudohallucinations in flicker experiments.

This encouraged scientists to find neural correlates through fMRI tests, which can be categorized as follows:

(1) There is some evidence that aphants have a bigger surface area of their visual cortex V1.

(2) Aphants activate more diverse brain regions [2].

(3) They activate some regions more (e.g., auditory cortex, or frontal regions) while others are more silent (e.g., fusiform gyrus, or precuneus) [2].

(4) Lastly, there is some evidence that hyperphantasics have a higher connectivity between visual and frontal regions, which could be blocked in aphants.

Outlook: Aphantasia and Society

Especially from aphantasic artists we can learn a lot about non-visual strategies like proprioceptive, labelling, or extended strategies. This supports the extended cognition hypothesis, as well as predictive processing since they use interactively the environment and can minimize prediction errors in specific situations. What this can mean for education, innovation, and society, will be part of the discussion in my master thesis.

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Phenomenology of Identity Disturbance and Affective Instability in Borderline Personality Disorder

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Introduction

Borderline personality disorder (BPD) is a psychiatric disorder, characterized by intense emotional fluctuations, uncontrollable emotional reactions and anger, chronic suicidality, and feelings of emptiness, stemming from an intense fear of abandonment, leading to unstable sense of self and interpersonal relationships. The disorder most often develops as a defence mechanism from childhood trauma or neglect. BPD is one of the most common personality disorders with one of the highest suicide rates, often misdiagnosed, primarily diagnosed in women, and stigmatised by professionals and the public [1, 2].

BPD is one of the few personality disorders that studies show to have a high success rate in treatment. However, due to diagnostic complications, patients commonly have difficulties accessing treatment. To improve the treatment options for BPD, one must first understand it; the best way to do that is to realise 'what it is like' for the borderline person, what they value and how they make sense of the world [1]. Several studies have been conducted on BPD, but concrete real-life experiences remain underexplored, and identity disturbance has received little empirical attention.

Method & Implications

The study intends to investigate the phenomenological aspects of disturbed identity in BPD: how patients experience it, how it evolves through time and how it affects their life. As identity disturbance is connected to unstable affect and relationships, the study will explore how these symptoms interact and reinforce one another. The participants will provide experiential data through experience sampling, which include items about affectivity, identity and the social dimension. After a day of sampling, the participants will be interviewed following the micro-phenomenological method. After the data acquisition, personalised network models will be constructed for each patient, outlining the relationships between different domains of functioning [3]. As the framework for psychiatric diagnoses is shifting from categorical distinction of disorders towards a dimensional perspective – focusing on the underlying mechanisms, the personalised network model approach could aid in an integrated understanding of mental disorders and provide new insights into their management and treatment.

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Phenomena of Parasocial Interaction as the Main Element of Stereotypical Behaviour and Its Influence on Theory of Mind in Individuals With Autism Spectrum Disorders

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Introduction

Despite the fact that we have recently sought a holistic view of individuals with autism spectrum disorders (ASD) and linked it to innovative approaches with multiple therapies, in order to support their cognitive abilities associated with the theory of mind (ToM), like an ability to attribute mental states (such as desires, beliefs or intentions) to oneself or others [1], such as an interpretive speech, symbolic thinking, or contextual awareness [2], we are still trying to find a way that would provide them with the most effective support in their individual development [3].

Aims and Objectives

The core of this research stands on the variety of the studies, trying to unveil the possible correlation between the influence of PI on individuals with ASD and their ability to develop certain skills, related to ToM., which has become also the main hypothesis for this work.

A specific type of interaction, depicted in our study- parasocial one, often described as a one-sided relationship with an imaginary or real-life figure, is very prevalent in the adolescent age group [3].

Therefore, the process of deciphering the different effects of PI on the individuals with ASD will be soon transferred into the empirical study, with four types of questionnaires (AQ, Empathy, Theory of Mind and Parasocial Interaction) in order to preserve a holistic view of the mentioned research attempts.

Conclusions

Although data collection was not finalised yet, we believe that principal component analysis, which will be applied to the received data, due to its power to get rid of additional data, will prove our proposed hypothesis. Hence, the outcome of this study lies in the summary of all possible effects after PI impact, contributing to future research attempts.

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Inside Voices: Studying the Maternal In-Nest Vocalisations of the Kea Parrot (Nestor Notabilis)

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Background

Native to the alpine regions of New Zealand's South Island. Detailed analysis of the structural properties of kea vocalisations [1] lead to the classification of 7 distinct call types, however observations of the nesting ecology [2] revealed a structurally distinct call type seemingly specific to nesting mothers. As yet little is known about the possible function of these nest-specific vocalisations, although initial analysis by [2] showed the calls to be structured in a way that would minimise the risk of predation (i.e. low amplitude and high entropy), and led to the tentative hypothesis that the calls serve multiple functions, including stimulating embryos during hatching and aiding the location of the mother's beak during feeding.

Few studies have looked at parental communication in nesting parrots in general.

This project aims therefore to identify behavioural contexts correlated with these vocalisations to better understand their possible function, communicative or otherwise. The findings will then be contextualised within the wider literature of parent-offspring communication.

Methods

Video data from 3 nests will be collected twice a week during nest-building (1–2 weeks), incubation (3 weeks), and the first week of the youngest chick's life.

The videos will then be coded for pre-specified behavioural categories (e.g. feeding, returning to the nest, interacting with the male etc.). From this a baseline calling rate (during periods of inaction) will be derived, against which the call rate during specific behaviours can be compared.

Possible function of vocalisations

Research on the effect of parental vocalisations on the developing embryo in fowl shows that postnatal sound preferences are at least partially innate, but that they can be shaped and enhanced by in embryonic exposure to maternal calling.

Similar plasticity in response to the mother's voice is also likely in the prenatal human brain, and has been hypothesised to facilitate the early stages of linguistic development as early as the womb [3].

In the case of kea, juvenile calls have been shown to be influenced by those of conspecifics with which they have regular contact during development. This provides an interesting parallel to phonemic specification during the development of vocal control in human infants.

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Identifying Neurophysiological Markers of Movement Quality Progress in the Context of BCI Post-Stroke Rehabilitation

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Introduction

Stroke is a debilitating medical condition, often leading to severe impairments of motor function. Recently, brain computer interface (BCI) systems have been proposed as a novel and promising tool in post-stroke rehabilitation. BCI rehabilitation systems aim to promote activity-dependent plasticity by providing real-time sensory feedback based on user's neural activity [1]. Immersive virtual reality (VR) has become an increasingly popular way of presenting feedback, as it has been shown to promote engagement in users and enhance a sense of embodiment [2]. While VR-BCI systems have been found to have a positive impact on functional motor recovery [2], research rarely reports on neurophysiological changes associated with the motor learning process. This study aims to address this gap by examining electroencephalographic (EEG) activity of subjects as they perform repeated sessions of a VR-based motor rehabilitation game.

Methods

The study will include five healthy subjects. Each will complete five sessions of a game, developed for future use in VR-based motor rehabilitation (with adapted difficulty levels for healthy players). The game requires a subject to perform several upper limb movement tasks (e.g., pouring water into a cup) in a repeated manner, while the HMD's hand-tracking feature detects performed movements. Behavioural data, specifically, the number of correct trials and reaction times, will be combined with EEG data collected during the session on a 128-electrode system. Changes in EEG activity will be examined in reference to subjects' improvement in task performance with the aim to identify possible neurophysiological markers of movement quality progress.

Expected Results & Discussion

We expect the improvement in movement quality to be associated with stronger desynchronization at *mu* frequency band (8–13 Hz) [2], as well as changes in motor cortex connectivity [3]. Identifying consistent EEG markers of movement quality progress would potentially contribute towards improved neurofeedback in rehabilitation BCI systems, paving the way for accessible in-home rehabilitation for stroke survivors.

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Differentiation of Dementia Phenotypes Based on EEG Spectral Parameters

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Introduction

Dementia is a neurodegenerative disorder characterized by a marked decline in various cognitive domains such as language, memory, attention, visuospatial and executive functions. The first and most frequent sign of dementia is memory loss, however, some patients present with more prominent impairments in other cognitive functions [1]. This cognitive heterogeneity has been shown in various studies and has been linked to various demographic, genetic and neuroimaging characteristics. The two most often identified phenotypic subgroups of dementia are the »amnestic« (patients with memory impairment) and the »non-amnestic« (patients with impairments in other domains) which have different clinical and pathophysiological representations [1, 2]. In terms of electroencephalography (EEG), one of the most described effect of dementia is the »slowing of the brain waves«, i.e. an increase in spectral power in the delta and theta band and a decrease in the alpha and beta [3]. The present study aims to explore whether different phenotypic subgroups of dementia, apart from differences in affected brain regions and demography, also show differences in EEG spectral parameters.

Methods

We will perform 24-channel resting state EEG recordings on 400 elderly participants between the ages of 60–90. Separately from EEG we will evaluate their cognitive functions with 4–5 different psychometric tests. Participants with probable dementia according to scores on psychometric tests will be clustered into more homogeneous subgroups in terms of their results on different tasks of psychometric tests given as an input for clustering. EEG recordings will be pre-processed and the selected EEG parameters will be calculated and compared within the clusters. Participants scoring high on psychometric tests will be used as a control.

Expected Results

Based on previous literature, we expect to get at least 2 subgroups from our clustering method, representing the amnestic and the non-amnestic group. Since the literature reports structural differences in affected brain regions between the two groups, we expect to detect some functional changes, i.e. differences in at least some of the selected EEG parameters.

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Linking Macroscale Resting-State Functional Connectivity to Acute and Chronic Stress

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Introduction

Stress exposure leads to an intricate psychophysical response [1]. Acute stress is triggered by a transient change in the environment and is considered adaptive. Chronic stress is characterised by a prolonged stress exposure and is considered maladaptive, and a risk factor for psychiatric disorders. Resting-state functional connectivity (rs-fc) captures task-independent neural activity [2]. Hence, it is a useful indicator of brain network organisation and is heavily featured in stress research. Recently, the novel method of functional connectome gradients emerged. Adapted from spectral graph theory, it captures the multidimensionality of the cortical landscape and provides a hierarchical view on brain organisation [3]. In our explorative study, we hypothesise that there will be a link between macroscale rs-fc and acute and chronic stress.

Methods

Two overlapping datasets will be used: (1) Max Planck Institute Mind-Brain-Body Dataset - LEMON and (2) The Neural Consequences of Stress dataset (NECOS), an extension of LEMON. Within the NECOS datasets the Trier Social Stress Test was used to invoke acute stress. Within the LEMON, the Trier Inventory of Chronic stress questionnaire was obtained to assess chronic stress. To establish macroscale rs-fc, resting-state fMRI scans will be obtained from both datasets and gradient analysis will be performed using the BrainSpace toolbox in Python.

Expected Findings & Significance

We expect to see a change in macroscale organisation of rs-fc with increasing chronic stress and following acute stress intervention. Due to our analysis being primarily explorative, we cannot infer the directionality of the results. The impact of this study is two-fold: First, we aim to shed light on the applicability of the method to stress research. By looking at stress we are contributing to the current debate on the robustness of gradients across states and traits. Second, we hope to advance the knowledge of the effects of stress on functional organisation of the brain to contribute to future stress interventions, preventions, and treatments.

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Determinants of EEG Peak Alpha Frequency in the Elderly

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Introduction

Dementia is one of the greatest health and societal burdens of our time. Early detection of this disease may critically delay the onset of symptoms and thus improve the quality of life for patients and their caretakers. Besides genetic, biochemical, and neuroimaging biomarkers to screen for dementia, the value of EEG biomarkers is being increasingly recognized [1]. The so-called "brain slowing" is a well-established phenomenon in patients with dementia where the EEG power spectrum shifts toward lower frequencies. In particular, the peak alpha frequency (PAF), which is thought to represent a robust EEG correlate of general cognitive performance, is known to decrease in dementia patients [2]. However, PAF may be affected by other (demographic) factors apart from a patient's cognitive status. Reducing the variability of PAF by accounting for these confounding factors might increase the usefulness of EEG as a method for cognitive assessment.

Methods

300 elderly participants (60–95 years old) will be included in the study. Five psychometric tests (Montreal Cognitive Assessment, Alzheimer's Disease Assessment Scale - Cognitive, Addenbrooke Cognitive Assessments, Phototest, and Eurotest) as well as 8-minute resting state EEG measurement will be performed on three different occasions (each session will include 1–3 psychometric tests and an EEG measurement). EEG data will be pre-processed to exclude common artifacts and the PAF calculated for each subject. Multiple regression with the following factors will be performed: age, education years, head size, gender, and cognitive performance.

Expected Results

We expect a negative moderate yet significant relation between PAF and factors of age and education. We do not expect significant relationships between gender and head size. Strongest relations between PAF and cognitive status (as assessed by psychometric tests) are expected, indicating that cognitive status predicts PAF better than age, education years, head size, or gender.

Discussion

Should any demographic factors show a highly significant and independent correlation with PAF, this would need to be corrected for further assessments of EEG biomarkers for early dementia screening. Correction factors may increase specificity and sensitivity of such EEG tests, thus increasing chances of correctly separating pathological from healthy brain oscillations.

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Assisted Suicide in Austria: Attitudes, Experiences, and Support Needs of Palliative Care Nurses

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Introduction

Physician-assisted suicide is the medical procedure in which patients who are deemed mentally fit and eligible are able to make the choice to medically end their own life [1]. This occurs within the context of palliative care medicine, an interdisciplinary field of medicine dedicated to mitigating suffering through comfort-based care of patients with long-term, chronic, or serious illnesses. In some places such as Oregon, USA, Switzerland, and Belgium, physician assisted suicide has been legalized [1]. In January 2022, this procedure has been legalized in Austria as well for patients with a severely debilitating long-term condition or a terminal illness [2]. Since its legalization, there has not yet been a review of the experiences, beliefs, or needs of medical care staff encountering this procedure in their workplace.

Research Question & Methods

The present study investigates the overarching research question: "What is the current status of the implementation of assisted suicide in Austrian palliative care medicine?" with various sub-questions directed at the legalization of assisted suicide.

The method of this cross-sectional, explorative study includes an online survey distributed to hospice care nurses in palliative care centers around the country. This will contain three sections, with questions aiming to assess the general personal opinions regarding assisted suicide in medicine, the details of their most recent encounter with a patient wishing to utilize this process, and finally, what personal and professional support may still be needed. After the surveys have been returned, a comprehensive assessment and analysis of such data will be performed and ideally used to refine the current system as needed.

Expected Results & Importance

Given the results from other countries' comparable studies, we expect that attitudes will not have drastically changed regardless of experience [1].

This work is necessary as it helps society understand and acknowledge the perceptions, beliefs, and potentially high toll taken on these direct care workers who are confronted with the implementation of assisted suicide as a legal practice. Such a study at this early stage of implementation is important in Austria to understand both how the nation's implementation of the new law is progressing and to assess attitudes and needs of care staff.

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Effects of Heat Stress on Cognitive Performance

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Environmental factors, such as heat stress, affect human performance. Increased ambient temperature reduces heat loss from the body, resulting in increased deep body temperature. Such heat-induced physiological strain may cause cognitive impairment, resulting in slower reaction time and an increased number of human errors performed [1]. An understanding of the effect of heat stress on cognitive performance is crucial for improving safety in the workplace. Especially since the increased complexity of industrial and military tasks has increased the level of mental workload required for the completion of these tasks, leading to a higher risk of human error [2].

Hypothesis and Methods

Based on previously conducted studies we hypothesize that heat stress will induce impairment in cognitive performance and thermal comfort and that a ventilated vest will mitigate these impairments due to the enhanced evaporative cooling offered by the vest (portable cooling systems) [3].

Ten male participants will perform a walk on a treadmill, and simulated guard duty in two different conditions. In the first condition, they will be wearing an evaporative cooling vest with the bulletproof vest (to add extra load), whereas in the second condition they will only be wearing the bulletproof vest. During the trial, the following physiological measurements will be collected: gastrointestinal temperature, torso skin temperature, microclimate temperature, relative humidity, and heart rate. Subjective ratings of thermal comfort will also be assessed via questionnaires. Cognitive performance, more specifically reaction time, attention, and executive functions, will be measured using the Trail Making Test and Stroop Test.

Discussion

Considering the results of previous studies conducted in a real work environment we expect to see impairment of cognitive performance and thermal comfort within each subject in conditions without an evaporative cooling vest that mitigates heat stress. Altogether, attaining a definite conclusion regarding the relationship between heat stress and cognitive performance might be difficult due to task type, exposure duration, skill, and acclimatization level of the individual and gender variable [1].

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A Pilot Study on Haptic Aubert-Fleischl Phenomenon in Parkinson's Disease

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We will carry out a pilot study of a study The effect of dopaminergic medication on visual and haptic Aubert-Fleischl phenomenon (AF) in patients with Parkinson's disease (PD) and therefore ensure its feasibility as well as data collection of healthy controls (HC). A pilot study (PS) is a smaller scale study with fewer participants but follows the same methods as the main study to identify possible complications, optimize the procedure and get preliminary results [1]. AF is visible when a moving stimulus appears to move faster when the receptive organ is stationary (afferent motion perception) versus when we pursue the stimulus (efferent motion perception) [2]. The AF has not yet been studied in the PD population, nor has the effect of dopaminergic drugs on it. The main research question is whether the main study can be carried out as planned or whether some components (process, resources, or management) should be changed.

The full-scale study will include 30–40 PD patients and 20–25 HC for each visual and haptic AF task. The results will be compared between HC and patients with PD and in patients before and after dopaminergic therapy.

The PS will be performed on 5 healthy participants, without PD symptoms, age, and sex comparable to the participants of the full-scale study and with the same exclusion criteria. It will cover the task of haptic AF, where participants must estimate the speed of the band in relation to the reference speed by kinesthetic stimulus (K) where the finger is touching a spot on the moving band and by tactile stimulus (T) where the hand is stationary [3], without seeing and hearing the machine, taking around 3 hours to complete. There will be 4 experimental blocks of the T and K stimuli: TT, KT, TK and KK, each with 70 trials. The same procedure is to be used for data collection for HC.

To test the feasibility of the study we are analyzing the methods used, acknowledging the problems that could arise regarding the use of the equipment, the software, the time needed, data analysis and therefore ensuring the maximum efficiency of the main study.

Results will show whether changes to the design are necessary. One of the limitations of the PS could be that it will only include healthy participants, so its results may not give a complete insight into how the study design will work with PD patients in the full-scale study and make wrong assumptions about the results of the PS in general and their effect on the full-scale study.

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Human Gut Microbiome Biomarkers for Prediction of Depression

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Introduction

Although depression is the most common mental disorder in the world [1], the methods used for its detection and treatment are still limited (mainly based on clinical examination and subjective evaluation) [2]. This could be improved with non-invasive, quantitative tests based on biomarkers [2]. A potentially promising and relatively under-researched target for biomarker discovery in depression is the gut microbiome. Gut microbiome is one of the most important parts of the gut-brain axis (GBA), which represents the bidirectional pathways between the gut and the brain and appears to be dysfunctional in depression [1].

In our research we will acquire sequenced gut microbiomes and associated metadata of individuals with depression and healthy controls, pre-process them, identify potential biomarkers and use them to make a classification model for prediction of depression.

Method

The acquired data is a subset of the Flemish Gut Flora Project dataset [3] and it contains faecal metagenomic data and metadata (age, sex, BMI, BSS, RAND) from 157 subjects (M = 50, SD = 12,96, 38% male), 80 of which have depression, 7 treatment-resistant depression and 70 are healthy controls. The sequencing data was pre-processed with bioBakery and mothur tools, which extract information about taxonomy, diversity, functional genes, enzyme reactions, metabolic pathways, and predicted metabolites from the sequenced microbiomes. We will try to identify which of these levels of information are significantly different between healthy individuals and those with depression and then use them to make a classification model in Orange, trying out different algorithms, settings, and optimality criteria to find the most accurate model.

Expected Results

We expect to identify biomarkers and create accurate classification models using various levels of microbiome information that will be able to distinguish between healthy individuals and those with depression. This will help shine light on the role of microbiome in the aetiology and pathogenesis of depression and highlight the importance and usefulness of implementing machine learning methods in microbiome and depression research.

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Comparison of Negative Effects of R- and S-Ketamine in Wistar Rats

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Ketamine induces several similar symptoms observed in schizophrenia in humans and is therefore used to establish a pharmacological model of schizophrenia in rodents [1]. There are two enantiomers of ketamine, R- and S-ketamine, which differ in pharmacological properties and effects on psychiatric symptoms and brain metabolism in healthy participants [2]. S-ketamine has 4x higher binding affinity for NMDAR than R-ketamine [2]. A common finding in preclinical studies is that R-ketamine causes fewer side effects than S-ketamine, suggesting that the side effects of (R, S)-ketamine are due to the action of S-ketamine rather than R-ketamine [3].

With our study, we aim to determine whether intermittent use of ketamine, as commonly used for medical purposes and recreational drug abuse, causes neurotoxic effects in animals similar to those characteristics of the ketamine model of schizophrenia. By analysing changes in the expression of the GAD67 enzyme, we will observe the changes in the GABAergic system and the association with the glutamatergic hypothesis of schizophrenia. Also, by analysing alterations in dopamine D1 receptor, we aim to detect changes in the cortical dopaminergic system.

Methods

The study will be performed on adult male Wistar rats. 18 animals will be divided into three groups, the first will receive R⊠ketamine, the second S-ketamine and the third will be a control group receiving saline. We will use a sub-acute, intermittent ketamine dosing pattern, which consists of seven ketamine doses, applied every third day. A single dose of ketamine hydrochloride will be 15 mg/kg body weight.

After the ketamine treatment we will analyse changes in the dopaminergic and GABAergic systems in the isolated brains. We will perform western blot analysis for two biomarkers, D1 and GAD67; this procedure is used to study the expression levels of proteins of different sizes in individual brain regions. We will also perform immunohistochemical staining for GAD67 and D1 on brain tissue samples; a procedure, where antibody binding determines the tissue distribution of the antigen of interest.

Expected results

We expect to observe differences in expression of GAD67 and D1 between ketamine-treated groups and control and differences between S- and R-ketamine groups.

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Treating Developmental Dyslexia Using tDCS

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Transcranial direct current stimulation (tDCS) is a non-invasive brain stimulation technique, increasingly used both as a research and therapeutic tool. Due to its ability to modulate synaptic connectivity and prime the brain for neuroplasticity, it is often used in combination with cognitive training [1]. Recently, several studies have demonstrated positive effects of an intervention combining tDCS and reading training on the reading skills of students with developmental dyslexia.

During the review of the currently published studies, we identified several weaknesses which we will attempt to address in our research. First, we will aim to improve the positioning of the electrodes by using computerized models of the current flow to choose the optimal location. Second, our intervention will target both processes related to serial phonological coding as well as whole-word recognition (meanwhile, the majority of previous studies only targeted the former processes). Our training will combine both the traditional evidence-based exercises with novel approaches, based on the latest neuroscientific findings. Aside from already explored improvements in reading speed and accuracy, we also aim to investigate practical outcomes of the intervention by assessing long-term progress in reading comprehension and several quality-of-life indices (including adaptive behaviour, academic success, motivation, and self-esteem). To our knowledge, this will also be the first randomized-control study, which will include two control groups (one receiving sham stimulation and the other not receiving intervention at all).

The goal of our study is to investigate whether our intervention can serve as a useful technique for achieving long-term improvements in children and adolescents with developmental dyslexia. We will achieve that by comparing reading skills and quality of life indices at baseline with measurements taken 1 and 6 months after the intervention. Any improvements will be then contrasted to the progress of a control group which will not receive the intervention.

Furthermore, we are also interested in exploring why our intervention might help the readers. To answer this question, we will examine differences in cognitive processes before and after the intervention and check whether they can explain improvements in reading skills. Lastly, we aim to replicate findings from previous studies which demonstrate that tDCS optimizes the effects of cognitive training and therefore results in larger improvements than after training-only intervention. We will achieve this by comparing our experimental group with a second control group, which will receive training combined with sham stimulation.

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On Being *With* a Traumatized Subject

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Introduction

In *On Being *with* a Traumatized Subject* the fundamental human condition of feeling alone and alien in the world if not shown otherwise, is explored as part of the experience of "trauma" as the phenomenon of dissociation or depersonalization.

Research Question

How can trauma therapy facilitate re-sociation and re-personalization after experiencing dissociation through a traumatic event? –How and Why? Arguably, it is one that focuses on relationship-building, starting with the therapeutical relation as pillar. The therapeutical relation can be a supportive opportunity to reconnect with the subject's inner (emotional, cognitive, imaginative) world and the outer (intersubjective) world. This relation must be grounded in empathetic understanding which has many layers (cognitive, imaginative, emotive, somatic,…). Since dissociation from trauma comes with the loss of the ability to actively express oneself, therapist and patient must enter into an existential dialogue and therapeutical alliance that allows them to relate to each other through a way of understanding one another that moves beyond words or active communication. Here Emmanuel Levinas' understanding of the ethical relation grounded on the self lived as *hineni* ("Here I am") shall be explored. The concept touches on this sense of being alien ("Other") in the world, or rather the world and the vis-á-vis being "Other" -- the phenomenological idea of Alterity. It describes the going into an encounter (in this case the therapeutical relation) with an attitude of "Here I am"; fully present. What can Levinas' philosophy contribute to our understanding of psychotherapy, and handling of traumatized patients?

Methodology

By going through different journals of psychotherapy, and -analysis, it becomes clear that Levinas' approach is one that touches on the "movement of the soul" (Goodman/Grover 2008, 32), going beneath analysis, narrative, and verbal communication. As different layers of *hineni* will be explored — spiritual and somatic — , the phenomenon of traumatization and, in turn, dissociation are elucidated, and somatic-based therapies introduced as those approaches that allow reconnection to oneself (re-personalization), and, in turn, re-socialization. I try to show that scientifically grounded/technologically advanced therapies (such as EDMRI or SE) can be enhanced by a ethico-spiritual attitude such as the idea of a therapeutic self to be lived as *hineni* with Levinas to give space to the "Other", that which is alien and secret. This approach may, too, be relevant in transcultural trauma work.

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Phonaesthetics & Familiarity: The Influence of L1 on Language Perception

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It is assumed that certain languages are aesthetically more appealing than others, for example, it is often claimed that Italian sounds more beautiful than German. Phonaesthetics is the subfield of phonetics concerned with these aesthetic properties of speech sounds [1].

There are some studies, mainly in the fields of psychology, (socio)linguistics, and neuroesthetics, that investigate phonaesthetical perception, nonetheless, the topic has not been sufficiently researched. This thesis aims at exploring language perception and how language familiarity is related to it.

In previous phonaesthetical research [2], [3] participants with different native languages (L1s) evaluated aesthetical characteristics of Indo-European languages according to their impressions. The results revealed that aesthetic evaluations of a language are influenced by a variety of factors, including familiarity with the language and speaker's voice.

In line with this, a positive correlation between familiarity and pleasantness was found. The listeners in the studies preferred languages they recognized; however, listeners did not prefer their L1 or languages very close to their L1. Familiarity then, was related to foreign or second language-learning experience.

The purpose of this investigation is to reduce familiarity by selecting listeners whose L1 is not related to any of the languages of the experiment. This thesis attempts to replicate previous studies about phonaesthetical perception of languages but with a different sample of participants. Chinese speakers/listeners will listen to twenty-four recordings of Indo-European languages and will evaluate four aesthetical categories of them: eroticism, beauty, status, and orderliness.

On this basis, it is expected that familiarity will not be a nuisance variable anymore and that aesthetical evaluations of the languages will be largely based on the languages' characteristics. Nevertheless, it is also expected that the voice of the speaker will influence the aesthetical evaluations since in previous studies [2], [3] it was found that voice likability was significantly correlated with some of the aesthetic characteristics of the languages.

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Social Attention and Social Reinforcement Learning

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Introduction

Attention to socially important regions of the face is a key component of daily social interaction and precedes fundamental social skills such as emotion recognition, nonverbal communication and mentalizing. It is also an essential prerequisite to social learning, i.e., when integrating emotional feedback to one's behavior. Eye contact is a salient social signal and, along with social skills, is often found to be atypical in disorders characterized by social impairments, such as autism spectrum disorder (ASD) [1]. Furthermore, atypical responses to rewards and deficits in social reinforcement learning are documented in individuals with ASD. [2]

Problem

Studies investigating eye gaze on faces often rely on social representations rather than real people, which differ remarkably from real-life social interaction [1]. Furthermore, social reinforcement learning paradigms tend to rely on stimuli that differ on a range of perceptual characteristics [3]. The aim of our project is therefore to develop a novel eye tracking paradigm which uses mobile eye tracking in conjunction with AI face-recognition to allow fixations to the face to be measured during a real-life conversation. Additionally, we have developed a reinforcement association learning task (RALT) using point-light displays (PLD's) of emotional faces as social feedback.

Methods

We will test 60 neurotypical adults in our study, with whom we will conduct a semi-structured interview while recording their eye gaze with a mobile eye tracker. Furthermore, we will collect data on the RALT and the Autism Spectrum Quotient (AQ) questionnaire. Levels of autistic traits will be investigated in association to fixation frequency to socially important regions and learning in the social condition of the RALT.

Conclusions

Currently, the project is still in the data collection phase. However, we expect that AQ score will be negatively associated with the frequency of fixations to socially important regions (face, eyes, mouth) as well as with reduced social learning.

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Memorability: Differences Between Children and Adults

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Introduction

Research has shown that image memorability – i.e., if a certain image is memorable or forgettable – is consistent among people and is therefore not largely affected by individual differences and past life experiences [1]. Image memorability can be predicted and neural networks are better at doing so than humans – the attributes that make an image memorable seem to be different than what humans expect [2].

Previous research has focused mainly on memorability in healthy adult individuals. This thesis aims to assess the memorability of images in children and to find out if any differences between adults and children occur. With this, we want to understand if the memorability of images changes or is consistent in development.

Methods & Expected Results

150 healthy adults aged 20 to 25 years and 150 children aged 6 to 7 years will be included in the thesis. All participants will be Slovenian. We will conduct a 40-minutes long experiment. The participants will look at different pictures and will have to signalize when they recognize that a picture is shown again. We will get a rate of image memorability for a specific picture separately for adults and children and we will compare these rates with predicted memorability scores form an already existing neural network [2].

We expect to find differences in image memorability between children and adults and that the existing neural network that was only trained on adults will thus successfully predict the image memorability in adults, but not in children. Because no such research was conducted before, we will also try to evaluate which kind of images are more memorable among children and which among adults and we will retrain the neural network separately for the two groups in order to get a neural network that can also accurately predict memorability scores in children.

Limitations & Conclusions

One limitation is that no similar experiment was done before and we can therefore not accurately predict if and what differences between subjects will occur. Another limitation is that the differences observed could stem from generation and not development differences. A longitudinal study or multiple experiments with different generations would be better in this case.

Alongside better understanding of the development of memorability, this thesis also aims to find out which images are memorable in children in order to incorporate such images in schools to improve the memorability of the learned subjects.

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Computational Investigation of Phase Transitions in Mental Health

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Introduction

Several cognitive phenomena can be interpreted through the paradigms of complex and chaotic systems. This enables the paradigms' mathematical methods to be applied to the data analysis. Some of the most important aspects of human change processes in psychotherapy, e.g., the discontinuous progress, can be explained in terms of their chaotic dynamics [1]. Moreover, the phase transition of self-organizing systems (PT) is characterized by the changes in various dynamical aspects of a patient's multivariate time series which could computationally be seen e.g., as a shift in the mean–in psychotherapy research defined as "sudden gains or losses" [2].

We are interested in whether the use of machine learning (ML) models will attribute to higher PT detection precision. We will investigate this by (a) comparing our ML models with the Pattern Transition Detection Algorithm [3] (PTDA) which includes various computational algorithms to detect PT and (b) determining the aspects of extending PTDA with ML models to detect PT with higher precision.

Methods

We will use two datasets consisting of participants' time series of daily self-rating questionnaires and diary entries. The datasets were either gathered from a psychotherapeutic process, or participants' self-assessments of their depression, anxiety, and stress levels during a month-long study. The features will be extracted from the diary texts with natural language processing (NLP) methods. Then, the dynamical aspects of PT will be computed from the time-series data (e.g., the mean change and periodicity). For (a), ML models will be built, trained, and tested to get the precision scores for the comparison with PTDA. For (b), ML models will be assessed in terms of their convergence utility with PTDA.

Expected Results and Limitations

We expect that our ML models will not be able to replace the PTDA as the included algorithms assess various aspects of PT [3]. Moreover, we expect that extending PTDA will attribute to the detection precision. Higher detection precision will enable mental health workers to plan interventions promptly and enable further investigations of PT precursors [2]. This work will give a novel contribution to NLP text features extraction in the mental health domain.

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Review: Mindfulness Meditation Techniques and Brain Stimulation

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A mental training combining complex practices such as mindfulness, yoga, Tai Chi, are all certain form of mindfulness meditation (MM). Over the past decades, MM has gained increasing traction in the western world and has gained such mainstream cultural popularity that high-tech companies now employ chief of mindfulness officers. More importantly, MM has spun interest in psychology and neuroscience-related research, chiefly due to asserted stress reduction and other benefits in psychological disorders [1]. Given it's increasing popularity, numerous mindfulness-based interventions have been developed over the past years. With techniques ranging from sitting meditation to mindful breathing and even mindful eating, the scientific basis for such interventions has frequently been questioned. However, recent results show that MM-based interventions have substantial transdiagnostic potential, with some applications supported by stronger than others [2]. More recently, transcranial direct stimulation (tDCS) has shown to be beneficial in behavioural based interventions. Even in relatively infrequent and short interventions, MM with the combination of tDCS was shown to reduce anxiety [3].

The main objective of this study is to provide a critical overview of the current trends in MM techniques, which will aid in designing an experiment in which different target groups will undergo the combination of MM and electrical stimulation.

The empirical status of current studies will be evaluated by a systematic review of their effect sizes and target populations. The literature search will be carried out on three data-bases (Web of Science, PubMed and Google Scholars), upon selecting the relevant articles, further review will be carried out by using visualisation tools which aid in finding similar relevant works (Connected Papers and ResearchRabbit).

Upon completing the theoretical research and review, a novel experimental design will be compiled that will incorporate current findings on the state-of-the-art MM techniques. We will apply transcranial electrical stimulation to the chosen groups and compare the effects between master and novel groups of meditators. The current idea is set to have the experiment carried out at two locations (Ljubljana and Bratislava) simultaneously, which has the potential to yield better generalizability and thus greater validity.

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Psychological Interventions Against Susceptibility to Fake News About COVID-19

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The pandemic is shaping the world in many ways, one of which is the spread of fake news. The notion of fake news refers to viral posts based on false information. The ability to distinguish between fake and real news is called fake news discernment [1]. To promote this ability there were studies that used psychological interventions such as priming critical thinking [2], which exposes participants to simple questions, that should enhance their ability to think rationally when rating the accuracy of news headlines, or inoculation [3], in which the recipients are offered counterarguments, true information to prevent persuasion by false ones. In our research, we aimed to verify the efficiency of the combination of the two above-mentioned interventions. After collecting demographic data, we measured fake news discernment by asking participants to evaluate the accuracy of fake and real news headlines. The first experimental group (N=120) was exposed only to three simple questions inspired by [2]. The second experimental group (N=102) was exposed to a combined intervention. First, in the detailed inoculation, they were shown interactive videos explaining myths considering the COVID – 19 vaccines common among the Slovaks with interaction done by interrupting the video with multiple-choice questions related to the information from the video. Next, participants were also exposed to priming critical thinking and were asked to evaluate the accuracy of the headlines. In the control group (N=130), the participants were asked to evaluate the accuracy of the headlines. We hypothesized that (1) both interventions will decrease the belief of the participants in fake news, (2) using both interventions will have a greater effect on fake news discernment (3) the fake news discernment will be correlating with participants' conservative/liberal political leaning, negative attitude toward vaccination in general, and conspiracy beliefs. It was revealed that our three groups did not differ significantly in their ability to detect fake versus real news, Nevertheless, the patterns of correlations yielded some interesting results. First weak correlation suggesting that the more liberal our participants were, the better were they able to discern fake news from real ones. Further, found a large negative correlation meaning that the more dismissive the attitude toward vaccination is, the worse is participants' fake news discernment. Also, the correlation between fake news discernment and the conspiracy belief was found to be a largely negative one, meaning that the more participants believe in conspiracy theories, the less are they able to discern between fake and real news. Other correlations, such as the reliance on fake news, and the willingness to share them were interconnected.

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Employee as a Whole Person: Personal Life and Well-Being Support at Workplace

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Introduction

Satisfied, healthy, and happy employees are also better performing employees, research shows, which is why organisations are becoming increasingly aware of the importance of employee well-being [1]. While personal well-being is affected by several types of factors outside the workplace environment, organisations should first focus on the workplace resources crucial for employee performance and satisfaction. However, the question remains on how much they should also invest in overall employee well-being and supporting their personal lives. Namely, employees are often still treated as one of the types of resources and are not considered holistically [2]. Thus, the main aim of this research is to contribute to a workplace consideration of employees as whole individuals with support of their overall well-being and personal lives. Consequently, it will shed light on the importance of employee well-being and a whole-person approach to employees, while also emphasising the importance of employee satisfaction and experience with implications for further practice.

Methods

Workplace environment and employee well-being/personal life support will be assessed in a business unit of 35 employees working in healthcare IT field. A questionnaire will be formed intended to measure the level of workplace personal life support, workplace contribution to different dimensions of employee well-being according to an established whole-person approach [3] (physical, psychological, social, and spiritual), and employee satisfaction. The questionnaire will be followed by qualitative interviews with employees to assess their overall satisfaction and well-being, as well as collect their personal suggestions. Furthermore, ongoing organisational practices related to employee well-being will be compared to the more quantitative results for a realistic assessment, providing the basis for further improvements. However, the relevance of the results lies in the assumed correlation between the whole-person approach and employee satisfaction. This research will hopefully illuminate the urgency of treating employees holistically and why implementation of such practices should be prioritised by organisations.

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Passive Viewing of Emotional Stimuli: An fNIRS-EEG Study

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Introduction

With the latest debates in affective neuroscience on how emotions are organised in the brain, an increase in the number of neuroimaging studies of emotion processing can be detected [1]; specifically studies using the relatively young method of functional near infrared spectroscopy (fNIRS) [2]. However, these sorts of research studies differ immensely in the type of tasks and stimuli used to evoke emotions in their participants (from using written sentences to listening to specific emotional prosodies), which affects direct comparison of the results.

Moreover, focusing on studies that used visual stimuli (static pictures), we notice that little research has employed neuroimaging methods to study specific emotions; in most cases, labels "pleasant" and "unpleasant" are used to describe the valence of the emotion stimuli, but there is no clear indication if these stimuli correspond to discrete emotions like fear, anger and disgust [3]. In an up-coming study, we use different emotional contexts as examples to validate studying the brain basis of emotions by simultaneously using fNIRS and electroencephalography (EEG).

Methods

In the present study we apply a multi-modal neuroimaging method of combining hemodynamic and electroencephalographic measures in an experimental block design. During the measurements, participants will be presented with diverse emotional visual stimuli (disgust, anger, fear, happiness, sadness and neutral) obtained from the *International Affective Picture System* collection (IAPS) to evoke corresponding emotional responses. Post evaluation of the same stimuli's valence and arousal will follow.

Conclusion

The new-found results are expected to resemble the findings of previous studies [2][3], which indicate the lateralization of the prefrontal cortex (PFC) based on stimulus valence (pleasant – unpleasant); the left PFC was more active in regards to positive or pleasant stimuli, whereas the right PFC corresponded to negative or unpleasant stimuli. Furthermore, variations in brain activity among specific emotions are expected.

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Concept Learning in Logic Tensor Networks

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How is information represented in cognitive systems? How do these representations emerge? How are they processed? These are pivotal questions in cognitive modelling. Our study assumes that cognitive systems generate multiple kinds of representations that favor different processing styles. We propose that representations can be roughly organized in levels of increasing abstraction, and decreasing specificity: the sub-symbolic, the conceptual, and the symbolic levels. Our study aims at bridging the conceptual and symbolic levels using Logic Tensor Networks (LTN), a neuro-symbolic framework combining input-driven pattern extraction with rule-based reasoning [1]. Built on top of a neural network basis, *Real Logic* is a fully differentiable fuzzy first-order logic (FOL) where all symbols i.e., objects, functions, and predicates, are grounded into real-valued tensors, tensor operations, and standard fuzzy logic operators respectively [1].

Methods

We use a previously published data set on 13,978 movies based on highly processed, semantically interpretable geometric representations of review texts which we treat as conceptual space [2]. We apply the data set in a classification task with three types of labels: genres, keywords, and ratings. Each label has multiple classes (multi-class) and often movies belong to multiple classes in one category (multi-label). In the case of LTNs, the "classes" are used as FOL symbols which are grounded in the vector representations in conceptual space and refer to concepts. Simple logical rules of the type *A implies B* and *A different B* are approximated using conditional probability and difference between sets respectively. The LTN is optimized for *satisfiability* i.e., the network learns which vector representations of the symbols satisfy the logical rules most.

Experiments

We explore whether LTNs can offer a competitive performance compared to standard ML models, whether they can benefit from background knowledge in the form of logical rules, and whether they can compensate for missing data. To investigate these questions, we train standard ML algorithms – kNN and ANN – on the classification task and compare the performance to the LTN that has additional learning constraints in the form of logical rules.

Conclusion

The main contribution of our study consists in exploring the potential of a neuro-symbolic framework with regards to performance and capability to generalize on a real-world data set.

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Classification of Forum Questions About Depression with Machine Learning

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Introduction

A strong link between language and thought processes reveals how mental issues impact the ways in which we express ourselves. Depression, as one of the most disabling mental illnesses, can alter mood, cognition and linguistic style – making language a potential diagnostic and therapeutic tool.

Absolutist thinking, characteristic of depression, is conveyed by phrases which denote totality [1][2]. Individuals affected by depression more frequently use first person singular pronouns, negative emotion words and verbs in past tense [2]. These linguistic markers have been shown significant for diagnosing depression [3].

Individuals who suffer from depression often use social media platforms to discuss their problems, get information and help. Machine learning models hold potential for detecting depression based on a large collection of text data that is generated on the internet.

Problem

For classification we will use questions posted on a Slovenian youth forum "To sem jaz", which are already labelled by mental health experts. They continuously monitor incoming questions and offer advice.

We want to design a model, which will help classify the questions that need immediate attention (i.e. questions about depression, suicide and self-harm).

Methods

The questions will be filtered based on their public accessibility, their length and label.

We will use CLASSLA pipeline to process non-standard Slovenian language – to break down pieces of text into smaller units, extract the root of the words and tag their classes (e.g. noun, verb). We will use different features such as Bag of words, N-grams and TF-IDF to construct different statistical models (e.g. support vector machines, naïve Bayes), which are most frequently used in studies with similar problems.

Based on how well we will be able to explain and interpret model predictions, on their evaluation metrics and in comparison with results of other similar studies, we will choose our final model.

Contribution

Our final model will be able to classify questions about depression, which will be helpful to forum editorial board in making early and fast interventions for those who need it the most.

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Mutual Impact of Politics and AI in a World of Developing Populist and Authoritarian Regimes

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Technology and politics cannot develop separate from one another. Not just the development but also how they are applied and used in what means. Political leaders, especially in authoritarian regimes have great impact in regulating technological developments. Both present and future are affected by these regulations. AI is the most prominent development of our century and it will be used in every part of society in the near future. It is already used in various governmental institutions and the more technologically advanced states have advantage over it which directly impacts power dynamics.

Many people understand politics as the work of politicians and as a separate entity from our daily lives. Lately even the term 'apolitical' is quite popular and many people identify themselves as apolitical. However, I disagree. I believe everything in our lives is political; from the prices in grocery stores, to the discourses we have in our daily encounters. And technology is even more important. While even the simplest things like market prices have an importance in our lives, technology – as people of the 21st century – is even more crucial to us. And just as everything else our technological developments are affected by our politics. AI being the most prominent technological development of our period and not only the most prominent but also the most important one, I would like to focus on the relationship between this branch of technology and politics.

Even though authority and authoritarian are similar terms, also in this study it is important to make the discrimination between these two terms. Because, authority is needed even to regulate technology, however, since the term authoritarian indicates oppressive and extremist regimes the technology regulated under such regimes has tendency to be dangerous. That's why it is important to draw ethical boundaries to avoid increased amount of harm.

Since this is a theoretical work, I have read and will be reading a series of articles, including [1], [2] and [3]. Since this work is also about authoritarian regimes, leaders who can be categorized as authoritarian are a source of information and their speeches, interviews etc. will be included and studied. For that the development of the country in the field of AI is important so only the countries who have enough access to the technology are included. Terminology is very important for this work. Therefore, there will be a chapter dedicated to it. I will analyze these resources and my observations with all the cons and pros. After emphasizing on them in my paper, I will be creating possible ethical solutions for them.

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What Makes a Robot? Understanding Perceptions of Robots Using a Draw-A-Robot Task

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Introduction

Robots have been automating manufacturing and assembly processes for more than five decades. A wide range of applications has been added in recent years, including space and marine sciences, architecture and construction, medical care, agriculture, infrastructure, and emergency response. In this context, robots can take on any shape that enables their corresponding functions. Social interaction remains one of the grand challenges in robotics [1].

Methodology

This exploratory study aims to understand the future of robotics by examining children's perceptions of robots in a mixed approach of qualitative and quantitative methods.

First, a Draw-A-Robot task is conducted, which is an adaptation of the draw-a-scientist test [2]. In this task students from 10 to 14 years old draw a robot in its environment on paper in the trial. The generation of this artifact will help them actively construct their perception of robots and serve as a basis for further analysis.

In the second part of the study, students will evaluate their robot drawings using a coding scheme developed in the context of this thesis. It will include categories such as the robot's assumed purpose, appearance characteristics related to embodiment, specific human-like features, locomotion methods, and communication capabilities.

Finally, the results will be evaluated quantitatively.

In the third part of the study, interviews will be conducted to gather more in-depth information that could not be obtained through third-person analysis of the drawings or quantitative research alone.

Expected results

The main goal of this study is to investigate children's perception of the embodiment of robots and how it relates to their functions. It is hypothesized that children's perceptions of robots vary concerning how human-like and technical features are attributed to robots. The impact of these features in terms of robot functionality and application is examined. The long-term goal of this project is to establish the Draw-A-Robot task as a measurement tool that can be broadly applied to diverse populations, create a large cross-cultural database, and to better understand common perceptions about robots.

Researchers can use this tool to understand how the perception of robots in children evolves over time or from interventions such as educational robotics workshops.

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Understanding Opinion Formation: A Horizontal Map of Current Epistemological Landscape

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Opinions are an essential part of any intelligent human being. A society of individuals having opinions is a crucial premise for democracy. Querying scientific databases with search terms like "opinion formation" yields results from a large variety of sciences – psychology, political science, sociology, computer science, marketing science, economy, and others. Because of this breadth, there are no meaningful review articles. This (early-stage) thesis thus aims to fill this gap and provide a bird's-eye view, a broad map of the current epistemology of the topic of "How humans form opinions".

Methods

To account for the breadth of the topic, science mapping tools will be used to first map the topic and second identify key articles. Science mapping look at statistical characteristics of a larger body of scientific literature, relations between articles, most common keywords etc. [1] Identified key articles and review articles from subdomains studying opinion formation (e.g. computer modelling of opinion dynamics [2]) will be analysed.

To map the general population's knowledge a survey will be conducted with laypeople, targeting what they define as opinions and what are their intuitions about opinion formation. The findings will be compared with scientific knowledge.

Expected results

Science mapping tools will help us show what sciences study opinion formation, what are the relations between them and what are the key topics within these sciences in terms of opinion formation (e.g. attitudes for psychology, opinion dynamics for computer science, public opinion for political science).

Analysis of key and review articles will serve to describe what are opinions, what are the types of opinions, what are the factors influencing opinion formation (we are expecting surprises like that the language itself can be such a factor [3]) and what are the connected concepts. If possible, a model of opinion formation will be created. We expect that there will be a great difference between folk and scientific knowledge – people consider themselves rational and are not aware of the spectrum of existing biases.

We believe that this "broad perspective" approach is vital for any scientific topic and will show what are current research gaps. Comparison with folk knowledge can show that the main gap lies in communicating the scientific findings to folk people.

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Posters

Measuring Associative Memory

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Associative memory (AM) is the ability to learn connections between semantically unrelated items [1]. AM has been researched in the past, however, there is a problem with its assessment. Namely, the currently validated tests assess it by instructing the participants to memorize connections between faces and words, as indicated in the examples, provided in [1]. These stimuli are not culturally neutral; thus, we don't have a culturally universal test for measuring AM. This can affect the results, obtained in different cultural environments. The aim of our research, therefore, is to create and validate a culturally universal test for assessing AM. We will also conduct some additional tests with the aim to further explore AM.

Our project is part of a larger international study. Our first task was to translate the original test (developed by the leading team) and adjust the included survey for gathering demographic data. This was done to adhere to the characteristics of our sample. The first part of the test is designed to measure explicit and the second part implicit memory. The explicit memory task consists of a learning phase, where the participants are exposed to images of as universally recognizable objects as possible (e.g., keys, a banana, bicycle) paired with images of natural scenes (e.g., fields, roads). In this way we will try to ensure cultural universality of the test, even though we are aware that not one stimulus is truly culturally neutral. In the second phase, we assess whether the participants have correctly remembered the combinations of visual stimuli. After a period of rest, the participants continue to the implicit memory task, where they are asked to make animacy judgments about presented objects. As mentioned, we also developed additional tests, namely for attention, mind wandering, and visual memory. We did this to further support the test's validation focusing on the possible connections with AM. We aim to collect a minimum of 150 data samples from the student population. Data will be gathered by online applications without the presence of an experimenter. Moreover, we will provide the participants with thorough instructions.

Our project is at a stage of data gathering. We expect to successfully validate the test. Furthermore, we expect to find that AM positively correlates with visual memory and attention. We expect to find a negative correlation between AM and mind wandering. Considering all participants will be students, our results could be affected by the lack of populational representability. Another limitation of our study is the length of the experiment, as it lasts approximately one hour. Due to the resulting tiredness the participants could underperform on the tasks.

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Phonological Networks and Their Relationship with the Mental Lexicon

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Language networks seem to be a new way to picture the complexity and evolution of language. Thus, they have been divided primarily into semantic -the most widely studied- syntactic, and phonological. In fact, Phonological Networks (PN) may provide an explanation for the phenomenon of how the mental lexicon is built within the brain. They work under the principle of phonological similarities or phonological neighbours and it is suggested that those PN share a common set of properties even though they are different from other types of networks found in the literature [1]. Identifying the structure of these given networks may provide some insight into the mechanisms that might have influenced the development of the observed network. Besides, with the aid of Graph Theory, it would be plausible to have some insight into the mental lexicon [2].

Using the software for visualization networks Gephi, the graphs of three data sets will be compared. Those data sets will be organized into # of nodes (the words) and # of edges (the relationship between these words). The data sets are the followings: One random with 268 nodes and 938 edges, one from children lexicon with 268 nodes and 496 edges, and one from adults lexicon with 2588 nodes and 35582 edges. The exploratory software Pajek would be used. Properties such as Giant component, Small world property and the Degree distribution would be analysed. Besides, it is expected to learn about how these properties are connected to the composition of the mental lexicon.

Taking into account some studies carried out on the phonological similarities in the lexicon of English [2] and applied to other languages [1], the three main properties shared in the emergence of PN might differ from other complex networks. The Giant Component, which shows the number of nodes connected, is smaller than in other complex networks. The degree distribution which is normally defined by a power law, in PN would be driven by an exponential law due to constraints like the length of words or number of phonemes in them. Finally, the small world property might be defined by other components like the average path-length and the clustering coefficient. Thus, in the emergence of these three networks to analyse these components is still very abstract. The difference in nodes within the data sets and the also the edges might influence the results. Besides, it is necessary to go deeper into an analysis from a psycholinguistics perspective. To see how these results matched theories of the composition of the mental lexicon in the brain.

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The Aesthetics of Organizational Purpose

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Introduction

The experience of aesthetics is not only limited to the perception of the visually beautiful, but can also be understood in a broader sense. What is special about the aesthetic experience (AE), is that it has hedonic properties and by the possibility to provide self-rewarding cognitive operations, this experience generates a sense of meaning and purpose [1]. In an organizational context, the objects of aesthetics can be the product, the work environment and the organizational culture [2]. If the aesthetics of organizations should not just be an abstract construct, the question is whether and how the members perceive their organization and their purpose as aesthetic. To answer this question, it is crucial to explore the link between AE and organizational purpose. Since perceptions regarding aesthetics are mostly tacit, this research project wants to investigate how an AE and the purpose of an organization can be identified, shaped and enacted. A further application-related research question is: How does aesthetics influence the form and enactment of an organization's purpose in practice?

Method

In order to investigate this research question, the method of Straussian grounded theory is chosen. This approach makes it possible to pursue exploratory questions with great openness and enables theory generation [3]. In order to get a holistic impression of an entire organization, three small companies with five to ten employees are examined following a theoretical sampling strategy. The analysis of the first interviews guides the selection and analysis of the following ones leading to an iterative research process. The data stems from narrative interviews that also include a specific inquiry phase. The interviews last about an hour and ask about the personal aesthetic perceptions and the sense of meaning and purpose in the organization. When evaluating these interviews, it will be revealed whether there are similarities in the answers within a company and if something like an aesthetics of the specific organization and its purpose can be derived from this.

Impact

The goal is to find an operationalization for aesthetics in organizations. In the next step, concrete possibilities can then be shown to make the purpose of a certain organization tangible. When this knowledge of the aesthetics and purpose of an organization is applied and cultivated, it can help guide organizational decisions and actions.

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Cortico-Limbic Coding of Object Navigation

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In order to survive, animals are required to learn about threat or safety objects in their environment and tune their behaviour accordingly. This mechanism is called object directed navigation. Previous studies have shown that the lateral entorhinal cortex (LEC) takes part in object directed navigation [1,2,3], it has however not been determined how the information in the LEC about the external environment triggers avoidance or approach responses based on experience. Here, we hypothesize that a dedicated circuit between LEC and amygdala controls spatial object navigation.

Specifically, we suggest that projections from the LEC to the basolateral (BLA) and centrolateral (CEl) amygdala are ideally suited for this purpose. These projections are thought to process information about safety objects via the CEl, whereas threat object information is delivered to the BLA. Neurons in the BLA and CEl are innervating the centromedial amygdala (CEm) which controls certain behaviours of the animal. Specifically, excitation of the latter causes an avoidance behaviour. Projections from the BLA to the CEm are thought to have an excitatory effect on the CEm while projections from the CEl to the CEm have an inhibiting effect on it. Thus, we hypothesize that threat object information and behavior are channelled through the LEC-BLA-CEm circuits, while safe object behavior runs through the LEC-CEl-Cem circuits.

Through a conditioning task, mice were conditioned to avoid a threat object. In this conditioning task, a mouse was placed in an arena with two objects, one of them a safety object and the other a threat object that triggered an electric shock in the mouse whenever it was touched.

During the sessions of the conditioning essay, activity in the relevant brain areas that we hypothesize are involved in the suggested neural circuit was recorded using Ca^{2+} imaging. This imaging method is used to identify Ca^{2+} spikes that indicate that action potentials are generated. At the same time, the behaviour and position of the mouse were recorded as well.

Here, we analyse this neuronal activity data to investigate correlations between neuronal activity in the suggested circuits and object related behavior.

With this project we aim to understand which neuronal circuits underly experience dependent behavior towards a threat object. In addition, we speculate that the rate of the Ca^{2+} spikes in the relevant areas corresponds to the position of the mouse. Furthermore, the tuning of these spatial spike gradients might underly the mouse's behavior respectively to its distance to a threat object.

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Audio-Tactile Short-Term Memory

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Introduction

Perception works holistically: different perceptual inputs coming from distinct modalities are blended together in singular experiences. Normally, human beings do not discriminate the modalities and sources of their impressions unless an attentional focalization intervenes. Certainly, this immanent integration enhances the perception itself and the use of its contents in other cognitive processes. For example, what lacks or is confusing in the auditory sense can be compensated by an accurate information or processing in the tactile sense. But, simultaneously, the mutual influence between different perceptions can diminish or affect the processing. The aim of this project consists in investigating the role of STM in the integration of heard and felt impressions.

Methodology

This project is based on existing cognitive computational models of tactile short-Term Memory [1] and arises from the Retrieved Context Theory [2]. In few words, it revolves around the idea that the links shaped by item information (i.e., frequency) and their contexts (e.g., time of presentation) can be used by the short-term memory to compare frequencies and make tactile judgments on the similarity of vibrations. Four mutually connected but different hypotheses are tested applying a computational model on data collected from N = 62 participants. First, the interferences in the memory about tactile frequencies emerge from a confusion of different items associated with similar contextual states. Secondly, the integration of different perceptual modalities is done in a contextual layer. Thirdly, the accuracy in the distinction of different auditory and tactile inputs comes from modality-specific tunings. Finally, the memory interference can be reduced by a dual-coding of context-item. The process for corroborating these hypotheses is divided in four laboratory experiments in which variants of a Delayed Match-to-Sample (DMS) tasks are implemented, i.e., matching and judging the similarity of a third vibration (the Probe) to two preceding vibrations), and Model-based simulations are utilized for the data analysis. So far, the first experiment has been conducted.

Partial Results

The main findings of the first experiment indicate that the observed data about the tactile perception follows a pattern that is consistent with the existence of a context layer, helping maintain item information of previously presented stimuli. Hence, the tactile perception seems to be supported by episodic memory structures, i.e., short-term traces of item and context information about tactile stimuli (Hypotheses 1 and 2). The efficiency of the computational model is demonstrated by its capacity to accurately predict the empirical data. Performance loss in the DMS task can be attributed to Item-Context binding errors.

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Pupil Dilation and Heart Rate as Responses to Ad Exposure

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Introduction

Pupil dilation and heart rate can show variations in emotional arousal, mental activity, and cognitive processes [1, 2]. Eyes and heart can show what draws our attention, what excites us, and reveals our desires, fears, and preferences. The main research question of the presented study is whether the effects of advertising exposure can be measured based on physiological responses, such as pupil dilation and heart rate. In contrast to self-reports, physiological responses are less prone to bias.

Methods

The experimental study on 33 participants (age M = 21.70, SD = 2.36; female = 68%) was conducted in a laboratory setting to investigate the physiological responses of pupil dilation and heart rate to ads. The materials were four in-video ads with varying levels of engagement (lower/higher) as the main selection criteria. The ads were randomly assigned to the participants.

Results

Statistical analysis was performed in Python using the Scipy and open-cv libraries. A Pearson coefficient showed a slight negative correlation between pupil size and heart rate, r(33) = -.16, p = .08. A Kruskal-Wallis test showed a significant effect of ad exposure on pupil dilation (H = 75.38, p < .001) but not on heart rate (H = 6.60, p = .085).

We tested for the effects of ad brightness on pupil dilation, as the latter can be affected by light. There is a significant difference in pupil dilation for Ad1 and Ad2, but no difference in brightness (Ad1: M = 0.26, SD = 0.37; Ad2: M = 0.26, SD = 0.26), no difference in pupil dilation for Ad2 and Ad3, but a big difference in brightness (Ad2: M = 0.26, SD = 0.26; Ad3: M = 0.48, SD = 1.8), and a difference both in pupil dilation and brightness between Ad4 (M = 0.6, SD = 1.9) and the other ads. The results are inconclusive and further research is needed to evaluate pupil dilation as a reliable measure of ad exposure effects.

Further Research

Future research will include other physiological responses, such as electrodermal activity, leading to a better evaluation of ad exposure effects. Integrating physiological measurements with traditional methods (e.g. surveys) can help overcome bias and better identify consumer behaviour, needs, motivations, and preferences.

Physiology measurements can be used in future marketing strategies and technologies related to ad exposure effects and consumer behaviour.

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Building Blocks for a Computational Psychotherapy System: A Partial Implementation

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Artificial intelligence allows for a new type of care focused on building personalized mental health support systems. To this end, we used various methods on a dataset containing daily diary entries and quantitative mental health questionnaire scores.

Algorithms from chaos theory can be applied to the dataset to detect various change phenomena [1]. Dynamic complexity measures detect susceptibility to change and long-term changes. This helps discover when to intervene and inform us whether further interventions are needed. We are in the process of applying these algorithms to the dataset.

To forecast mental health trends, we built a machine learning model that predicts stress, anxiety, and depression (SAD). Several machine learning algorithms were implemented. Multilayer perceptron performed best with forecasting SAD with a 81.51%, 88.01%, and 87.33% accuracy for 1-day forecasts, and a 74.23%, 84.88%, and 84.54% accuracy for 7-day forecasts, respectively.

Detections and forecasts can be used to guide digital interventions [2]. Our goal is to implement a chatbot following the principles of cognitive behavioral therapy (CBT). Depending on the detected SAD levels and symptoms, personalized CBT techniques are triggered to offer interactive, dialogic mental health support to the user in a natural language.

To gain a deeper understanding of the genesis and treatment of change in mental health, combining knowledge from different theoretical frameworks is required. We explored predictive processing in relation to CBT. Computational models of perception, as envisaged by predictive processing, seem to help explain the interactions between thoughts, feelings and behavior, which are also leveraged in the process of CBT [3]. A deeper understanding of these interactions could help design more effective psychotherapeutic methods.

Future work includes finishing the various listed building blocks for the system, combining them into a functional whole and testing its efficacy.

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Measuring EEG During Social Video Game

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Different brain connections are activated during different social interactions. Several research papers study the brain network through studying interdisciplinary approaches and devices, such as EEG, fMRI, etc [3]. We decided to study the brain network based on social interactions. Based on our research, we assess how different personality types contribute to different brain connectivity. We are interested in finding out the connectivity of the brain when it comes to different social interactions. These interactions will be brought about by a social videogame, where brain activity will be measured with an EEG. Our research aims at elucidating which ERP waves occur during social interactions whilst playing the videogame.

For the purpose of this research, a pilot study with 12 people will be done first. We will use a 32-channel EEG, with the electrodes distributed according to the 10/20 principle. Each participant will play the social videogame for 20 minutes, where they will have to pass a ball between other players. After each pass of the ball, we will record the ERP. Before starting, the participants will fill in the Edinburgh questionnaire [2], which is used to make sure that all participants have the same hemisphere dominance. Alongside this, the participants will fill out the personality type questionnaire, the five big personalities [1], which will be used to determine how different personality types process social information. The collected data will first be pre-processed and then we will extract the ERP signals.

Based on previous research measuring brain activity during social interactions, we expect the presence of the P300 signal, more precisely P3b [3]. Given the personality types of participants, we expect that statistically significant differences will occur. We expect a considerable difference between participants with high and low characteristics on the neuroticism scale that is described in the personality type questionnaire [1].

We see our limitations mostly in the amount of collected data and the participants' profiles. During our research we also mainly focused on measuring brain activity with EEG, however for a better analysis, we should employ more interdisciplinary methods. Alongside the EEG, we could also include fMRI, first-person research, etc.

We believe that this research will prove useful since the topic of brain networks is new, applicative, and important in helping us to discover how different types of people deal with various tasks and challenges.

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German Word Formation and the Organization of the Mental Lexicon

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Human language abilities depend on the mental lexicon (ML). However, it is still a matter of debate what exactly is listed in this collection of words and their building blocks [1]. Studies conducted for English [2], [3] suggest that not only affixes, but also affix combinations (-less-ness in rest-less-ness) are represented in the ML, since speakers do not need words or other semantic cues to judge whether an affix combination exists in the given language. The present study investigates whether the same is also true for a more inflectional (e.g. case endings) and composition friendly (long sequences of words are written together and used as a single word) Germanic language than English, namely German.

Methods: 32 native and 29 advanced non-native German speakers were visually presented with 60 suffix combinations without bases (e.g. -erschaft) via an online questionnaire. 30 of these combinations exist in standard German, while the other 30 are non-existing, the latter served as distractors. Of the existing combinations, 15 were productive and 15 unproductive, i.e. deriving less than 10 lemmata (words). Since we were interested in speakers' intuitions about word formation, the task was to intuitively identify existing suffix combinations

Hypotheses: Based on the results for English [3], native and advanced non-native speakers were expected to perform on a par. Both groups should also recognize productive combinations more accurately than unproductive ones [3], thus supporting the idea that the former are memorized as such, whereas the latter are learned in whole words.

Results: On average, native speakers identified 80% of the existing and 74% of the non-existing combinations correctly (p=.05). Accuracy for productive combinations (90%) was significantly higher than for unproductive ones (70%), p=.02. Non-native speakers' accuracy was around 71% for both existing and non-existing combinations, but the difference between productive (80%) and unproductive (63%) combinations was statistically significant, p=.01. Overall, natives' (77%) accuracy was significantly above non-natives' (71%), p=.01.

Discussion: We confirm previous research for English (and other languages): suffix combinations are listed in the ML and productive suffix combinations are more easily recognizable than unproductive ones. However, unlike for English, German native speakers significantly outperformed advanced non-native speakers. Possible reasons, such as inadequate self-assessment (as "advanced"), should be addressed by future studies targeting the organization of the ML as an indicator of language proficiency.

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Detecting Error-Related Negativity During a Motor Task

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When a person makes a mistake while executing a motor task and recognizes making the mistake, an error-related potential (ErrP) occurs. ErrP is a neural signature of error processing and a form of event-related potential [1]. An important component of ErrP is a frontocentral potential, termed error-related negativity (ERN) [2]. The negative frontocentral potential peaks at 50–100 ms after an erroneous response, which can be the consequence of making either an execution error or an outcome error. An execution error happens due to inaccurate feedback during the motion [1]. An outcome error happens when the outcome is different from the desired goal of an action [2]. The goal of this study is to determine whether we can detect an ERN in a motor task where a participant tries to reach the target but experiences perturbation. We hypothesize that perturbation will cause an execution or an outcome error, which is why we will be able to detect an ERN.

Methods

Two subjects participated in the preliminary study and we plan to include additional 6 subjects for the main experiment. We used a visuomotor paradigm where the participants performed arm-reaching movements. They were sitting in a chair and moving the handle of a haptic robot. On the screen above, the participants saw their starting position and the target that was located 10 cm away from the starting point.

The aim of the motor task was to hit the target on a screen with a cursor that was controlled by the motion of the hand. The motion of the participant's hand was displayed on the screen as a cursor. Participants performed 300 trials. There were two types of trials: unperturbed and perturbed. During perturbed trials, the cursor underwent a visuomotor rotation, for 25° or 45°. While participants executed the task, their brain activity was measured using EEG with 64 electrodes (Brain Products GmbH, Gilching, Germany). The data we collected will be analysed to determine whether an ERN can be detected during trials where participants experienced errors.

We expect the perturbation will cause the participants to make an execution or an outcome error that will be reflected in the ERN. Based on the previous studies we expect to detect the ERN at the Cz electrode location. The ability to detect the perceived motor errors from brain activity will allow us to determine when a person experiences errors and enable further contributions towards the understanding of different motor errors connected to distinct motor learning processes. Moreover, these findings have a potential to help with developing algorithms for brain-computer interfaces [1].

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Observing Driver's Cognitive Load in a Driving Simulator

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Autonomous vehicles are bound to become a part of our daily lives in the near future and the safety of users is the primary concern of many researchers when trying to incorporate the technology for public use. Fully autonomous vehicles can operate without a human intervention under any conditions. The research question addressed by the research is whether the addition of a Head-up display (HUD) can improve the user experience, perceived usability, user well-being and driving safety, when using conditionally automated vehicles. [1]

Methods

The experiment was done in a driving simulator, where participants had to undergo two rides, one using a regular dashboard and a HUD, and the other one only using a dashboard. During the rides, they were asked to turn on autonomous driving, during which, they were able to use their phones, head-down display, read a magazine or just use that time to relax. To avoid learning effects (and sleepiness) on the study results, half of the participants started with the HUD, and half started without it. We measured variables using biometric devices: eye tracker and a smart wristband, the driving data from the simulator. We also observed user experience with four different types of questionnaires. The most important variables were pupil dilation, heartrate responses and skin conductivity. These can then be translated into either cognitive load data or different emotional responses. For example, pupil dilation shows greater cognitive effort. [2]

Results

The data collection and analysis have not been completed yet. The research hypothesis is that the addition of a HUD will result in better scores for the above-mentioned aspects when operating a conditional vehicle compared to a vehicle with only a classical dashboard.

The devices used to measure cognitive load in this study are all indirect. For better results we should track brain activity directly with EEG or other similar methods.

Discussion

This study is an excellent indicator of what autonomous driving can and is able to become. It's important that we invest in these preliminary researches before the technology gets on the road and becomes a matter of public safety. Autonomous vehicles will inevitably be a part of our future and every aspect of their use should be thoroughly examined and tested.

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The Effects of Hatha Yoga on Anxiety, Stress and Trait Mindfulness

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Mindfulness based interventions (MBI) which entail yoga practices, have been shown to have mediating effects in a lot of mental and also physical conditions: anxiety, bipolar disorder, depression [1] and even multiple sclerosis [2]. This study addresses the question, how Hatha Yoga practice (this is a practice focusing on breath and meditation work during the bodily movements) affects individuals' stress, anxiety, attention and trait mindfulness (TM), and how these effects are moderated by pre-intervention trait mindfulness**.** TM refers to the capacity of maintaining attention to present-moment experiences with a non-judgmental attitude**.** While MBI's have gained more attention in research, what makes this study innovative, is that it is using a study sample of total n = 122 while using a control group as a contrast (not having any intervention) and using a combination of methods, such as questionnaires, EEG measurements and biological marker assessments instead of focusing on one of these methods. Furthermore, the type of yoga intervention is clearly specified and more extensive compared to other studies.

The study is using a pretest-posttest design. The data analysis will be focused on three primary outcomes:

1) 'task switching' and inhibition of attention: differences in participants' ability to change between distinct tasks and inhibiting stimuli (through EEG and behavioural computer tests)

2) stress through biological markers (saliva samples) like cortisol and alpha-amylase levels

3) subjectively reported stress and anxiety levels as well as TM (pre- and post-questionnaires).

While we expect an increase of TM and a decrease of cortisol, alpha-amylase, self-reported stress and anxiety levels in the intervention group (which is absolving an eight-week yoga course, with compulsory attendance of at least three times a week), we also expect a significant difference of these effects in the control group. This study could help optimized MBI application in the future, where specific MBI components could be assigned to specific target groups (through taking into account pre-TM and its influence on post-TM), which can be especially useful during a time where stress and anxiety levels are on the rise worldwide [3].

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A 4E Approach to Creativity

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The aim of this paper is to argue for the importance of incorporating the framework of the embodied, embedded, extended and enactive (4E) cognition approach into creativity research. Creativity is one of the most significant components of human intelligence and is of interest in any area of human activity, including business, philosophy, science, art, etc. Our creative faculty is a tool that enables us to understand, engage with, and even shape the ever-changing and complex world in which we live. Creativity is a complex phenomenon that can take different forms, can be defined differently according to the constraints we impose, and can be empirically studied using different methods. The classical approach to creativity defines it as a process by which something novel and useful is produced [1]. There are several problems associated with this definition: (1) Since it is as difficult to characterize novelty as it is to define creativity, the definition is circular and useful only in retrospect, since it refers to the product rather than the process. (2) Such a definition does not consider contextuality in judging something as useful.

This underscores the need for a broader definition of creativity that goes beyond the limits of the standard output-oriented approach. Most importantly, creativity should not be limited to the brain, but should be seen as a dynamic interaction between the actor and his or her environment since brain and body evolved together and are intrinsically coupled with one another. It is critical to note that "the wellsprings of creativity lie not inside people's heads, but in their attending upon a world information" [2] (see embodied and embedded cognition). It is also crucial to see the creative process in light of the possibilities for action that the environment offers the agent, as well as to recognize that the process has components that spill over to the tools we use (see enactive and extended cognition). Within the framework of 4E, it is also important to ask how creativity evolved in the first place, can creativity be explained from its components if we were able to determine them, how is the emergence of novelty in complex systems relate to creativity, and what are the evolutionary benefits associated with creativity? Then one has to introduce the concepts of exaptation and emergence.

Trying to understand creativity in line with those concepts mentioned above is expected to render a theoretical understanding of the process which is (1) more accurate and in line with how cognitive scientists go about to understand cognition, acknowledging that creativity is best understood as a dynamical interaction encompassing brain, body, and world; (2) more useful in that having a more accurate definition of creativity is expected to lead to better practices associated with fostering it.

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Aphasia: Bringing in the Container Schema

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A cerebrovascular accident may leave individuals bereft of speech. A person affected by aphasia may require years to regain the ability to effectively communicate. Differentiating members of a closed word class such as spatial prepositions may still pose a challenge even after years of therapy.

For the recovery of linguistic competence, aphasia treatment has mainly focused on speech in isolation. Acknowledgement of the body's fundamental role in sense-making appears to have been neglected.

Research Question and Hypotheses

The aim of this case study is to assess whether image schema theory in combination with bodily motion that corresponds to what is being expressed may constitute an efficacious approach in impairment-based aphasia therapy.

Since spatial cognition is reflected in language use and meaning appears to be intricately linked to modal experience that can be evoked [1], re-establishing a correlation between sound (phonology) and meaning (semantics) via enacting what is being expressed is expected to facilitate retrieval, i.e. access to the mental lexicon.

Methods

A 59-year-old English native speaker with chronic Broca's aphasia (more than 20 years) who despite long-term therapy [2] still faces challenges regarding prepositions underwent a four-week training programme (16 hours in total) that focused on the container schema. Frequent concrete senses of verb-preposition constructions (VPCs) containing *in* [3], which typically denote actions, were delineated from uses of *out* and *on*. This consisted in the subject concurrently carrying out corresponding actions while speaking, e.g., in terms of changes in the arrangement of household props. A familiar children's song with corresponding actions, a modified game and mini scenarios were utilised to tap into memories. Instances of interference of other prepositions were instantly addressed correspondingly. Pretraining, mid-training (spot check) and post-training performance is evaluated via aphasia assessment tools.

Implications

Preliminary findings corroborate image schema theory and notions of enactivism as well as their role in enhancing retrieval. Despite this being beyond the scope of this study, findings may encourage research in terms of a more embodied treatment of aphasia that extends to embrace rehabilitation of affected limbs in enacting, which may aid in side-stepping or unlearning learned nonuse. Finally, this may also offer new approaches to L2 language teaching concerning prepositions and VPCs.

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Research on the Psychological Effects of Music: A Beginning of a Study.

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People's behaviors and affective states are influenced by a number of external and internal factors. An interesting one among them is music, which has a number of effects on humans. To understand the phenomenon of music, it is important to tackle the question of how music is experienced and what it means for people. Previous research has produced knowledge about the underlying mechanisms for emotion induction with music [1] and has identified the functions of music listening [2]. In our study, we will focus on modern day listeners and their personal experience of music. In the beginning of our project, we are exploring the possibilities for researching individual differences that make music listeners develop specific music tastes and attitudes towards music, and make them susceptible to mood regulation with music. We would like to identify novel factors from listener profiles potentially associated with listening habits, emotional processing of music, and/or music preferences.

Methods

To approach our research question(s), we identified tools such as the Gold-MSI, Meta-Mood Scale, and Five Factor Model as useful. Our plan is to collect participant data via an online survey. A short self-reporting questionnaire will be used, such as a SAM scale, to measure emotional responses.

Limitations

While researching relevant works, we found a substantial number of studies done on similar topics. However, whether they deal with the question of mood regulation with music or music preferences, the situational influence always presents a limitation in measuring emotional responses. There are various agents that influence the psychological state of participants in given situations, consequently influencing the results. These limitations could be relatively overcome with a preliminary study, that can hopefully provide stable knowledge about the independent variables.

Discussions

We would like the relevance of our study to be recognized among disciplines such as musicology, psychology, and machine learning. We hope our findings will also contribute toward improving methods of music therapy. We would like to generate insights that can ignite new questions about the psychological effects of music. Future research on this and similar topics should be able to narrow down the space which the mystery of the mechanisms of music now takes.

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Psychologically Profiling Drivers: A Questionnaire

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Analysing driver behaviour can contribute to the larger scheme of improving road safety and reducing the number of accidents due to uneducated or reckless driving [1]. The term "driver's behaviour" refers to features and activities that a driver exhibits when operating a vehicle. Therefore, we can classify drivers according to their behaviour.

Our goal in this study was to design a questionnaire with a similar objective as the Driver Behaviour Questionnaire (DBQ), the most popular instrument to measure driver behaviour [1], while also providing a psychological analysis of the questionnaire partaker. Another aim was to make our questionnaire recognise the driver's intention to operate a vehicle (e.g., as a taxi driver, you intend to drive customers from one location to another). Finally, we wanted to classify the drivers with the data coming in from the questionnaire answers. To classify means recognising different types of drivers (e.g., reckless drivers). Then, using the data from the questionnaire, we offer participants pointers on how to improve their driving capability (e.g., how to avoid being a reckless driver).

To achieve the set goal, it was essential to analyse the currently standing surveys for measuring driver behaviour; the DBQ, the Freight Driving Behaviour Questionnaire (F-DBQ), and the Danish DBQ. We then utilised the strengths of the currently standing surveys to our advantage. By extracting and adapting the questions, we want to identify the psychological profiles of drivers. Driver's psychological profiling is a method for determining a driver's mental, emotional, and personality characteristics. We structured the questionnaire into different sections. The polar section and the non-polar section questions were based on a real-life situation on the road to contribute to the subject's psychological profile.

The questionnaire, classifications and constructive feedback have been created but not yet tested. However, we plan to use it alongside driving simulators to provide the subject with informative classification supported by strong and valid evidence from the questionnaire and the driving simulator (e.g., eye-tracking to measure awareness).

We expect subjects to take the feedback constructively and improve their driving behaviour. The result was to create a questionnaire for the researchers of the driving simulator study. In addition, we wanted to help them identify driver psychological profiles.

With further research, our goal is to develop an algorithm that will automatically classify the driver based on the analysis of the gathered data (from the questionnaire and the driving simulator).

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Cognitive Demands in Semantic Memory Retrieval

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Introduction

Pupillometry as a measure of the task-evoked cognitive load has been used in a myriad of studies over the past 20 years. Pupils diameter change is an autonomic reaction that occurs as a response to light, emotional stimuli, or high task demands. The modulations in the pupil constriction and dilation are driven by the locus coeruleus–norepinephrine system activity (Van der Wel & Van Steenbergen, 2018**)**. A series of research have demonstrated the effect of pupil dilation as a consequence of higher cognitive effort. For example, retrieving taxonomically low-related word pairs yielded higher pupil dilation and cognitive load, as opposed to low and high semantically-related word pairs (Geller, Landrigan, & Mirman, 2019). Furthermore, overcoming automatic or dominant responses to provide a more appropriate response has shown a similar effect. In tasks like Go/No-Go or Stroop task, participants' pupils exhibited a higher diameter on No-Go trials, as well as on incongruent Stroop task trials (Van der Wel & Van Steenbergen, 2018). This research is the first to address the cognitive demands pertaining to inhibition in semantic memory retrieval. Our goal is to assess whether the same effect as in previous research will be observed while the individuals generate free associations (the first related word that "pops" into the subject's mind) as opposed to dissociation tasks since dissociative tasks are expected to yield a higher cognitive effort, due to inhibitory processes being utilized to suppress automatic associative responses.

Method

In this study we used a within-subject research design, meaning that the same subjects were exposed to all conditions, with retrieval condition (A vs D) as independent variable, response time, intrusion, and pupil diameter as dependent variables. The participants were presented auditory verbal stimuli, to which they responded orally. The intrusion was detected through self-report measures, while pupil size was recorded using eye-trackers. We hypothesize that the retrieval condition exerting the demands on inhibition in dissociative tasks will yield higher latency and wider pupil diameter, compared to easy retrieval and control. As for intrusion, we hypothesize that it will be more often present on dissociative trials that have a high potency (strong associations to a single word), as opposed to those with low potency (many probable associations).

Results

After excluding data of insufficient accuracy of measurement we have observed longer RT and more intrusions in dissociation than association trials, as predicted.

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Illumination Effect on Psychophysiological Measurements in the Automatic Assessment of Multimedia Exposure ("Advertisement Engagement" Dimension)

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Introduction

Literature [1] shows that increases in task demands generally lead to increases in pupil dilation across the cognitive control domains of updating, switching, and inhibition. Based on these findings alone it cannot be decided whether this reflects an increase in task demands or an increase in actual effort exertion since it at best reflects a psychophysical marker [1]. Researchers emphasize the effect that external stimuli can have on pupil dilatation, and well-controlled lab conditions are always required to prevent alternative explanations [1]. The goal of our research was to determine if measures of predicting exposure can be found by measuring signals of pupil dilatation at rest and under positive load. We have hypothesized that based on the standardized pupil signals, we are able to find statistically significant correlation between pupil signals and answers from questionnaire of four exposers. The purpose of this study was to determine if pupil signals could replace questionnaires in the future researches.

Methods

Two user studies were designed and conducted in the LUCAMI lab at UL FE. Answers on advertisement engagement in the form of questionnaire and psychophysiological signals such as pupil size and heart rate were collected from 60 participants while watching specific multimedia content. We got data of normal pupil signals, pupil signals under positive load, and results from four exposures (engagement, psychological reactance, awareness and attitude (AA), and purchase intention). Then we calculated correlations between exposures and pupil signals (standardized and unstandardized) with the aim to detect any statistically significant relations between signal and exposure. We estimated Kendall tau (due to non-normal distribution of data) and the p-value was set at 0.05 %.

Results

We made altogether 12 scatter plots (31 participants provided useful results) and measurements of correlation. The highest correlation among all of them was between the average normal signal and AA (Kendall tau: 0.238 and *p-value*: 0.063). Based on the results, we rejected the hypothesis because we did not find any statistically significant correlation (with standardized or unstandardized data) between pupil signals and exposures.

Discussion

Our further research will be directed in search of pupil dilation features that can better correlate with exposures and are therefore better candidates for prediction models. Researchers should also include some other physical signals and make combined models, which will be able to better predict exposures.

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An EEG Exploration of Emotional Flexibility

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Introduction

One important component in human interaction with the environment is emotional flexibility (EF), or the ability to flexibly shift emotional responses according to environmental modifications. Aging is associated with a general decline in cognitive function, and EF can differ between older and younger adults. However, research has shown that, contrary to what might be expected, older adults often have better emotional regulation than younger adults. As this shows, consistent and ecologically valid EF paradigms are still lacking in the literature. Accordingly, this project is a pilot study which aims to investigate the nuances of EF in older and younger adults using a novel Emotional Shifting Task (EST). The novel EST is a modified oddball paradigm using electroencephalography (EEG) [1].

Methods

Two groups of participants (18–26 years and 55+ years) will complete two behavioral measures and also participate in an EEG oddball task consisting of 4 practice and 300 experimental trials. In each trial, an emotionally valenced pair of images is displayed, with a cropped segment first and the full image afterward. The possible combinations are pos-pos, neg-neg, pos-neg, and neg-pos. After the participant responds whether they feel that the cropped image is positive or negative, the full image is revealed, and the participant responds whether the full image has a positive or negative valence. The study has already received ethical approval and is still in the recruitment phase, and will be carried out over the summer.

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Linguistic Therapy as Treatment for Language Disorders

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Introduction

The aim of the study is finding out how linguistic treatment will aid more people who suffer from language disorders. This is done by using behavioral treatment with or without the addition of repetitive transcranial magnetic stimulation (rTMS) in order to see which approach is more effective. Adding to the importance of the study is that this is the first time that research like this is conducted in Slovene-speakers with language disorders.

Method and Results

To study behavioral treatment, 3 people with Alzheimer's disease (all females, 1 mild, 2 moderate cases) participated thus far. The therapy consisted of rTMS and then linguistic treatment with complex sentence structures was admitted for 60 minutes 5 times a week for 4 weeks. Preliminary results show improved language abilities for the mild AD participant after the end of the treatment. No impact was observed for participants with moderate AD. [1]

Similar findings have been reported in another study, where only rTMS was applied. Participants received rTMS 5 times a week for 3 weeks and participated in a) a picture-naming task where they were asked to name verbs ('reading'), agent-nominalizations ('reader'), process-nominalizations ('reading), and nouns ('book'), b) a lexical decision task (online & offline) where they had to decide whether something is an existing Slovene word or not, and c) word-derivation task. Preliminary results show improved performance in the picture-naming task for all the under-investigation word categories. A slight improvement was observed in both the offline lexical decision task and the derivation task. An improved performance was achieved in the online lexical decision task after the rTMS. [2]

Discussion

Considering the preliminary results, we can expect the research of linguistic treatment in Slovenia in the future to benefit those suffering from language disorders.

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Our Mortality and the Need for Consistency

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Introduction

Terror Management Theory (TMT) constitutes a framework of how human awareness of their mortality affects their cognition, emotions, and behaviour. This unconscious death saliency is typically followed by an increase in anxiety. To manage this terror and reaffirm a sense of meaning humans unconsciously resort to anxiety-buffering mechanisms which in turn might result into conflict with possible threats to the self-protective defences. [1] One of the widely reported effects is the defence of culturally familiar worldviews after being primed for mortality salience (MS). Additionally, there have been accounts indicating that MS increases confirmation bias and motivates people to seek consistency in beliefs when estimating the value of information. However, another branch of research examines alternative coping with existential terror by redirecting anxiety-buffering strivings towards more positive behaviour such as healthy lifestyles or creative expression. [2] A body of research investigated how the adherence to salient norms or values after reminders of mortality can also replace typical anxiety-buffers. [3] This framework and the increase of mortality salience due to current developments in Europe raise the question of how mortality salience influences selection of information on unfamiliar topics.

Methods

The idea is to combine prior findings and test the effects of norms promoting exploration after MS on the need of consistency when searching for information. The research will consist of a 2 (MS saliency/control) x 2 (primed norm/no priming) factorial design. Norm saliency will be manipulated by instructing participants to read a short paragraph about the importance and value of creativity and exploration in our culture.

For the information-seeking task, participants will be presented six topics expected to be culturally distant and generally unfamiliar and asked to choose the topic least familiar to them. Participants will then be asked to search for the respective topic and choose five of the found results on a simulated Google search engine, which provides conceptually conflictive results, as resources they would use for researching on the given topic to introduce it to someone else. We expect that on average participants primed with MS will choose more conceptually consistent combinations of search results compared to the control group. Priming cultural norms after MS, however, is expected to cancel out the MS effects.

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The Memory of Attractors in Recurrent Neuronal Networks and Its Application to Controlling Systems

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This project is about the practical implementation of a recurrent neuronal network with the goal of using oscillating attractors as a model for memory in an embedded system. Through the neuronal simulation, it is shown that the properties of dynamic systems can provide a model for memory.

Aram et al. [1] suggest to interpret the oscillating output-states (oscillating attractors) of recurrent neuronal networks as a storage for information. By changing one parameter of the system, it is possible to access different oscillating attractors which are interpreted as different stored information. This parameter represents the level of dopamine in the brain, whereby dopamine is associated with attention and focusing.

The suggested model of Aram et al. [1] is embedded in a controlling system of a robotic arm to prove its applicability in the context of a simulated environment and the plausibility of the memory system.

To implement the system, a replication of the model of [1] is done in a first step. In a second step, the outputs of the memory system are connected to the virtual actuators of a digital simulation of a robotic arm. In the following, the system is trained and the behaviour observed.

On the one hand, it can be demonstrated that recurrent neuronal networks can store information and provide a model for memory in biological organisms, which consist of recurrent neuronal networks. On the other hand, a controlling system is suggested, which provides a neurobiological inspired approach to operate a robotic arm in a simulation.

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Reliability of fMRI Language Mapping Paradigms

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Introduction

While the excision of a brain tumor is an inherently challenging procedure, one notable concern is whether language function will remain unimpaired following surgery. This is an important consideration, as the loss of linguistic ability can have a profound, negative impact on quality of life. Language mapping with functional Magnetic Resonance Imaging (fMRI) is a technique used to localize eloquent language cortex and verify hemispheric language dominance. This method is used regularly for preoperative planning to 1) determine the risks and benefits of surgery, 2) guide intra-operative cortical stimulation during awake craniotomy, and 3) supply patient-specific information about the location of language-critical areas to avoid during resection to maximize post-operative language function [1].

Language mapping paradigms are not currently standardized and may vary across clinics. Despite this variation, it is common practice to use a combination of expressive, receptive, and/or semantic linguistic tasks to ensure activation throughout the entire language network, thereby producing comprehensive language maps [2]. Reliability is a critical metric in assessing the validity of a language mapping paradigm for clinical applications. The present study will examine the intrasubject reliability of four paradigms in healthy participants in order to evaluate their usefulness in clinical applications.

Methods

Twenty right-handed native German speakers will participate in four fMRI measurements over three weeks. Participants will be asked to perform visual and auditory semantic decisions, name two objects, and decide if auditorily-presented sentences contain semantic violations (sentence comprehension). Of the four measurements, one will take place in a 7-Tesla (7T) scanner and the rest will occur at a 3-Tesla (3T) scanner. The repeated measurements at 3T will be used to assess reliability, whereas those from 7T will provide insight as to whether ultra-high-field MR is better suited for fMRI language mapping.

Expected Results

We predict that the object naming task, which involves overt language production, will be highly robust for localizing Broca's area. Moreover, we expect that this task together with the sentence comprehension task will consistently and reliably map language areas in the dominant frontal, temporal, and parietal lobes. The results of this study will shed light on paradigm reliability and the impact of parameter choice for language mapping with fMRI.

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Detecting Suicide-Related Content from Bereaved Individuals on Twitter – A Machine Learning Approach

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Introduction

Research suggests that suicide rates are associated with what and how individuals, news agencies and non-governmental organizations write about the topic of suicide on social media. The main idea of research in this field is that the right tone and content when writing about suicide may positively influence how people cope with their suicidal thoughts and may help to prevent an exacerbation of the individual situation and suicidal thoughts. To analyze these effects, it is necessary to understand what type of social media content relates to an increased or decreased suicide rate. The computational social science lab of Austria established a novel approach employing a machine learning algorithm that categorizes Twitter tweets related to suicide in an automated and efficient way. Currently, the running algorithm can distinguish six suicide related tweet categories. For this project, two already identified categories of interest were selected and a new algorithm that classifies posts of these categories was trained. The new categories should assign tweets from bereaved individuals (individuals who experienced loss of a close relation by suicide) that are either written in a positive tone indicating successful coping, or a negative tone indicating suffering, into the 'bereaved coping' or 'bereaved negative' group.

Methods

The analyzed data came from U.S. Twitter users and was posted between 2013 and 2020. In a first step, a high-level keyword search was employed to select data entries from a large-scale data set of twitter-posts to identify tweets that were supposedly posted by bereaved individuals. The result was a dataset of approximately 400 datapoints of bereaved stories with a new identified third tweet category of 'neutral bereaved'. We then used descriptive methods comprising word clouds and word frequency analysis to better understand a possible distinction of the three bereaved categories.

Conclusion

The word frequency statistics, as well as the rather poor performance of the trained classifier have shown that all three categories are very similar and difficult to distinguish from one and each other. Both, for humans and the machine learning model. The latter could not achieve sufficient accuracy in prediction to be used in practice. For this reason, it is recommended to train an algorithm solely to distinguish bereaved tweets from other suicide related tweets, but not to perform an inner group classification. The suggested algorithm could then be used to classify a vast number of tweets in large-scale studies about the association between social media content and suicide rates.

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Promoting Epistemic Disagreement in Digital Spaces

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As with most forms of (new) technology, Artificial Intelligence (AI) – in most use-cases denoting concepts of Machine Learning (ML) – can be seen as providing opportunities for societal and individual benefits, but also as posing dangers to democratic values and societies, as well as reinforcing already existing, problematic power structures. Today, there are already a many important decisions made by machine learning algorithms, so the impact they have – although often unnoticed – is hardly deniable and will probably only get stronger. One step that could contribute to a more reflective and diverse landscape of knowledge, specifically in digital spaces and AI, might be the development of tools detecting and visualising epistemic disagreements in the web. Epistemic disagreement is understood here, being reductionist, as any form of coexisting but differing accounts of the same phenomenon. For example, looking at the governance and societal management of the Covid crisis, there was a wide range of different, often contradicting public statements, incentives and management strategies, which in turn imply different interests, goals and efficiencies. More generally, the concept of disagreement, the coexistence of a plurality of epistemological lenses with which to look at phenomena in the production of knowledge is important, not only in making visible marginalized groups in society [1], but also in the (scientific) production of knowledge generally [1], [2]. Enabling plurality of epistemological claims through AI tools could open paths to more inclusive and democratic discourses in digital spaces. Hence, specific tools and applications would need to be conceptualized, as well as implemented in a specific way in order to pose a beneficial sociotechnical configuration [3]. This work aims to explore how such a tool could improve practices around the management of disagreements, especially in situations of societal crisis. Specifically, the goal is to investigate contemporary academic discourse on crisis management and digital governance in the context of healthcare, in order to gain an understanding of how epistemic disagreements are reified and practiced in applied contexts. An exploration of how the introduction of AI tools to visualize and represent such disagreements can benefit their management in a democratic and inclusive fashion follows. Expected results are an idea of how epistemic disagreements are and are not understood in the context of digital health governance, who is able to contribute, how they are communicated, and how such epistemic plurality in digital spaces might be shaped by AI tools aiming at finding, visualising and representing them.

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Nationalism as a Cognitive Preference of the Western Balkans

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Research backbone

While exploring the topic of fake news we can easily come across the concept of "Cognitive Preferences" (CP). CP dictate a set of emotion triggering concepts that play with our mind in a way that makes us "prefer" certain content more. For example, when talking about cognitive preferences: for fear evoking factors, we understand that it is the need and desire of any living being to survive, we are drawn to things that pose a threat in order to be better prepared if a threatening event were to happen. [1] CP, like any other cultural discovery, opened the door to misuse. In our case, this type of understanding of cultural evolution has brought about an easy way for media to manipulate and shape our thoughts and opinions. We will explore and discuss the concept of nationalism as a CP in political content that has become prevalent in the Western Balkans. In this research, we heavily relied on cultural evolution in the digital age and drew conclusions from material related to CP in order to come up with a clear and comprehensive answer as to why we are drawn to nationalistic content [2]. We also used reviews done in political science to shine light on the severity of nationalistic narratives and political misinformation in general. [3] The research done is based on a questionnaire set to present the current climate in Montenegro in relation to nationalism as a CP and the trust in media in Montenegro

Method

The questionnaire that will be presented as a method of obtaining experiential data, will ask young people from 18 to 30 years old from Montenegro to rate, score and describe how nationalism plays a part in the growing hostile climate currently plaguing the region. The results obtained will indicate the level of trust young people have towards the media.

Expected results

We expect to see a large level of mistrust in media in Montenegro due to nationalistic narratives and to be able to easily tie these results with existing literature on the topic, thus shining light on the problems of nationalistic narratives in media that have at this time engulfed the world in flames.

Proposing solutions and future works:

After obtaining data, the goal of this research is to propose a form of solution to the issue.

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Understanding Inter- and Intrasubjective Variability During Working Memory Task Performance With Behavioral Neurophenomenology

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Working memory (WM) is one of the central cognitive functions of interest in psychiatry. WM is measured using performance measures (accuracy, reaction time) gathered with psychological tasks. Performance on cognitive tasks, however, is marked by both inter- and intrasubjective variability [1]. Variability in task performance can be understood from several perspectives (e.g., stable traits). One perspective that remains underinvestigated is phenomenology; that is, individuals experience solving the same task differently [2]. Our goal was to test the hypothesis that lived experience can be used to explain some of the variability in the data gathered using a visuo-spatial WM-task. To this effect, we mutually constrained first-person data (reports on different aspects of experience) and third-person data (performance measures).

Method
25 university students (aged 18–30) attended four experimental sessions. During the sessions, participants solved a progressively more difficult visual span task. Target stimulus in the form of a partially colored-in grid had to be memorised and subsequently selected from four similar probe stimuli. After each trial, participants reported on their lived experience using a computerised framework, based on previously gathered in-depth, interview-based phenomenological data on the experience of WM-tasks [3].

Several questionnaires were used to allow for comparison between how much variability in cognitive performance is explained by stable traits (personality, need for cognition, mood disorder symptomatology, cognitive styles) and how much by different aspects of experience.

Analysis
Data analysis is underway. The data will be analysed using k-prototype clustering, since we are gathering both numerical and nominal data. Additional exploratory analyses will be used as well.

Implications
We hope that elucidating intersubjective differences in experiences associated with WM-task performance will shed further light on impairment of cognitive functions in psychiatric disorders.

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3D Brain Model as Learning Aid

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Introduction

Three-dimensional information is important in medical education and healthcare; however, its understanding can be challenging, especially in medical neuroscience, which is why the world is moving towards a digital environment [1]. Several studies have shown that 3D neuroanatomical learning is an effective strategy for increasing neuroanatomical knowledge, motivation, and retention of neuroanatomical material [2]. The successful development of an interactive 3D learning tool could help alleviate the low level of understanding of students in neuroanatomy by helping students master complex and often abstract spatial relationships between neuroanatomical structures. The goal is to make an improved 3D brain model, both in physical and interactive form, to facilitate learning and understanding of neuroanatomy.

Method and Outcomes

The plan is to print different 3D brain models based on the required levels of neuroanatomy knowledge ranging from primary school, through high school and university - especially in the fields of medicine, psychology, and cognitive science. 3D models could be taken apart into pieces and would be colour coded. First step of the research was to review and compare existing studies, to get the idea of the best type of combined learning aid. Printed 3D brain model will be accompanied by a small manual with QR codes that would lead the user to a website, which would also allow, in addition to the virtual 3D image on the screen, the functions of the brain area or nervous system that interests us. Individual sections of the brain will also be integrated into the website, which will also be marked on the 3D physical model itself, perhaps by engraving. It should also be taken into consideration that learning the neuroanatomy takes a long time, so the materials and the models should be assembled in such a way that during n-fold disassembly and assembly it does not wear out or gets destroyed. This could be achieved by choosing the appropriate 3D printing material and technology. It would also be necessary to perform a financial analysis, both of production itself and of potential sales later. The successful development of an interactive 3D learning tool could contribute to assimilate the required neuroanatomical knowledge on different levels of education.

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Jealousy in Polyamorous and Monogamous People: A Theoretical Approach

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Introduction

Scientific research underlines the popular believe, that the feeling of jealousy is triggered when situations occur, which are perceived as a threat to the current relationship structure. [1]. However, there are multiple factors, which can influence the level of jealousy, like general tendency to interpersonal aggression, experiences with prior partners or upbringing. With increased occurrence of non-monogamous literature and the phenomenon of "Compersion" the question arises: Is jealousy as natural as we thought it is, and can we find a way to proactively navigate relationships with it? In this research we aim to combine findings regarding jealousy and monogamy/non-monogamy from multiple scientific viewpoints to create an integrated cognitive approach.

Methods

This research is aimed to find specific gaps in cognitive research on jealousy and nonmonogamy and formulate hypotheses to lay groundwork for our future practical research. Therefore, the methodical part consists of compilation of literature from evolutionary and social psychology as well as neuroscientific findings and current non-monogamous perspectives regarding compersion.

Results

Even though early human societies were largely non-monogamous, a development towards monogamy still happened and had plenty of advantages. [2] Hence, plenty of research regarding jealousy assumes that infidelity of a partner is in direct proportion to the loss of them. Different levels of jealousy as well as the existence of non-monogamous people throughout human history and the concept of compersion proof otherwise. Proactively dealing with trauma, attachment styles and psychological needs can significantly improve jealousy levels [3], which can improve monogamous as well as non-monogamous relationships. Future practical research to fill these gaps can include effectiveness measurement of physiological regulation mechanisms of jealousy reactions. These can include reassurement-talks, conscious routines and expectability, behaviour after conflict as well ways of mutual attunement.[3]

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Effects of Guided Relaxation Technique on Symptoms of Anxiety: A Combined EEG-ECG-Respiration Study

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Generalized anxiety disorder is considered one of the most serious public health problems in Europe, affecting 9 million people annually [1]. Many psychiatric disorders in general, and anxiety in particular are accompanied by somatic symptomatology. Anxiety is associated with an increase in respiratory activity, heart rate, perspiration, etc. It is a matter of ongoing investigation what are the mechanisms linking mental and somatic symptoms of anxiety [2]. Recently, theoretical models have been proposed suggesting that peripheral physiological systems (e.g., respiration) may act as top-down regulators of neuronal activity [3]. It therefore follows methods of guided relaxation might be able to make use of such mechanisms to alleviate the physiological symptoms of anxiety. Our research goal was to empirically test the efficacy of a guided relaxation protocol used for reducing the symptoms of anxiety and evaluate its potential clinical use by studying the interactions of the neural, cardiac and respiratory activity.

30 men and women aged between 23 and 52 (15 diagnosed with generalized anxiety disorder and 15 healthy controls) participated in the study. Their level of anxious symptomatology was evaluated using MASQ and BCSQ-32 questionnaires. During the session EEG, ECG, PPG and respiration were measured. The session was divided into 6 blocks, each lasting for 10 minutes. The first and last block consisted of a standard EEG resting state recording. In the remaining four blocks participants listened to guided relaxation and/or their synchronous and asynchronous heartbeat. Between blocks, participants' current well-being was estimated with the STAI questionnaire and a blood pressure measurement.

The results of one-way repeated-measures ANOVA showed that both blood pressure measurements and STAI scores were statistically insignificant ($p > 0.05$). Results in the differences in heart rate variability (as indexed by mean R-R interval) were statistically significant for both ECG measurement ($F(2.84, 62.4) = 3.74$, $p = 0.017$) and PPG measurement ($F(2.65, 58.3) = 4.41$, $p = 0.010$), indicating a possibly positive influence of listening to the heart and guided relaxation on heart rate variability in absence of subjectively perceived improvements.

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Improving SSVEP-Based BCI Experience Using tDCS

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The human brain can communicate with a computer or other device without any movement via the brain-computer interface (BCI), which recognizes and translates changes in human brain activity into commands [1]. Over the past years, BCI has received substantial research attention. It has been successfully used for wheelchair control, virtual reality, gaming, spelling systems, and other domains.

Electroencephalography-based BCI is the most popular approach due to its relative availability and non-invasiveness. The most preferred EEG- based BCI modalities include Motor Imagery (MI), Steady-State Visual Evoked Potential (SSVEP), and P300 Evoked Potential, each for a specific purpose.

Despite the many outstanding breakthroughs achieved in BCI research, some issues remain unresolved. One of the major problems with these technologies is BCI illiteracy – an inability to learn to use BCI by a significant proportion of the population. There is no identified reason for this problem, although differences in anatomy or physiological activation might play a significant role.

SSVEP is an essential method in BCI, mainly because of its benefits over other BCI methods, such as its fast reaction time and relatively high information transfer rate. However, about 10- 25% of people suffer SSVEP-based BCI illiteracy [1]. Previous studies have proposed several approaches for improving SSVEP detection to reduce SSVEP illiteracy. Many of them have been concerned with enhancing the efficiency of SSVEP stimuli or improving the SSVEP detection algorithms.

Research Design

Transcranial direct current stimulation (tDCS) has recently gained attention in neuro-modulation approaches because of its non-invasive procedure of modulating cortical excitability. Some studies have tried to enhance BCI accuracy and reduce illiteracy using tDCS with promising results, mostly for MI-based BCI [2]. Only a sparse number of studies have addressed the potential improvement of SSVEP-based BCI illiteracy using tDCS. [3] This study plans to design an optimal experiment for using tDCS with the SSVEP BCI paradigm by proposing the essential parameters in using tDCS and BCI in order to reach a more precise and standard result in observing the effects of tDCS on BCI illiteracy.

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Cultivating Improvisation Literacy

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Inspired by insights from the creative and performing arts, current research within the emerging field of improvisation studies has shown improvisation to be a skill that can be learnt. In a recent survey by Zenk et al., general principles of improvisation were extracted from the lived realities of leading experts for practical application in didactic formats aimed at teaching an improvisation mindset [1].

To determine how students learn or improve their ability to improvise, empirical research will be conducted in a five-day university course on *Business Improvisation* at the Danube University Krems from May 30 to June 3, 2022. While previous studies within the context of this course have focused on the perspective of teachers, this study concentrates on students' experiences and how they receive and integrate the didactic models of organisational improvisation implemented by teachers. Results will evaluate students' acquired improvisation skills and feed back into optimising these didactic models.

Data collection follows a qualitative approach that involves two empirical phases: Phase 1 focuses on participant observation (PO) of the course, which includes reflecting on personal experiences in the form of observation protocols and actively engaging with participants and lecturers along the lines of informal interviews. Phase 2 concentrates on generative depth interviews (GDI) with all participants, reflecting on individual experiences of the course and learning outcomes of acquired improvisational abilities. The GDI format blends semi-structured with open interview formats and involves the formulation of five core questions that provide an overarching frame of reference along which questions that organically arise from the dialogue will be aimed at uncovering underlying layers of meaning. Constructivist grounded theory (CGT) is applied for qualitative data analysis, following an inductive approach that involves text analysis of interviews from which new insights are generated.

As improvisation translates to competently dealing with the unforeseen, the ability to improvise is essential to meet the challenges of the 21st-century VUCA world, characterised by Volatility, Uncertainty, Complexity and Ambiguity. Cultivating improvisation literacy thus has great relevance for leaders at the forefront of activities that require fast decision-making without full situational knowledge while under pressure for creative, intuitive and ultimately successful problem-solving.

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Neural Correlates of Language Production and Comprehension in Three Years Olds

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Introduction

The neural correlates of language comprehension and production have been widely discussed topics in children. General language abilities in small children as well as the extent to which children's abilities in word production and comprehension, have also been widely discussed topics in Linguistics across many points of child development. Previous studies explored the neural activation patterns of the two language abilities in children [1]. However, the understanding of the neural correlates and fundamental basis of overlap between these abilities in children's brains is not as well known. The overlap in neural networks across language capabilities has already been studied in adults. Specific abilities such as planning and motor functions have been observed to use some of the same neural resources in the prefrontal cortex and are also viewed to have substantial overlap in resources in the temporal regions of the brain [2].

Methods

The current study aims to examine the differences between language comprehension and word production in three-year-olds and to what degree specific neural networks overlap in the brain. We hypothesize that three-year-old children will already show some degree of activation overlap in neural resources and temporal regions between both modalities of language comprehension and word production. However, not to the extent that adults have shown overlap. The project will incorporate functional near-infrared spectroscopy (fNIRS) methods which will measure blood oxygenation changes in the brain which is similar to functional magnetic resonance imaging (fMRI) [3]. Participants will undergo audiovisual tasks for language comprehension, which contains a regular condition with visual and auditory stimuli, while the scrambled condition contains scrambled visual and auditory stimuli. A picture naming task will be done for the word production condition, which entails the participants to give responses by naming the object in the picture. The stimuli are age-appropriate for three-year-olds to be able to understand. For data processing, Matlab with the Homer2 plugin will be used as well as R programming for statistical analysis. We expect to see specific brain areas related to word production and language comprehension be activated during these tasks as well as some overlap in these regions.

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A Neurophysiological Study on the Attentional Capture

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According to the Attentional Dwelling Hypothesis (Gaspelin et al., 2016), irrelevant abrupt-onset cues capture attention in a stimulus-driven way, and attention then dwells at cue position until target display onset. As a consequence, search can be facilitated if a target is presented at the cued location (in valid conditions) relative to presenting the target away from the cue (in invalid conditions). Critically, the size of behavioral effects (i.e., cueing effects) is a function of search difficulty and thus, becoming evident only under difficult search conditions.

Even though, there are many replications of significant research findings on attentional capture by salient, task-irrelevant abrupt onsets in visual search, additional neurophysiological measurements were not used in previous studies. The main reason why almost no electroencephalography (EEG) studies are published on this topic until now lays in the nature of the cue itself: A bright, lateralized stimulus.

To circumvent the problems related to the physical nature of the cue, we ran an additional difficult search block but with task-relevant cues (red). This served as a control condition: If task-irrelevant cues capture attention, we should find no difference in event-related potential (ERP) waveforms between them and the ones of task-relevant cues.

In this study, we used both behavioral measures (i.e., cueing effects in reaction times and error rates), and EEG to test if task-irrelevant abrupt-onset cues capture attention during difficult color search.

Thus, our participants searched for a color-defined target among differently colored distractors. In each trial, the target (e.g., a red stimulus) was presented at one out of four possible target locations. Prior to the target, we presented a white onset cue at one of the four possible target positions. In addition, as the target color (i.e., red) is far away in color space to the color of the onset cue (i.e., white), we expected the cue not to capture attention from the perspective of prominent top-down attentional control theories in which capture is contingent on our current search goals.

We found behavioral support for attentional capture of task-irrelevant cues, but no support for the Attentional Dwelling Hypothesis in the size of cueing effects as a function of search difficulty.

Conclusively, the implemented search protocol in this study, as well as the use of new analysis methods on ERP components elicited by a single, lateralized stimulus has relevant implications for future ERP research on attentional capture in cueing studies.

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Comparison of Agonistic Interactions Between Different Test Batches in the Joint Log-Lift Task with Pigs

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Introduction

Although cooperative behavior in non-human animals has been extensively studied in recent years, few studies have focused specifically on farm animals and many require training the animals to engage with an artificial task, potentially limiting the biological relevance of such studies. The joint log-lift task was developed as a biologically relevant method to study cooperative behavior in domesticated pigs [1]. In a prior study utilizing the joint log-lift task, domestic pigs were shown capable of coordinating their actions to simultaneously lift a log in a box in order to access treats [2]. In the current study, the aim was to use the joint log-lift task to investigate the effect of cooperative behavior on the prosocial and affective state of pigs. The study was conducted using a total of 24 pigs split into 4 groups of 6. The study began when the pigs were 5 weeks of age and included a habituation phase designed to offer the pigs the opportunity to learn to jointly use the joint log-lift apparatus prior to beginning the testing phase. However, during the habituation phase the success rate was surprisingly low with the pigs managing only 13 successful joint log-lifts over the course of 10 days. This contrasts with a previous study (unpublished) with an identical habituation phase in which the pigs jointly lifted the log approximately 783 times over the course of 10 days [2]. One potential explanation for the difference in success rates in the habituation phase between the current study and the previous study is that there were differing levels of agonistic interactions among the pigs between the two batches.

Results

Behavioral analysis of video recordings of the first two days of habituation for both the earlier successful study and for the current study are ongoing and seek to determine whether differences in the level of agonistic behaviors between the pigs of the two studies could explain the differences in performance during the habituation period. The results of this analysis could provide novel insights into the factors that influence cooperation in pigs and possibly other species.

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Control Mechanism for Hierarchical Reinforcement Learning Agent

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Introduction

Reinforcement learning is a branch of machine learning that is focused on developing artificially intelligent agents, solving sequential decision-making problems in the environment.

Thanks to reinforcement learning (RL) models, the roles of dopamine and the cortico-basal ganglia-thalamo-cortical (CBGTC) circuits have been better understood in recent years. One of the theories behind the CBGTC circuits suggests that basal ganglia (BG), play a crucial role of action selection, while the action candidates are initially generated in the cortex [1].

One of the biggest challenges associated with majority of the reinforcement learning models is their inability to properly represent multiple levels of temporal abstraction that are critical for extended courses of action over a broad range of time scales.

To tackle challenges like these, the field of hierarchical reinforcement learning (HRL) has been closely studied in the past two decades. Particularly, the pivotal work of Sutton, et al. [2], extends the usual notion of primitive actions to the more generalizable framework of options with temporally variable courses of action.

The main objective of this project is the study of the Hierarchical Reinforcement Learning system inspired by the CBGTC. We hypothesize that we will observe a division of tasks between actors at lower levels, which could be interpreted as the emergence of skills.

Method

We will test and compare the performance of the agent inspired by CBGTC circuits with and without the implementation of a hierarchical control mechanism in the Atari game (Pac-Man) environment. Both implementations will be trained with the proximal policy optimization (PPO) algorithm that is an on-policy gradient method for the training of RL agents.

Agents will be quantitatively compared on metrics such as the average number of steps and the average collected reward per episode. Moreover, we will make a qualitative examination of the agent's behavior, and look for signs of potential task division between the actors at the lower level in the agent with hierarchical control.

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The Contribution of Dopamine and Serotonin to Differentiation Amid Personalities

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Personalities represent the difference in human beings' behavioral tendencies, and how they approach the environment and other individuals. We can assume emotions and expectations as determinant factors forming internal feelings, representations and actions [1]. Emotions are modulators of cognition and specific forms of thinking. On the other hand, expectations are conceptualized as the anticipations of what could happen in the environment. Then, the personal ability to predict the likelihood of an event is contingent on subjective emotional experience, needs and desires. Hence, motivation represents the need for certainty and competence. Motivation is strictly associated with emotional regulations depending on the levels of certainty and competence [2]. Thus, a further investigation can be executed by searching for the neural correlate of these cognitive phenomena. It has been shown that serotonin is responsible for affective processing. It is projected from the raphe nuclei, through the fibers to almost every region of the brain. Additionally, dopamine is generated by other areas: substantia nigra, ventral tegmental area, arcuate nucleus, periventricular nucleus, zona incerta and the posterior hypothalamus. Dopamine is the neurotransmitter which contributes to reward feeling, memory and movement. The relationship between serotonergic and dopaminergic systems is crucial to regulating appetitive and aversive motives, depending on the value an individual attributes to a goal. The goal of this project is to propose a venue towards a computational model of personality theory, which simulates how subjects give different meanings to environmental inputs due to their neuronal processing of value-based choice tendencies. In particular, the focus will be on the interaction between behavioural inhibition system and behavioural approach system (BIS/BAS) systems and their neuronal correlates: dopaminergic and serotonergic systems. [3].

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"I Know How You Feel": A Quantitative Study on Factors Affecting Empathy With Artificial Conversational Chatbots

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Introduction

There is a lack of mental health workers worldwide, with a median of 9 workers per 100,000 people and up to 2-years waiting periods for therapy. Supposedly, 'chatbots', the artificial intelligence-based conversational agents (CAs), represent an optimal solution since they offer anytime-available support. However, due to the unclear adherence to interventions, the CAs play only a supplementary role to human therapists. Empathy is the critical emotion for developing a robust working alliance, which is further essential for maintaining a successful intervention. Consequently, the present project aims to identify the core features of virtual CAs responsible for clients' perceived empathy.

Factors Affecting Empathy

Based on Rogers' person-centered approach [1], the ultimate criterion for determining empathy in therapeutic rapport is the client's perception of the therapist's attitude. Previous research suggested four factors affecting closeness with CAs: physical characteristics, conversational ability, rapport building behaviours, and program errors [2]. Additionally, ten conversational cues that affect empathy in text-based conversations with CAs were identified [3].

Methods

Each participant virtually conversed with two CAs, which varied in their physical characteristics and conversation abilities. Additionally, participants self-reported their perceived empathy and shared their overall empathic perceptions in a semi-structured debriefing interview. A directed content analysis was used to code the conversations with CAs using the ten empathic cues [3], and the correlations between them and the reported perceived empathy were analysed.

Preliminary Results and Discussion

The present study is the first to analyse the clients' perceived empathy via experimental quantitative measures. Despite its importance, empathy with therapeutic CAs has only been assessed secondarily through qualitative results. Supposedly, it will clarify the presence of empathy in virtual conversations with CAs and identify the methodological features for future improvements of empathic CAs, and the field of artificial psychotherapy.

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Inner Speech as a Medium of Binding Information Across Domains

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Manipulating variables of Inner Speech (IS), the phenomenon of thinking in words, has behavioural consequences in many cognitive tasks (e.g., logical reasoning). This has led to the hypothesis that IS may serve as a separate representational medium supporting cognitive functions. For example, in [1], the authors found that a verbal shadowing task interferes with adults' ability to integrate geometric with colour information in a spatial orientation task. Since language allows to combine words irrespective of their modality (e.g., in an expression such as "right of the green wall"), language is seen as a representational medium that can be used to integrate multiple sources of information from multiple modalities (e.g., colour and geometry). In the same vein, Bemis and Pylkkänen [2], were interested in the question whether basic linguistic combinatorial processes of concepts ("the red boat") are also utilized in non-linguistic combinatorial processes. In a visual task, participants had to match pictures that showed a combination of two conceptual features (shape and colour) to elicit combination processes across domains. The authors found higher activation in brain areas utilized in linguistic combinatorial processing in trials in which visual combinatorial activity was required. This led to the conclusion that the mechanism of linguistic combinatorial processing operates also in other domains of conceptual combination. Based on this evidence that language could serve as a medium of cross-modal information binding, an empirical project will be conducted. The hypothesis is that people who have a higher propensity to engage in IS (measured with the "Internal Verbalization" factor of the "Internal Representation Questionnaire"[3]) are also better at cross-modal information binding. To investigate this, a modified version of the visual task from [2] will be used. The participants have to match objects that carry two conceptual features (colour and shape), which requires cross-modal binding. The predicted outcome is that participants who engage more in IS should show a reduced reaction time in matching the correct pictures (if IS supports cross-modal binding). To see if people use verbalization as a strategy in the matching task, the stimuli will be divided into objects that are verbalizable and non-verbalizable.

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Music as Noninvasive Tool in Wound Healing

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Music is easily available everywhere in daily life. It has been shown to influence heart rate, skin temperature and frontalis muscle activity. Research has been done on the influence of music on skin conductance, heart rate, and cardiovascular measures as well as cortisol levels. Importantly, music can decrease stress levels in humans [1]. Stress has been divided in positive stress (Eustress) and Distress. While Eustress can increase performance and concentration in the short term, distress leads to the opposite. Hormones like Adrenalin or Noradrenalin are released without any compensation, leading to discomfort. This distress arises from cardiovascular and endocrine changes in the bodily function following the activation of the sympathoadrenal medullary (SAM) axis and the hypothalamic-pituitary-adrenal (HPA) axis. Of great importance for this project are glucocorticoids that exhibit immunosuppressive effects when released during stressful situations [2], that in turn negatively affects wound healing.

In this project I will analyse the data of female participants in a study about stress and wound healing. The participants' stress level has been elevated the TSST test. In this study, ca. 120 female participants in the age range of 18-35 years are exclusively tested in their follicular phase of their menstrual cycle and not using oral contraceptives. Those participants that report significant decrease in stress while listening to music are compared to those that were not listening to music. Can music decrease stress levels significantly? And does it make a difference in observing healing if the participants listened to music or not?

I use the self-reports made by the participants directly after the TSST and after listening to music to measure stress. As a measure for wound healing the skin barrier recovery is observed. The skin is impaired by tape stripping, a method where tape is applied and removed repeatedly to remove the upper layer of skin [3]. While the skin heals the amount of water that is lost from the sight decreases, therefore healing can be observed via the transepidermal water loss (TEWL) using the Tewameter® TM300. In comparing the data of participants that have been stressed and then listened to calming music, to those that have not listened to music, I hope to observe the potential distressing properties of music and their influence on wound healing. Using music to decrease stress could lead its incorporation as a holistic approach to reduce negative influence of stress on wound healing. It could be incorporated as a tool to decrease stress and therefore help in wound healing.

As a noninvasive method this could make a difference in patient recovery without major changes to medication or medical treatment.

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Innovation and Psychotherapy A Synthesis for Enabling Novelty

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Introduction

This theoretical research project aims at comparing two disciplines, both concerned with enabling radical change: innovation and psychotherapy. To conceptualize the process and method of profound innovation, Scharmer's "Theory U" [1] is used. In this process, the phase of *presencing* labels the state of immersion where real novelty emerges and where the purpose of an organization is about to *actualize* its future potentials. Psychotherapy, on the other hand, is a discipline that has long been concerned with providing a relationship-space that enables such radical changes of identity and the emergence of profoundly new structures and behaviors in a person.

At the crucial step of presencing, the innovation process relies on an *open will* [1] – this implies being radically open for novelty, being fearless, being willing to let go of old patterns and being ready to take a leap of faith. The hypothesis is, that psychotherapy is the discipline of expertise most acquainted with enabling and holding a space where these conditions are met and where these processes of change can occur [2].

Research Question & Literature Gap

The main question addressed by the present paper is whether the field of innovation can learn something from the theories, attitudes and methods used in psychotherapy. It endeavors to translate therapeutic models and practices of enabling change and growth to make them usable for the context of radical innovation. The question at hand has not yet been dealt with for several reasons. On the one hand, despite the growing interest and worldwide hype about innovation, very little concepts deal with these profound levels of change. Models of innovation that touch the existential realm are seldom applied [3]. On the other hand, psychotherapy is typically not considered related to working with teams and organizations in the innovation context.

The processes presented here are by no means limited to the domains of companies and products. Rather, they can be applied to the fields of science, education, activism, and many others [3].

Method

The method of this paper follows a comparative and integrative approach. First, connections between the two disciplines are sought with a special focus on the phenomenon of presencing and the conditions under which it can take place. In a second step, translations of concepts and methods that are considered useful are made.

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Modeling Synapses of CA1 Pyramidal Neurons

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CA1 Pyramidal Neurons

There are multiple theories regarding the role of the hippocampus - the part of the brain renowned for its high levels of plasticity. Biologically realistic modeling provides another method of investigating its behavior. CA1 pyramidal cells are the principal cells in the CA1 region of the hippocampus. They are characterized by the pyramidal soma, single axon, large apical dendrite, and multiple small basal dendrites. This paper is concerned with simulating the distribution of the synapses on the CA1 pyramidal neuron.

Modeling of Synaptic Plasticity

Neuronal computation consists of the integration of multiple synaptic inputs. Synapses are distributed over the whole dendritic tree, and due to the electrical properties of dendrites, synaptic potentials are dramatically attenuated as they propagate along the dendrites toward the soma. One of the compensatory mechanisms is distance-dependent synaptic scaling [1], which we implemented in our model.

We used the reduced-morphology model of the CA1 pyramidal cell [2]. The model was previously successfully validated and is biophysically realistic. In the model, we distributed excitatory synapses while maintaining synaptic scaling.

Synapses changed their weights according to the Event Timing-Dependent Plasticity (ETDP) rule, in which the presynaptic event is a presynaptic spike, and the postsynaptic event happens, when the local postsynaptic potential (PSP) exceeds a certain voltage threshold. In addition, we used the BCM-like metaplasticity as a global homeostatic mechanism [3].

Results & Implications

We performed a series of experiments in neuronal simulation software NEURON. Using the meta-ETDP synaptic plasticity rule and realistic distribution of synapses, the model was dynamically stable during ongoing in vivo like spontaneous activity. This finding is important from the point of view of the stability-plasticity dilemma because synapses should change their weights only when a significant input (pattern) is presented.

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Do Aesthetics Influence an Organisation's Purpose?

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Introduction

With a market cap of around 100€ million a year, the corporate team-building industry is dwarfed by the team collaboration software industry (which stands at 11.65 billion). Within the hypercompetitive corporate world, every compound advantage is leveraged to foster productivity. However," scholars have yet to build a coherent, integrative body of research for understanding the work of aesthetics in organisational life" [1]. Understanding the role and impact of aesthetics in organisations could yield gains in innovation, social interaction and mental health, and perhaps make more things work beautifully.

A growing angle has been experimenting with framing aesthetics within a productivity context, with Barnard going so far as to claim that management was "aesthetic rather than logical" [2].

Problem

There is something phenomenological which varies in degree and quality, that both potentially impairs and enables performance. Making this tacit perception explicit and usable — with the goal of yielding advantages in corporate culture, productivity and dynamism — means improving organisations and those who compose them [3]. But first, one has to understand the role, context and extent of aesthetics in organisations, leading to the questions: "do aesthetics influence an organisation's purpose in practice?"; and, sustaining this question, as aesthetics are necessarily and inseparably connected to experience, "how can we make aesthetic perceptions and aesthetic knowledge explicit (i.e. tangible)?".

Methods

To address this, semi-structured interviews are conducted with the members of two or three organisations, and the interviews then screened for similarities, differences and conceptual networks, within a grounded theory approach, across individuals (five to ten per organisation). At an hour-long interview, the subject is asked about its aesthetics perceptions in relation to the meaning and purpose of the organisation.

Impact

We expect this line of inquiry to leverage individual aesthetic experiences within organisations. It could provide an initial approach for building a lens through which to analyse this characteristic, yet elusive, phenomenon at a corporate level, so as to benefit from it.

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Evaluation Of Machine Translated Riddle-Style Dataset Into Slovenian Language – RiddleSense

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Introduction

The topic of my project is about evaluating the quality and usefulness of the RiddleSense dataset (Lin et al., 2022), machine translated in Slovenian language. RiddleSense is a new multiple-choice question answering task, which includes a large dataset with 5700 examples of riddle-style questions and answers. The dataset requires complex commonsense skills for reasoning about creative and counterfactual questions (Lin et al., 2022). As the dataset exists only in English language, a machine translation can be used to translate it to other languages. An analysis of a small test set would be used to assess the usability of a machine translated dataset for this type of datasets.

Methods

We wrote the translation script in Pycharm, an integrated development environment, where the programing language Python was used. We used Pandas software library for data manipulation and analysis, which is important because it enables the input data in. jsonl format to be processed. The script first takes the dataset, where we translate the plain text with DeepL neural machine translator, and then we save the translated data on a hard drive in the same format and structure as in the input. At the end we evaluate a smaller test set, based on the percentage of human solvability.

Results

As we looked into the translation it can be seen that some words are repeated, left out, not translated, translated out of the context, or have grammatical errors and the semantics can begin to differ with the original version. In some examples, where metaphors were originally used, the use of the metaphor is simply harder to detect in Slovenian, because the translation is too literal and the meaning is not clear anymore. Out of 20 translated examples, 14 can be easily solved by someone whose mother language is Slovenian. Based on these results, we expect the translated dataset to be harder to get answered at correctly as in the original version. An example of a more difficult to solve translation is ''Ko konj poboza macko, les zacne peti'', the answer is ''violina'' but it is hard to answer correctly because one rarely knows that violins, horses and cats have any correlation and in Slovenian it gets even harder. Another example of a word that was translated incorrectly is ''matches'', which has two meanings and it was translated with the wrong meaning. For further research, our translated dataset can be used for evaluating the reasoning of large pre-trained language models. These models have achieved the most promising results in the field of natural language processing, coming close to human performance.

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Statistical Analysis of the Influence of the Few on the Many

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Introduction

The words "A few have most of the effect" ring true in many aspects of daily life, from business and wealth management to phone app usage and their in-app purchases. The phenomenon was described by Vilfredo Pareto as the Pareto principle [1]. Pareto distributions are extremely skewed, with the most known being 80/20 or that 80% of outcomes are due to 20% of causes.

In the world of mobile gaming, Pareto distributions are very prevalent when it comes to players spending on in-app purchases, but they tend to be even more extreme. With very skewed distributions, standard statistical procedures such as the t-test could lead to underestimated p values and an increased risk of alpha error. On the other hand, sample sizes in mobile games experiments are usually large, which could mean that the t-test is reliable due to the central limit theorem.

We will evaluate the behaviour of standard statistical tests and measures of central tendency on samples coming from distributions that are zero-inflated (most users have a value of 0) and extremely skewed (most of the value comes from a few users).

Method

We are interested in how the parameters of the population distribution influence our ability to correctly detect differences in average revenue between groups in A/B tests (also known as split tests). To manipulate the distribution parameters, we will create several simulated control datasets that mimic user spending in mobile games, and testing datasets with an increased or decreased spending.

In the second phase of the study, we will randomly sample from both the control and testing datasets to obtain smaller samples for simulated A/B tests. We will use the t-test and Mann-Whitney U test to compare groups and check whether the resulting p values match the chosen alpha.

Results and Implications

The dataset simulation and their testing for statistically significant results are still in progress. The first datasets were generated, but the second phase has not yet been started.

The results will offer recommendations about sample size that can improve methodology of split tests in the gaming industry, experiments in consumer behaviour or any other phenomena [2] where the Pareto distribution is present.

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Investigating the Flexibility of Top-Down Feature Suppression Contingent on Search Goals

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Background Literature and Experiment Aims

According to the contingent-capture hypothesis of visual attention, task-relevant positive features capture attention in an involuntary manner [1] [2]. Recently, it has been shown that task-relevant features that negatively define a target also guide visual attention through top-down suppression (goal-driven). However, only when negative features are being used consistently.

In this experiment, we will investigate whether top-down suppression also applies if searching for a target requires flexibly switching between a top-down search for and top-down suppression of the very same feature. Therefore, we will use two instruction conditions (positive versus negative) presented intermixed. We will measure attentional guidance by target-defining features with target-preceding peripheral singleton cues (a unique feature that causes a stimulus to stand out from the background). It has been shown that such cues capture attention only if they share a target-defining feature [1]. This attentional capture by the cue is reflected in faster reaction times if the cue precedes the target at the same position (valid condition) versus a different position (invalid condition). In contrast, cues with a task irrelevant feature can be ignored. Furthermore, cues with a negative feature are suppressed and, thus, elicit slower reaction times in valid than invalid conditions, probably due to diminished visual processing at the suppressed position. The experiment will be performed using colour and orientation features and it will involve 40 subjects recruited from the LABS database of the University of Vienna.

Hypothesis

Our hypothesis is that depending on task instructions, if top-down suppression can be flexibly and rapidly initiated, it is expected to observe an inverse validity effect in the negative instruction condition. In addition, it is expected to observe a standard validity effect for cues with the task-relevant feature in the positive instruction condition and not to observe a significant validity effect for cues with a task-irrelevant colour for any instruction condition. For instance, in positive instruction participants will search for a red horizontal bar and for a non-red horizontal bar in negative instruction. Thereby, the aim of this research is to better understand the flexibility of goal directed human attentional control.

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Learned Helplessness Simulation Using Reinforcement Learning Algorithms

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Introduction

According to WHO, about 3.8% of the world's population is affected by major depressive disorder (MDD), however, the mechanism underlying this serious mental illness remains unsolved. A significant amount of evidence testifies to the impairment of the decision-making process in people and animals suffering from depression [3]. That is, the inability to select actions that maximize reward and minimize punishment leads to the loss of behavioural control and decrease in responsiveness to reward. That, in turn, may result in such a phenomenon as learned helplessness which is one of the key concepts of MDD [3]. Neuroscientific experiments determined the monoamine structures that might play a key role in modulation of the action selection process and learning in the basal ganglia, which are the major regions of reinforcement learning in the brain. It is suggested that disturbance of these structures may induce depression. In order to investigate how neuromodulators might contribute to such conditions as learned helplessness, computational models are generated. One of the most renowned methods is Reinforcement Learning (RL) that provides a framework in which goal-directed behaviours can be understood [2]. The goal of this project is to simulate a RL agent's behaviour exhibiting learned helplessness by manipulation of the parameters representing four major neurotransmitters.

Methods

The simulation is based on classical experiments with rats which are exposed to inescapable shocks. However, in our environment, the goal of a rat is to go through a maze to get to the final state with a maximum reward. While progressing through the maze, the rat is exposed to a series of inescapable shocks, which frequency and magnitude are the parameters of the environment. We use the computational theory which proposes the role of neuromodulators as metaparameters in RL algorithms [1]. Dopamine activity represents the Temporal Difference error, which predicts a long-term future reward and select an action. Serotonin controls how far an agent looks to predict a reward. Noradrenaline controls randomness of action selection, and acetylcholine modulates the balance between the storage and update of memory of state and action values [1].

Expected Results

By manipulation of the parameters, we expect to simulate in the agent a learned helplessness behaviour when instead of escaping from the punishment the agent chooses not to select any actions. We also aim to analyse how neuromodulators induce learned helplessness.

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Potential Underground Water Source Mapping With Convolutional Neural Network on Mars

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Abstract

The studies have shown, that due to similar pasts, Mars has similar rocks formed by the same forces as Earth [3]. Therefore, in this research, we aimed to find and locate sedimentary rocks, which indicate potential underground water sources, on Mars with help of the convolutional neural network that trained with Earth-based types of rocks dataset.

Introduction

The rocks of the earth have been formed by three different forces: pressure (Metamorphic), magmatic activity (Igneous), and natural forces (Sedimentary) [1]. Therefore, it is possible to predict the history of the environment where rocks have been found. Specifically, Sedimentary rocks are reliable evidence of water force and the potential underground water sources in the environment where they were found [2]. Although the knowledge about the rock types and their formation processes were earth-based, studies [3] have shown that terrestrial planets such as Mars, whose past is similar to the earth, were also under the same influences and shaped their rocks similarly to the earth. Therefore, with the developments in the field of machine learning, it has become possible to classify the known earth-based rocks [4] by comparing them autonomously with the rocks on the Martian surface [5].

Method

We collected pictures of the sub-rock types of Metamorphic, Igneous, and Sedimentary rocks found in visual search engines as a data set. We then trained the dataset for object detection with the convolutional neural network Then, with the help of the convolutional neural network, which we trained with earth-based rock images, we found the matches on the Mars surface photographs we collected from MSL Analyst's Notebook. Finally, by marking the matching rocks on the Mars map, we determined the areas where the rock formations are concentrated.

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Optimum Stimulus Design for fMRI-Based pRF Mapping

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Regions adjacent to each other in the visual field are represented by adjacent areas in the visual cortex, which is referred to as retinotopy. Functional magnetic resonance imaging (fMRI) has been used to generate population receptive field (pRF) maps that assign areas in the visual field to regions in the visual cortex [1]. The pRF maps generated using fMRI depend on the nature of the stimulus used [2], which is undesirable for standard mapping applications. Ideally, we would like the pRF maps generated to be robust, which we define as the confluence of good coverage of the entire visual field and superior reliability of the generated maps across subjects and sessions.

While there have been a flurry of recent studies investigating the impact of stimulus choice on pRF maps, the stimuli used in such studies (moving bar, rotating wedge, expanding ring) persist more for historical reasons than their ability to generate robust pRF maps. Yet, a wedge+ring combined stimulus results in higher goodness of fit (better coverage of the visual field) compared to a standard bar stimulus [3]. This was explained by the higher proportion of stimulation time within a run using the wedge+ring stimulus, allowing the pRF model to account for a greater proportion of the variability in the blood-oxygenation-level-dependent (BOLD) signal.

In this study, in addition to the standard bar stimulus we use two novel stimulus patterns involving two parallel/inclined bars sweeping across the visual field. This has the effect of (nearly) doubling the stimulation-related peaks in the BOLD signal, which is hypothesized to enhance the goodness of fit of the pRF model used. We also want to estimate the intersubject and intersession reliability of the pRF maps generated in order to arrive at a holistic assessment of robustness. The goal of this study is to investigate if either of the novel stimuli result in more robust pRF maps than the standard bar stimulus.

A prime use of pRF mapping is for scotoma detection and examination of neural plasticity in the visual cortex in cases of loss in visual input to certain regions. A stimulus design that produces robust pRF maps would allow for standardization of results from different labs, equipment, and methodologies, making it invaluable for further exploration of the visual cortex.

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Analog and Discrete Systems in the Brain

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I hypothesize that there are two systems in the brain: discrete and analog. Syntax and symbol manipulation abilities (e.g., language and arithmetic) are realized in the discrete system. In a typical human brain, formal theories of folk physics, folk biology, etc. are embodied in the discreet system. Symbols, which are meaningless per se, are endowed with meaning due to the causal link connecting the discrete system through the analog system to the world. Reasoning in the discrete system is symbol manipulation according to rules, which is specified by mental logic theory.

Analog computation, such as physical simulation is realized in the analog system. People can reason by constructing mental models in the analog system.

There is a division of labor between the two systems in reasoning and understanding the world. E.g., one can simulate and predict the trajectory of a football by constructing a mental model of physics in the analog system or she can solve the same problem by calculation based on physical axioms in the discrete system (although rarely). The correlation between them is specified by semantics.

I survey the difference in analog number processing and discrete number processing as empirical evidence that the distinction between the two systems exists.

The philosophical framework outlined here also sheds light on the symbol grounding problem. It explains how concepts, semantics, and thought attribution are realized in the brain.

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Self-Paced Reading Task of Garden Path Sentences in Slovenian Language

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Psycholinguistics is a discipline that studies the process of humans comprehending and mastering a language. The study aims to research language processing in Slovene.

Garden path (GP) sentences are language structures used to discover and illustrate how a reader processes the meaning in a written sentence [1]. They are grammatically correct and usually used as experimental sentences. GP sentences show that a reader builds an interpretation word by word, while a syntactic parser leads a reader in the wrong direction. Sentences are structured in a subject, a verb, and an object, with a critical point following the next word. At this point, the object transits into a subject regarding the last segments of the sentence [2]. The comma can divide sentences into a main and a dependent one, while no comma makes a critical point of reinterpretation. The examples below show the structure:

»John enjoys writing songs does not like too much.«

»Janeza veseli pisanje pesmi pa ne mara preveč.«

If the comma is between "writing" and "songs," the reader will know that the dependent clause ends with the comma and that "songs" belongs to the second main clause.

One of the methods for understanding the process of natural language comprehension is self-paced reading (SPR), which is a computer-assisted measuring reaction time through keypress. Sentences used in the SPR method are presented word by word and into segments [3]. The experiment is divided into two groups of sentences, one using a comma and the other without one. This way, groups are checking each other's results.

In the current research, we have included 30 participants so far. We are working with 110 experimental and 55 filler sentences with typical structure, keeping the reader's focus. The research is still ongoing, making us predict that the results are similar to GP research in other languages. We expect longer reaction times at the critical point/segment of the GP sentence, where the reinterpretation happens.

Much research on Garden path sentences exists for English, German, and other common languages, while rarely for Slovene. Current research brings more insights into readers' comprehension of the Slovenian language and understanding of its specifics.

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