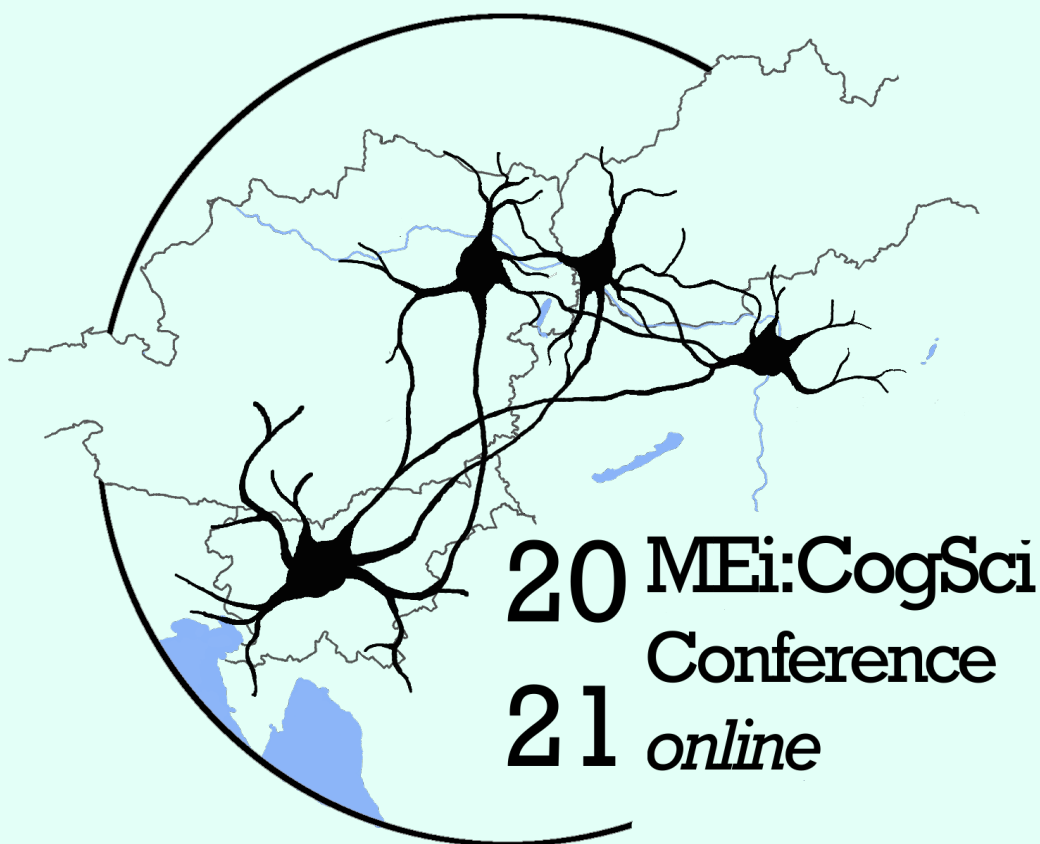
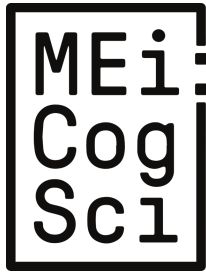


MEi:CogSci Conference 2021

Online, Vienna





Middle European
interdisciplinary
master's programme in
Cognitive Science

Proceedings of the **MEi:CogSci** **Conference** **2021** Online, Vienna

Editors:

Martyna Meyer, Mustafa Mohammed, Lena Müller-Naendrup, Mariette
Soulat, Elisabeth Zimmermann

University of Vienna, Austria

Igor Farkaš

Comenius University in Bratislava, Slovakia

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Proceedings of the MEi:CogSci Conference 2021

The conference took place as an online conference on 17-19 June, 2021,
hosted by the University of Vienna

Editors:

Martyna Meyer, Mustafa Mohammed, Lena Müller-Naendrup, Mariette
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Wilma Konrad

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Welcome!

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

Welcome to our 15th MEi:CogSci Conference!

This year, once again, the conference is taking place online as a result of the ongoing Covid-19 pandemic.

The past study year 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 behaviors. 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; many fundamental changes that the pandemic brought into our lives belong to our field of research.

Especially today, 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. The challenges of the past months are the first real-life exam we undergo in the face of the increasingly complex world we find ourselves in.

We want to welcome our invited speakers: Stephanie Gross (OFAI – Austrian Research Institute for Artificial Intelligence, Vienna), Sebastijan Veselič (UCL – University College London), and Nadine Schlichting (Heinrich-Heine-University Düsseldorf) who, among other alumni of our programme, join this event and provide us with insights into possible careers paths after the graduation of the MEi:CogSci programme. Thank you for sharing your knowledge and supporting the students who are at the beginning of their academic journey.

We thank Wilma Konrad 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 2021 an exciting and joyful event!

Thank you all for joining online this year. Enjoy the 15th MEi:CogSci Conference!

Martyna Meyer

Mustafa Mohammed

Lena Müller-Naendrup

Mariette Soulat

Elisabeth Zimmermann

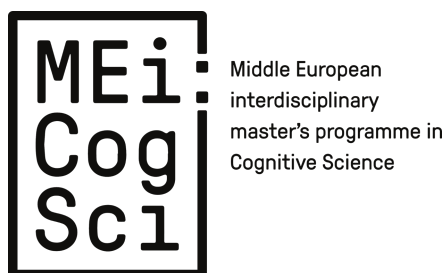
Editor's Note

We, the editors, thank all MEi:CogSci students/authors for submitting their work to the MEi:CogSci Conference 2021. 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 complied the proceedings based on the uploaded submissions. 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 2021 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.

**Fifteenth Middle European Interdisciplinary Conference in
Cognitive Science (MEi:CogSci Conference 2021)**
Online, Vienna
17-19 June, 2021



Conference Schedule 2021

Thursday, June 17, 2021

09:00 - 09:30	Welcome & Conference Opening																						
09:30 - 10:30	Plenary Talk: Modelling Multimodal Communication in Social Robots <i>Stephanie Gross (OFAI - Austrian Research Institute for Artificial Intelligence)</i>																						
10:30 - 11:00	Coffee Break / Socialising																						
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12:00 - 12:30	Lunch Break / Socialising																						

12:30 - 13:30	Lunch Break			
13:30 - 14h45	Track A: Animal Cognition	Track B: Free Will	Track C: Breathing	Track D: Online Behavior
	Marton Nagy	Olga Markič	Elisabeth Zimmermann	Peter Hochenauer
	Voice Referencing Abilities in Domestic Dogs (<i>Canis familiaris</i>) <i>Sabina Žakelj</i>	Intuitions About Free Will and Intrusive Metaphysics: A Cross-Cultural Study <i>Anže Baš</i>	Modelling the Effects of Breathing on Cognition Using a Cognitive Architecture Connected to a Simulation of Physiology <i>David Cserjan</i>	Effect of Emotion Manipulation on Accepting and Sharing of Fake News <i>Lubica Komarová</i>
	The Causal Role of Cortisol in Mediating Behavioural Flexibility in a Social Cichlid <i>Zala Ferlinc</i>	Compatibilist's Intuitions on Zygote Argument: Using Survey and Interview <i>Tzu Nung Lin</i>	I am Breathing: How Respiration Shapes the Self <i>Asena Boyadzhieva</i>	Dark Patterns in Website UI Design: Cookie Consent Banners <i>Matej Poljak</i>
		How Grounded Cognition Can Accommodate Morality Without Emotions, Free Will and Other Minds <i>André Zitterbart</i>		Affect, the Master Pulling the Strings? The Influence of Emotional States Induced Cognitive Strategies on Social Polarization: An Automated Analysis of Online Textual Data <i>Surya Knöbel</i>
14:45 - 15:15	Coffee Break / Socialising			

15:15 - 15:30	Off-Screen Time / Computer Break			
15:30 - 16h45	Track A: Linguistic	Track B: From Cells to Cognition	Track C: Method for Brain Activity	Track D: Creative Learning
	Kristína Malinovská	Marton Nagy	Igor Farkaš	Toma Strle
	Towards Slovene Word Sense Disambiguation Through Transfer Learning <i>Zoran Fijavž</i>	Biophotonics and Information Processing: the Possible Informational Content of Autofluorescent Phenomena <i>Maša Bratuša</i>	Intrinsic Functional Connectivity of the Amygdala Subnuclei Parcellations <i>Carina Ufer</i>	Creative Movement Teaching: A Kinaesthetic Approach to Teaching Electrical Engineering in High School <i>Eva Urbančič</i>
	What's in a Pun? Assessing the Relationship between Phonological and Semantic Features and Perceived Funniness of Puns <i>Anna Palmann</i>	From Genes to Cognition: Ligand-gated Ion Channels in Selected Cognitive Processes. <i>Nina Lang</i>	Analysis of Activity Flow over Resting-state Functional Networks <i>Primož Prevc</i>	Learning Improvisation to Deal with Unexpected Situations <i>Tjaša Može</i>
		Inhibition at the Physiological, Behavioral, and Traits Level <i>Michal Kováč</i>		Match Me If You Can - Continuous Dynamics of Learning to Coordinate Auditory-motor Rhythms with a Partner <i>Constanze Leeb</i>

Friday, June 18, 2021

09:00 - 10h15	Track A: Social interactions	Track B: Cognition and Pathologies	Track C: Perceived Reality	Track D: Modeling Cognition and Neural Networks
	Markus Peschl	Marton Nagy	Toma Strle	Martin Takáč
	Intentions and Affordances in Action Prediction <i>Maria Arias Sutil</i>	EEG Connectivity in Patients with Broca's Aphasia <i>Vanesa Močilnik</i>	What Is It Like to Wake up After Waking up? Testing a Combined Method for Lucid Dream Induction (Pilot Study) <i>Arijana Birsa</i>	The Question of Free Choice with the Autonomous Systems - An Example of Self-driven Automobile of the 5th Level <i>Alan Hazdovac</i>
	Happy Places, Happy People? The Effect of Modest Forms of Social Interaction on the Subjective Quality of Experience in Public Spaces. <i>Lena Müller-Naendrup</i>	Convolutional Neural Network in FTIR Histology <i>Nina Leonova</i>	A Distorted Reality: Depressive Disorders and the Perception of the World <i>Simon Šalomon</i>	Mathematical Techniques to Reveal Cognitive Mechanisms of Auditory Looming Bias: Connectivity Analysis of Auditory Psychophysics and Neurophysiological Measures <i>Kevin Purkhauser</i>
	Understanding Social Reward: A Systematic Review of Human Studies <i>Isidora Bojkovska</i>	The Linguistic Profile of Individuals with Brain Tumors <i>Aylin Calleja-Dincer</i>	Living with Low Visual Acuity: An Analysis of Cortical Thickness in Subjects with Uncorrected Myopia in the Context of Predictive Processing <i>Wilma Konrad</i>	Neural Networks for Emotion Recognition for Spoken Slovene <i>Zala Gruden</i>

10:15 - 10:45	Coffee Break / Socialising					
10:45 - 11:00	Off-Screen Time / Computer Break					
11:00 - 12:00	Poster Session 2					
	1. Lemmel	2. Malla	3. Halgašová	4. Kalan	5. Ferlan, Knific	6. Swaboda
	7. Kraut	8. Katnik	9. Kastelic, Slivšek, Žabnikar	10.Konečný	11. Podgornik	12. Brziak
	13. Zvarík	14. Dodič	15. Cséfalvayová	16. Mattová	17. Friebe	
12:00 - 12:30	Lunch Break / Socialising					
12:30 - 13:30	Lunch Break					
13:30 - 14:30	Plenary Talk: Representing value in the prefrontal cortex Sebastijan Veselič (UCL - University College London)					
14:30 - 14.45	Coffee Break / Socialising					
14:45 - 15:00	Off-Screen Time / Computer Break					
15:00 - 16:30	Alumni Panels					

Saturday, June 19, 2021

09:00 - 10:15	Track A: Treatments	Track B: Stress	Track C: Biases and Decision-Making	Track D: Conceptualising Cognitive Sciences
	Bri Römmer-Nossek	Markus Peschl	Peter Hochenauer	Igor Farkaš
	Development of a Screening Tool for Alexinomia and Its Validation <i>Sara Jakaj</i>	Effect of Stress Inducing Vr Games On Immersion and Presence <i>Viktor Sojka</i>	Personalization of Persuasive Technology Based on a Decision-making Style: Promotion of Energy Conservation <i>Janja Pecan</i>	Analogy as the Core of Artificial Cognition <i>Niko Kroflič</i>
	Effects of Dopaminergic Medication and Deep Brain Stimulation on Cognitive Impulsivity Domain in Parkinson's Disease <i>Darja Čepon</i>	Design of Human-Chatbot Interaction in Stressful Scenarios <i>Veronika Vishnevskaja</i>	Individual Differences in Attention Control and Visual Working Memory <i>Sinem Mustacoglu</i>	Rethinking Representations: Institutions and Predictive Processing <i>Tamas Gömöri</i>
	EEG Correlates of Good and Bad Movement in Acute Stroke Patients for Future BCI Rehabilitation Protocols <i>Ajda Bergant</i>		Analysis of Biases and Debiasing BERT Models <i>Marko Narat</i>	Comparing Micro-phenomenological and Constructivist Grounded Theory Analysis <i>Oskar Dragan</i>
10:15 - 10:45	Coffee Break / Socialising			
10:45 - 11:00	Off-Screen Time / Computer Break			

11:00 - 12:00	Poster Session 3					
	1. Gudenus	2. Cimcim	3. Sirk, Šiško	4. Reinwarth	5. McClelland	6. Frančeškin
	7. Širec	8. Jelovčan	9. Plementaš	10. Schimanosfky	11. Andolšek	12. Savelli
	13. Patyczek, Petersen	14. Berbić, Nonković	15. Liu	16. Jethmalani		
12:00 - 12:15	Coffee Break / Socialising					
12:15 - 12:30	Off-Screen Time / Computer Break					
12:30 - 13:30	Plenary Talk: From “Internal Clocks” to Motor-Dependent Time Perception Nadine Schlichting (Heinrich-Heine-University Düsseldorf)					
13:30 - 14:00	Conference Closing. Best Poster & Best Talk Award					
14:00	Post-conference Coffee/Lunch Together (optional)					

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Invited Talks

Modelling Multimodal Communication in Social Robots

Stephanie Gross

OFAI - Austrian Research Institute for Artificial Intelligence

For robots to be able to naturally interact with and learn from humans in the future, mechanisms are needed that enable robots to naturally communicate with humans. In task-based natural language interactions with robots, both verbal as well as nonverbal communication cues such as gestures or eye gaze play a crucial role. Therefore, the robot needs to be able to identify and interpret human verbal and nonverbal communicative behaviour, as well as to generate robotic verbal and nonverbal behaviour. In this talk, I will discuss challenges that have to be addressed for robots to be able to handle multimodal, task-based interactions. These challenges include amongst other (i) which data to use to identify robot mechanisms necessary to interact in a meaningful, socially adequate way, (ii) applying multimodal reference resolution when verbal descriptions are insufficient, and (iii) generating nonverbal social signals when different robot appearances and actuators are available. These topics will be illustrated with examples from our own research.

From “Internal Clocks” to Motor-Dependent Time Perception

Nadine Schlichting

Heinrich-Heine-University Düsseldorf

Compared to other perceptual systems, the study of time perception – ranging from a few hundred milliseconds up to a few seconds – is particularly elusive. For decades researchers have been looking for neural correlates of interval representations – our “internal clocks”. After reviewing empirical evidence for and, mostly, against this idea, I will sketch out my ideas about how time is intrinsic to dynamic neural activity and becomes tangible to us only through meaningful interactions with our environment.

Representing value in the prefrontal cortex

Sebastijan Veselič

University College London

The prefrontal cortex is one of the major brain regions involved in cognition. It has a vital role for goal-directed behavior such as making decisions or making plans about where to go for holidays. This talk will focus on the neural signals occurring in the prefrontal cortex when choices between two options are made. Furthermore, it will focus on how individual regions within the prefrontal cortex involved in decision-making interact with one another during this process.

Talks

Intuitions About Free Will and Intrusive Metaphysics: A Cross-Cultural Study

Anže Baš

University of Ljubljana

Introduction

The free will vs determinism debate has both an old and complex history. Simply stated, the gist of the free will problem is whether it is possible for human beings to have free will if determinism is true or whether we are just a product of a complex cause-and-effect system. In their arguments, contemporary philosophers often appeal to the intuitions of their audience or so-called »folk« intuitive views about (in)compatibilism and in doing so shift the burden of proof to the opposing side. Such claims have inspired empirical research in the lay perceptions of the problem. Much of the research exploring the issue employs vignettes describing (in)deterministic universes and follow-up questions on whether or not the character acted freely. Almost two decades later, the question remains unanswered with studies supporting both sides. Even more so, some studies have shown that the answers given by laypeople are contingent upon how and who one asks [1]. Other authors have pointed out that participants often fail to comprehend the abstract material and impose the existing indeterministic notion of human agency onto the situation, which leads to misrepresentation of the scenario and is called the intrusion effect [2].

Moreover, some of the research in experimental philosophy was not reproducible and, similarly to most Western psychology research, relies on WEIRD

(Western, Educated, Industrialized, Rich, Democratic) samples [3]. If we want folk intuitions to play some role in resolving the free will debate, the generalizability of past findings has to be investigated. Hence, the purpose of the study is to explore the cross-cultural (in)stability of folk intuitions about free will and the intrusion effect.

Method and Expected Results

In addition to multiple classic scenarios used in previous research new scenarios will be developed for the purposes of the study combined with follow-up questions measuring intuitions and the intrusion effect. The research will include students (50-100 per country) from Austria, Slovenia, Taiwan and the region of Hong Kong. Given the cultural variation in explanatory style, diversity in values, philosophical judgement [1] and understanding of free will [3] significant differences in intuitions and intrusion are expected.

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EEG Correlates of Good and Bad Movement in Acute Stroke Patients for Future BCI Rehabilitation Protocols

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Introduction

Stroke is a neurological disease that has different degrees of injury and is one of the most common reasons for chronic disability worldwide [1], entailing rehabilitation to be present in all stages of recovery. There is a growing interest in ways to incorporate Brain-Computer Interfaces (BCI) for optimizing therapy outcomes in search of new therapy protocols. The most promising systems seem to be focusing on analyzing the recruitment of cortical sensorimotor rhythms (SMR), specifically mu rhythm, found within the alpha band activity, and two kinds of signal patterns, event-related desynchronization (ERD) and event-related synchronization (ERS) [2]. The purpose of this study is to explore whether the quality of performed movements is reflected in these neural signatures, eventually enabling in-home maintenance therapy for stroke survivors.

Methods

Our study will include 10-15 acute stroke patients. Our pilot study tested the movement paradigm and will consist of flexion and abduction of the upper limb joints. The patient's assessment of each movement will be done within the framework of Goal Attainment Scaling (GAS), a five-point scale, commonly used in

rehabilitation as a mathematical technique for quantifying the achievement of goals set. Patients will be recorded every other day for two weeks, with each session lasting 40 minutes, divided into three movement blocks. Data acquisition will be done with a 64 electrode EEG system as well as an Electromyograph (EMG) to record the correlated amplitude of muscle electrical activity.

Expected Results

We expect to observe a lower, mu ERD over central sensorimotor electrodes, reflecting better quality of movement. Furthermore, we predict correlating results in the data from EMG, differentiating good and poor muscle activity. Based on our pilot study results, a greater alpha power decrease in better quality movements is expected, indicating higher alertness and focus in better quality movements.

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Testing a combined method for lucid dream induction (pilot study)

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Introduction

Lucid dreaming (LD) is a meta-cognitive phenomenon in which an individual is aware of their current dreaming state. Some methods for LD induction that involve waking the participants in the middle of the night showed a decrease in the quality of sleep [3]. On the other hand, studies have shown the potential benefits of LD [1]. The main aim of this study is to test a combined method for LD induction, that is reliable but would not disturb the natural wake-sleep cycle. The method in question combines administering pharmacological aspects with psychological training. To facilitate induction of LD by pharmacological modulation we will use the dried herb of *Calea Zacatechichi* (CZ), which has shown anxiolytic and antidepressant-like effects in rodents [2] and an increase in dream recall and vividness..

Procedure

The study will take place over two consecutive weeks. The combined LD induction method involves ingesting the CZ tea infusion before going to sleep (the dosage of the tincture will be adjusted to the BMI of each individual). Secondly, the participant will practice a cognitive SSILD technique (Senses Initiated Lucid Dream), that involves focusing attention on one's visual, auditorial and physical sensations [1]. This task will be performed before falling asleep. Upon awakening, participants will write down their dreams in a logbook, which is an effective method for

increasing dream recall [1]. Lastly, they will be instructed to rate said dreams, using the LuCiD scale. The control group will follow the same task without ingesting CZ. Both groups will also rate their sleep quality, using Sleep Quality Scale (SQS), before and after participating in the study. For both groups, we expect more frequent dreaming and higher ratings on the LuCid scale during the procedure, as well as positive or unchanged scores on SQS.

Discussion

LD is a unique state that could help us better understand consciousness. Because of its self-reflective properties, it also has a lot of therapeutic potentials. CZ is a reliable pharmacological supplement that is widely used and has shown mostly positive effects [2], even though it has rarely been used in scientific research. It is also necessary to maintain an undisturbed sleep cycle, so this study pays special emphasis on testing a method, that does not involve waking in the middle of the night. With this study, we hope to further research on efficient and healthy LD induction methods.

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Understanding Social Reward: A Systematic Review of Human Studies

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Rationale

There has been a recent surge in interest in social reward as a phenomenon in cognitive science, social neuroscience, and psychology [1], [2]. Social rewards are attractive and appetitive stimuli such as a smile, gesture or approval which induce approach behaviour and guide expectations [1]. However, little is understood about what constitutes a social reward, an otherwise broad and heterogeneous phenomenon [1], [2]. Most of what we do know comes from comparing social rewards to non-social rewards, such as money [1], [2]. In these instances, the choice of social reward stimuli (e.g., thumbs-up image) is often based on shared characteristics with the non-social stimuli (e.g., coin image) [1] which negates those aspects that might be specific only to social rewards. As such, the similarities and differences derived from these comparisons might be conflated with dimensions other than sociality (e.g., tangibility, familiarity etc.) [1].

Therefore, the current paper aims to contribute towards a better understanding of social reward by firstly investigating the operationalization of this concept, as well as the types of stimuli and measures used in experimental human studies. Secondly, the paper also aims to utilize a data-driven approach to extract the corresponding higher order dimensions or clusters.

Methods

To achieve this, a systematic review of the existing literature will be conducted on experimental human studies that include social reward as a stimulus. A literature search was performed using the keywords “social reward”, “prosocial reward” and “socially rewarding”. The abstracts of the initially generated articles were screened for inclusion criteria. All surviving articles proceeded to a full-text screening for which data will be extracted into a coding sheet including social reward (concept, content, familiarity, duration, delivery time etc.) and measure characteristics (concept, content etc.). The results will be synthesized narratively with an overview of the main variables (type of study, social reward, stimuli, measures, task). Broader categories and/or continuous dimensions will be extracted from these main variables.

Defining social reward in a clearer manner will help identify future directions regarding the development of new measures and stimuli used to investigate it. Furthermore, it will facilitate the soundness of implications when comparing social to non-social rewards or when comparing social rewards across species.

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I am Breathing

How Respiration Shapes the Self

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“Know thyself”, the maxim goes. This is no trivial task. Knowing oneself is a continuous process of attuning to change. Introspectively directed at first blush, it is a social act in its root. The processes which bridge the intraindividual and interindividual dimensions are, however, understudied. The current project suggests that breathing is well situated to acts as an organizer of the self on multiple levels. Positioned between the volitional and the autonomic, as well as the external and the internal, it is a powerful regulatory tool [1]. An enactive and dynamical systems theory account is used to conceptualize the relevant interactions. Although the model is applicable to all stages of life, empirical evidence is sought in a period of critical importance to the development of (bodily) selfhood - infancy.

Empirical Investigation

The respiratory interoceptive sensitivity, that is, the ability to perceive one’s own breathing sensations, of infants 8- to 10-months of age is operationalized by an implicit behavioural task [2]. An image expanding either in or out of synchrony with the infant’s breathing rhythm is visualized on a screen. Preliminary evidence shows that infants look at the asynchronous animation longer, suggesting they are sensitive to their breathing signals.

To explore how respiratory sensitivity is related to the development of cardiorespiratory synchrony, infants’ respiratory sinus arrhythmia (RSA) is

measured at resting state. We hypothesize that infants with higher respiratory sensitivity also have a higher resting RSA.

Further, the interaction between the inter- and intraindividual levels is investigated by recording RSA-coupling in mother-infant dyads during free play. We then analyse whether the degree of physiological synchrony is predictive of infants’ degree of respiratory sensitivity.

Implications

Understanding how respiration interacts with the various dimensions of selfhood is a prerequisite to utilizing it as a science-based tool for self-regulation. The conceptual model can support the development of nonpharmacological breathing interventions applicable to research and clinical settings, as well as everyday life. The empirical findings will advance the understanding of the development of bodily selfhood on the individual and intersubjective levels. Overall, the “I am Breathing” project empowers an (en)active stance towards self-regulation.

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Biophotonics and information processing?

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Introduction

Biophotonic radiation, i.e. cellular autofluorescence, is a result of mitochondrial metabolism observed in all cells. The role in growth coordination has already been established, but its possible effects in information processing of neural ensembles remains uncharted. Mitochondrial deficiencies have otherwise recently been confirmed in tauopathies, schizophrenia and autism spectrum disorder [1].

Argument

This theoretical exploration will try to find sound evidence that biophotons can, via the photoelectric effect, influence dipole moments of tubulin (due to the presence of delocalized electrons in aminoacidic aromatic rings) in microtubular lattices and that this could be a causal agent in neurotransmitter transport, dendritic computation and synaptic activity. Subsequent electromagnetic (EM) fluctuations may alter local ionic gradients, while autofluorescence itself has been proven to be sensitive to EM fields - providing a necessary feedback loop. The work also explores delayed photon radiation from neurotransmitters as a mechanism of natural optoepigenetics.

Our previous work has hypothesized enhanced spatial exposure of myelin transcription factors in meditators, which has been validated by findings of Marco [2]. Myelin hyperintensities have been implicated in frontotemporal dementia, while impaired myelination is correlated with schizophrenia – both findings are consistent with a

previous hypothesis that a proper amount of myelin ensures ample optical insulation of proximal neurons, and with that non-pathological EM fluctuations and electrical excitability. This mechanism for local-to-global coordination could inform the yet-unsolved problems of circadian clock synchrony, spatial coordination of mitosis, and also provide a demonstrable ground for theories such as Integrated Information Theory, CEMI field theory [3] or Orchestrated Objective Reduction.

Discussion

Motivation for this work stems from the question whether and how chemical signalling alone could suffice for rapid, complex, and coordinated actions of unicellular organisms. Preceding work suggests that biophotons participate in growth coordination and we aim to conduct a thorough analysis of literature to provide a testable hypothesis about the role of evolutionarily ancient biophotonic radiation in information processing.

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The Linguistic Profile of Individuals with Brain Tumors

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Introduction

Temporal and frontal brain tumors can cause language impairments which may be reduced or exacerbated by surgery and influenced by tumor size or location. These impairments are often mild and affect specific aspects such as verbal fluency [1]. Pre- and postsurgical language assessment is necessary for diagnosis and treatment. Further research is needed as test batteries and treatment are mostly based on stroke instead of brain tumor research [2].

Research Question & Hypotheses

The aim of this thesis is to find out how language impairments are characterized and diagnosed in persons with brain tumors. A selective impairment of verbal fluency, spontaneous speech, metaphor and text comprehension is expected. It is further hypothesized that language is negatively affected by tumor removal shortly after surgery and by tumor size, and that the impairment pattern differs between left and right hemisphere tumors.

Methods

15 individuals with frontal or temporal brain tumors of the left or right hemisphere underwent standardized language testing and magnetic resonance imaging (MRI) before and immediately after tumor resection.

Preliminary Results

The patients' results in the test batteries have been analyzed, but a statistical analysis is still pending. The preliminary descriptive results suggest mostly intact picture-naming, repetition, reading and writing, but subtle to more apparent difficulties in verbal fluency and metaphor comprehension.

Discussion

The results will be interpreted in view of the discussion about the necessity of specific language tests for this clinical population [2]. Moreover, findings regarding specific patterns of language impairment and recovery may contribute to ongoing research on the pre- and postoperative cerebral neuroplasticity of individuals with brain tumors [3].

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Effects of dopaminergic medication and deep brain stimulation on cognitive impulsivity in Parkinson's disease

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Introduction

While a gradual loss of cognitive performance is usually observed in normal aging, patients with Parkinson's disease (PD) often develop cognitive impairments and executive dysfunction additional to the most common motor symptoms [1]. This in turn has been associated with development of different impulsive behaviours and many relate it with the PD treatment; whether being on dopaminergic medication or having surgical intervention such as deep brain stimulation of the subthalamic nucleus (STN-DBS). Generally, impulsivity is described as acting fast without planning, however, multiple domains of impulsivity have been recognized; most notably reflection, motor and cognitive impulsivity domains [2].

To the best of our knowledge, no study has previously examined the effects of dopaminergic medication and STN-DBS on different domains of impulsivity simultaneously, therefore a larger study is intended to disentangle between different effects, addressing each of the three impulsivity types by the use of specific experimental task. However, for the purpose of this master's research I will focus on the cognitive impulsivity. Firstly, because it

seems to be least explored and secondly, this type of impulsivity appears to be very relevant in everyday life and can therefore contribute to understanding the effects of the treatment on the post-treatment functioning of PD patients in their daily life.

Methods

As part of a larger study, 20 PD patients (50-60 years old) treated with bilateral STN-DBS will be assessed - on and off dopaminergic medication and on and off STN-DBS on three different impulsivity measures; AX continuous performance task for motor impulsivity, delay discounting task (DDT) for cognitive and beads task for reflection impulsivity. Several questionnaires will be used for clinical measurements of impulsiveness and screening for exclusion criteria. Separately, a control group with healthy subjects (N=20) will be tested within the same age group as the patients. As said before, I will focus on the cognitive impulsivity, therefore I will be analysing the results from DDT.

Results

Based on previous research, we expect that dopaminergic medication and STN-DBS will affect impulsivity domains in different ways. Regarding the cognitive impulsivity, we expect, that patients with STN-DBS on stimulation and on medication to have higher discount rates (higher impulsivity), with higher reward magnitudes, as proposed STN-DBS alters decision making in high conflict situation.

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Modelling the Effects of Breathing on Cognition Using a Cognitive Architecture Connected to a Simulation of Physiology

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Introduction

There is significant interest in understanding how physiological and cognitive systems in humans interact. Exploring these relationships require resource-intensive experiments with human subjects and not all variables of interest can be measured because of technical and ethical limitations.

Breathing is a necessity of life and a bodily function humans can bring to mind with relative ease. Research into the effects of breathing on human performance suggests that breathing in a controlled manner can influence task performance.

Problem

To understand the human mind, efforts to create models of it have been made. One significant contribution to this field of cognitive architectures is ACT-R [1]. In a similar effort to understand the human body, HumMod has been created as a comprehensive simulation of the human body and its functions [2]. To take the role of the body, its functions, and their effect on the mind seriously, Dancy connected ACT-R with HumMod by modelling the relationship between physiological variables and affective states (Step 1) and affective states and memory (Step 2) creating ACT-R/ Φ [3].

Approach

The aim of this thesis is to: 1) explore the connections between breathing techniques and cognitive processes / task performance, 2) identify the relevant physiological variables mediating cognitive processes, 3) expand (if necessary) the HumMod physiology simulation to model breathing techniques that have been shown to influence cognitive processes (e.g. tactical breathing), 4) connect the breathing model in HumMod to ACT-R modules using sound theory to formally model how breathing might influence cognitive processes.

Contribution

By creating a model of breathing to influence the performance of a cognitive architecture, similar to how breathing influences task performance of humans, we open up possibilities to simulate breathing related experiments that might be hard to run with human participants. Results of such and related experiments could serve as stepping stones to further understand the relation between physiological and cognitive processes and contribute to our understanding of the human mind.

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Test-Retest Reliability of Peak Alpha Frequency Measure

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Introduction

Peak alpha frequency (PAF) is an individual measure of peak power within the EEG alpha band. In the absence of pathology, PAF has been shown to be a stable trait-like parameter, reflecting individual differences in cognitive abilities [1], [2]. Moreover, evidence suggests that PAF can be used to differentiate between healthy and clinical populations, as in case of Alzheimer's dementia [2]. Most of the research on the reliability of PAF has been conducted in a highly standardized laboratory setting. The aim of our research is to determine whether PAF could potentially be used to predict cognitive performance in a natural setting. We tested the reliability of PAF and compared it across 24 scalp EEG channels. We expect to find a moderate test-retest reliability.

Methods

The study was conducted on 8 healthy volunteers (6 women) with mean age of 63.6 ($SD=10.5$). Two EEG recordings were obtained from each participant at two different times (approx. two to four weeks apart). EEGs were recorded on 24 channels using a custom app and EEG system developed by BrainTrip Limited. Measurements were conducted in a home setting at varying times of day. In each session we recorded eight minutes of resting-state EEG signal, alternating between two minutes with eyes closed and two minutes with eyes open. For the reliability measure

we calculated the within-subject Pearson correlation for PAF in the closed-eye condition.

Results & Discussion

Since our measures were carried out in a home setting, there were several uncontrolled factors that could potentially influence the EEG recordings. Previous research [1], [3] found the test-retest reliability of PAF to be high ($r=0.83-0.95$), whereas we expect to find moderate reliability with $r=0.50-0.80$. If PAF showed to be a consistent measure outside of laboratory environment, it could potentially offer a more easily accessible and widely available way of cognitive testing.

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Comparing Micro-phenomenological and Constructivist Grounded Theory Analysis

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Introduction

In the field of cognitive science, the importance of qualitative research, especially the investigation of lived experience, is becoming increasingly relevant, leading to the rise of various qualitative research techniques that try to provide a rigorous approach to first-person data collection and analysis [1]. It is argued that these approaches share some similarities and are generally compatible [1], however, they differ in some of their epistemological presuppositions, which are reflected in the steps we, as researchers, choose when analysing our data (e.g. are the data analysed purely inductively; i.e. starting only from the data, or do we consult the literature when constructing categories) [2]. This, in turn, affects our understanding of phenomena under investigation [2]. Accepting this, we are faced with a crucial task of explaining *how our epistemological presuppositions affect our understanding of phenomena under investigation*. The goal of this study is to contribute towards achieving this task. By comparing micro-phenomenological (MP) and constructivist grounded theory (CGT) analysis we hope to shed light on some of the core aspects influencing the research results (e.g. attitude and expectations with which the researchers approach their data), the necessity of which is for example addressed by Kordeš [3]. We will do this for the process of data analysis only, keeping in mind the

limitations of our findings stemming from impossibility to acquire epistemologically neutral data.

Method

First, the clarification of epistemological presuppositions of both MP and CGT analysis is needed. Both methods will then be used on the same dataset consisting of samples of experience previously gathered using empirical phenomenological interviews on the experience of performing a visuo-spatial working memory task. Following the formation of results for both analysis methods respectively, comparison of said results will be made.

Expected results and implications

The expected differences in results derived by the two individual methods with the understanding of both epistemological backgrounds will hopefully provide some insight into how epistemological presuppositions of MP and CGT analysis influence the formation of results. This insight could lead to its inclusion in analytical tools for future research.

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The causal role of cortisol in mediating behavioural flexibility in a social cichlid

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Introduction

Activity of the hypothalamic-pituitary-interrenal (HPI) axis – the HPA axis equivalent in fishes, is regulated by a glucocorticoid (GC) induced negative feedback. The HPI activity following the circadian peak and acute stressors is constrained via the lower affinity glucocorticoid receptors (GR) that are found in high concentrations all over the pituitary and the brain. A short-term rise of GC hormones is important for adaptive responses of the animal, e.g., it enhances cognitive performance [1]. Although memory formation and attention are known to be influenced when exposed to stressors, whether stress also mediates behavioural flexibility is less investigated. The main objective of these experiments is to investigate the causal role of cortisol in mediating behavioural flexibility after repeated stress exposures in the cooperatively breeding cichlid fish, *Neolamprologus pulcher*.

Methods

Drug treatment. Mifepristone (RU486) is a potent progestin and GC antagonist, which binds to GR. Mifepristone application has been shown to result in blunted GC peak [2]. The treatments will be applied as water baths following [3].

Behaviour. In Experiment 1 (MIF $n = 25$, control $n = 25$), a detour task will be used to test behavioural flexibility following an acute stressor. This task will measure how quickly a focal subject will find a new route when the one it has previously learned is blocked.

Hormone sampling. In Experiment 2 (MIF $n = 10$, control $n = 10$), we will sample basal and stress induced cortisol levels using the fish-holding water method.

Brain sampling. In Experiment 3 (MIF $n = 10$, control $n = 10$), we will assess whether the MIF treatment alters GR expression after exposure to a stressor. We plan to cull test fish immediately after the water baths and a stress exposure to extract brain samples for gene expression analysis.

Expected results

We predict that blocking GRs by mifepristone treatment will decrease stress responsiveness in our experimental fish, and this in turn will result in impaired behavioural flexibility, lower cortisol levels, and a downregulation of *gr* in the brain. On the other hand, we expect non-treated fish to exhibit the adaptive bell-shaped GC response, resulting in increased behavioural flexibility.

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Towards Slovene Word Sense Disambiguation Through Transfer Learning

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Introduction

Word sense disambiguation (WSD) models benefit machine translation and information retrieval. Supervised models, based on lexical knowledge bases or manually annotated texts, are work-intensive. This limits the development of WSD models for low-resource languages such as Slovene. We address that by using transfer learning and a small high-quality Slovene WSD dataset.

Method

We will build and compare several WSD models for Slovene. We will use pre-trained Slovene-English contextual word embeddings, shown to perform well on an array of tasks even when trained exclusively on English examples [1]. Following state-of-the-art supervised models for WSD in English, we will also include lexical knowledge bases (e.g. WordNet) as a training signal in a neural model [2]. In addition, we will attempt to augment the Slovene WSD model by using Slovene non-WSD datasets through multi-task learning [3]. Auxiliary tasks will be identified through an interdisciplinary literature review on word disambiguation. Models will be evaluated by using an upcoming Slovene WSD dataset.

Expected results

We expect that a model incorporating

multilingual contextual word embeddings and standard English WSD training data will outperform the baseline of simply selecting the most frequent sense in the Slovene evaluation data. Furthermore, we expect that incorporating lexical knowledge bases and auxiliary tasks will improve the performance further.

Conclusion

An upcoming high-quality Slovene WSD dataset will allow for the automatic evaluation of Slovene WSD models. We will create these using multilingual contextual word embeddings, lexical knowledge bases and multi-task learning. The research may yield robust Slovene WSD models, advances in adapting models for smaller languages and insights into the value of particular auxiliary tasks for WSD in relation to features already represented in contextual word embeddings.

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Rethinking Representations: Institutions and Predictive Processing

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Introduction

What role do mental representations play in social ontological accounts of institutions? What can they tell us about institutions? The two most prominent camps in theories of social ontology can be summarized as the rule-based and the incentivized accounts of institutions, both of which rely heavily on the concept of feed-forward mental representations.

Accounts of Institutions

Incentivized theories focus on how humans are incentivized to coordinate and how this coordination turns into equilibria. Coordination can thus be explained through the lens of game theory: the different players of a coordination game, coordinate when the players respectively maximize their payoffs.

Rule-based accounts of institutions, on the other hand, propose that institutions are abstract rules that are recognized (but not necessarily followed) by all parties involved in the institution. Collective recognition necessarily involves collective intentionality – the suite of cognitive mechanisms which enable the creation of representations that are public and shared by two or more individuals [1]. These representations constrain and inspire new behaviors by the rule-based framework that they present. They also provide deontic powers: rights, obligations, prohibitions, etc. which motivate individuals to act on institutional rules, not just dispositions.

Methods

This research will draw on literature from philosophy of mind (specifically predictive processing) and social ontology.

Institutions and Predictive Processing

I will argue for an interaction-based account of institutions: the social interaction between two agents can be thought of as attempts to minimize error [2] and institutions serve to facilitate this prediction error reduction by providing mutual expectations about how an interaction should be structured. Mental representations in this account can be conceived of as aiming “to engage the world, rather than to depict it in some action-neutral fashion, and they are firmly rooted in the history of organism-environment interactions [3].” There is thus an incentive for following rules prescribed by institutions, as their error reduction allows better predictions for modeling and engaging the (social) world.

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Neural Networks for Emotion Recognition for Spoken Slovene

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Introduction

Speech is a complex signal containing a large amount of various information about the message, speaker, language, emotion, etc. [1] With the fast development of artificial intelligence and its growing role in everyday life, it is becoming ever more important for technology to understand people's needs and emotions as well as possible. To this end, we must teach artificial intelligence to recognize and accurately classify emotions in our voice.

Human emotions have been an important area of research for a long time, with numerous models and theories attempting to describe them. One of the best-established models is Plutchik's "Wheel of emotions", which proposes eight primary emotions: anger, anticipation, joy, trust, fear, surprise, sadness, and disgust [2].

Problem

Though neural networks have markedly improved in the classification of human emotions, a substantial challenge remains in dealing with the variety of languages and cultural differences that do not permit generalization across language groups. Even if we train a network to deduce emotions solely from the vocal and acoustic characteristics of words rather than their meaning, a neural network that works efficiently for one language or cultural environment may not work as well in another.

Though much research has already been done for the English-speaking world, we are not aware of any study in this specific area for the Slovenian language.

Our work will be centered around the classification of the emotions of a Slovene speaker. We will explore the transferability of existing models for other languages to Slovene as well as similarities of emotional expressions in different languages and cultures – to the extent that we can study them using neural networks as a tool.

Methods

We will create a dataset of short audio clips extracted from Slovene movies with captions. We will use some standard text mining approaches (such as a dictionary of words, indicative of specific emotions) to automatically detect emotionally loaded subtitles. The corresponding audio clips will be labelled with the detected emotions and used as data for our study. The data will be used to train and later test two neural networks: LSTM (Long short-term memory) and TDNN (Time delay neural network) that are designed for processing sequential data (such as audio or video). The performance of the two networks will be evaluated on out-of-bag data and assessed using a confusion matrix and common measures used in the field of text mining, such as precision, recall, and F1.

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The Question of Free Choice with the Autonomous Systems – An Example of Self-Driven Automobile of the 5th Level

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The concept of autonomy has often been connected with free choice and moral responsibility. According to Kant, people are autonomous beings because we manage our lives alone and write laws that we obey or not [3]. In technological sense this concept is connected with the autonomy of a certain function. In the example of a robot it can be described as a range, with which a robot can sense the environment, and plans an act with the help of information about the environment, as well as executes it with a purpose to achieve a certain goal. Doing all this, it acts independently, without human interference. Autonomy is described on 10 levels, whereas on the first one, a human is responsible for executing all the tasks, and on the last level there is complete autonomy [1].

An important question connected with autonomy is the question of free choice. In the case of people it is the characteristics, which makes them feel that they themselves are the source of their choice and that this choice is not executed under external coercion. I will follow the definition of Sanchis [2], who contributes the freedom of choice also to artificial entities and it defines it as a decision-making process, where amongst the offered alternatives the agent first chooses a predictable choice,

immediately after that follows a second choice, which enables the agent to stay with the chosen alternative or decide randomly for a new alternative from the offered set. Such definition can be described as surface freedom and is analysed in a similar way as the freedom of action [3]. Defining free choice in the way determined by Sanchis [2] opens many question for example is this freedom powerful enough to build moral responsibility upon it [3], but in this article I will concentrate on the question if self-driven cars of the 5th level achieve such a degree of free choice. Besides, I will also find out whether they could potentially achieve it and would this at all be desirable.

The method used in my article will be comparative analysis with which I will compare the process of decision-making and free choice as understood by Sanchis [2] and the decision-making of autonomous automobiles of the 5th level. I expect that the results will show that the self-driven cars of the 5th level do not reach these criteria so that such freedom of choice cannot be attributed to them.

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Development of a Screening Tool for Alexinomia and Its Validation

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Introduction

»What separates and distinguishes me from other people is the fact that I am called by my name; but what unites me with them is the very fact that they call me" [1]. People constantly use names in order to start a conversation, address someone politely or simply to call out for someone over a distance. Despite this tremendous social importance it has recently been shown that there seem to be individuals who cannot say names even though they want to [2]. They struggle with anxiety, feelings of blockade and the problem seems to become bigger the closer the relationship and it is the strongest in romantic partner relationships [2]. There is no prior research on this topic and the disability has not yet been documented as a disorder, however we decided to name it as Alexinomia (from ancient Greek; A: implies a disability, lexis: words, omnos: names), thus the literal meaning is "no words for names«. My Master's research focuses on the development and validation of a symptom screening instrument that will enable us to test for Alexinomia and thereby facilitate further research and potentially the development of therapeutic interventions. The research is mainly psychological but it also covers several other disciplines such as philosophy of names, linguistics and statistics.

Methods

Firstly, a qualitative research was performed on 13 participants, who were 18-40 years old and reported about their difficulty in addressing people by their name on internet blogs and forums. One aspect of this research was to understand the underlying causes of Alexinomia and figuring out how Alexinomia might be related to certain psychological traits and behaviours as measured with interviews and standard psychological questionnaires (BFI-2, SIAS, ECR-RD12, DSI-G, VASQ, KFB). Afterwards, we have developed a questionnaire as an instrument to assess whether someone is experiencing Alexinomia or not and to what degree (mild - moderate - severe).

Results

We analysed the data acquired with questionnaires in the first part of our research with the Independent Samples T-Test and received some significant results. Since the instrument for the assessment of the disability has only just been developed, we currently have no results about its validity. The following steps of my Master's research include a review of the screening tool by experts, testing the questionnaire with two groups - people who show no signs of Alexinomia and those who experience this disability. Lastly, we will analyse the results and we hope to prove that our questionnaire is valid in identifying Alexinomia properly.

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Affect, the Master Pulling the Strings?

The influence of emotional states induced cognitive strategies on social polarization: An automated analysis of online textual data

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Introduction

The affective turn has led to a paradigm shift in several disciplines. In research on social and political polarization this shift has led to a refocus in perspectives of ideological towards affective polarization. Hence affect and not ideology has emerged as a main indicator for social polarization [1]. This paper delves into the plurality of implications that stem from the effects of emotions on two broad cognitive strategies, and its effects on the polarization of online discussions during different timestamps.

Theoretical Background

More specifically I focus on concepts related to emotionally induced shifts in cognitive strategies, which are indicators for online discussions being characterized by higher versus lower levels of polarization. Concerning extracted measures from the first cognitive strategy, namely cognitive complexity, I build on theories such as dual processing theory [2] and dimensional affective intelligence theory [3]. The main assumption is that discussions which are characterized by emotional sentiment with more extreme valence and lower potency tend to be rather repetitive as participants who experience extreme valence are not open to process new ideas while sticking to simple heuristics and habits. Concerning the second, cognitive breadth, I build on

theories that focus on how different emotional moods narrow or broaden people's minds and perceptions. The main assumption regarding this cognitive strategy is that a discussion which is characterized by lower semantic breadth and smaller shift of focus tends to be rather polarized.

Case Study and Methods

To analyze shifts in emotional states and corresponding cognitive strategies I will focus on discussions around the disruptive period of Covid-19. The reason for this is that disruptive events are moments in which emotions are stirred up and habituated cognitive strategies shaken. Using a dictionary-based sentiment analysis approach, affect detection methods, and semantic similarity methods I aim at analyzing textual data related to the Covid-19 pandemic from comment sections of two Austrian newspapers at specific timestamps to track changes during different phases of the pandemic. Building on the given assumptions, I plan to infer via different combinations of the extracted measures whether a discussion during a given timestamp is characterized by higher or lower polarization.

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Effect of emotion manipulation on accepting and sharing of fake news

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Introduction

Emotion manipulation is one of the tactics used while creating fake news headlines [1]. Such content is appearing on social media platforms and then it is often shared among users. Comparing the velocity of spreading of the fake news and real news, fake news tend to spread three times faster than real news. Scientists observe even faster spread of politically motivated fake news [1]. Fake news has always been among us but they have never had such wide audience because nowadays, everybody can become advocate for fake news. All they need to do is create a webpage and post fraudulent content.

Classical reasoning account as a theory promotes analytical thinking as a virtue in searching for a sound judgement [2]. It is in line with the dual-processing theory of judgement where analytical thinking brings us closer to a sound judgement than so-called "gut feeling" [2].

Many factors can influence decision process when one is deciding whether to believe in the news presented. One of the factors is current mood [2]. We suspect showing of the emotion manipulation practices in fake news will increase anxiety in participants. Anxiety tends to decrease the gullibility causing believing in fake news [2], which might lead to lower susceptibility to the fake news.

Aim

In this work, we would like to explore whether reading about fake news practices using emotion manipulation immediately before reading fake news headlines affects the judgement of such news. This includes rating of the news with regard to their accountability as well as participants' sharing preferences of content.

Methodology

In this study, we will create two groups of participants. First will be presented with fabricated Facebook posts from a made up source without emotion manipulation and second with emotion manipulation. Manipulation will be demonstrated using alarming pictures or headlines. We will use Positive And Negative Affect Schedule (PANAS) to access participants' emotions. Additionally, we will be searching for correlation between one's liberalism or conservatism and its affect on fake news.

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Living with Low Visual Acuity: An Analysis of Cortical Thickness in Subjects with Uncorrected Myopia in the Context of Predictive Processing

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Introduction

Myopia or nearsightedness is a very common optical dysfunction that affects many people around the world, with rising numbers. Myopia is characterized by low visual acuity when looking at objects at a greater distance. It can be treated with optical correction in the form of glasses or contact lenses. However, many affected individuals choose not to wear any correction unless it is absolutely necessary, for example when driving a car or when going to the theatre. As a result, this group is used to unreliable visual information in everyday life, having to do more ‘guesswork’ in order to make sense of the input [1].

In predictive coding theory, perception is assumed to be an active process of constantly matching top-down expectations with incoming sensory information, frequently resulting in a mismatch, a prediction error. Correcting for this error leads to an adjustment of predictions in higher hierarchical levels. The strength of the sensory input influences the size of the prediction error and the top-down prediction. According to this theory relying on weak sensory input leads to a stronger role of top-down predictions [1][2].

Aim and Hypotheses

The aim of this thesis is to conduct an experiment using MRI to investigate the cortical thickness of areas related to visual processing and the relationship to low visual acuity. We hypothesize that the constant weak sensory input in the low visual acuity group should lead to a greater dependence on top-down prediction, resulting in increased cortical thickness in the parietal cortex in subjects with uncorrected myopia. However, we do not expect any differences in the occipital cortex.

Methods

For the experiment, 60 participants will be recruited through an online questionnaire and a subsequent ophthalmologic examination. Participants will be separated into 3 experimental groups: one group of 20 subjects with myopia, who choose not to wear their full optical correction in their everyday life, 20 subjects with myopia who are fully corrected and are used to good visual acuity, and 20 subjects with emmetropia who do not require optical correction. Afterwards, all participants will undergo an MRI scanning procedure at the University MRI Laboratory in Graz, Austria. T1 weighted structural scans will be used to examine the cortical thickness of the participants.

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Inhibition at the Physiological, Behavioral, and Traits Level

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Introduction

Inhibition is a concept with a long history spanning across scientific disciplines including philosophy, neuroscience, and psychology [1]. Its deficiency is related to a broad range of psychiatric disorders including schizophrenia, OCD, depression, ADHD, and addiction [1]. Currently, inhibition is considered to be a fundamental cognitive function that can be observed on different levels including physiological, behavioral, and personality traits one [1]. While we have some understanding of individual measures, the links between them are still mostly unknown. Our aim was to examine links between physiological measures prepulse inhibition (PPI) and prepulse facilitation (PPF); behavioral measures go/no-go task (GNG) and stop-signal task (SST); and traits of neuroticism, schizotypy and impulsiveness (measured by NEO-FFI, SPQ and BIS-11 respectively).

Methods

A within-subject experiment was conducted on 123 participants. The mean participant age was ~23 years (SD 2.67) and the group was evenly split by sex. In PPI and PPF a weaker stimulus is presented, shortly followed by a stronger one. Based on the delay between the two a weaker than baseline (PPI) or stronger than baseline (PPF) startle response is achieved after the second pulse. The response level was measured by EMG of the startle eye blink. Auditory pulses were used as stimuli with

delays of 30 ms, 60 ms, 120 ms, 2000 ms, and 4000 ms. In GNG participants were instructed to press a button as quickly as possible if a go target was presented and to avoid pressing it if a no-go target was presented. A cue with 80% validity was presented before the target. Visual stimuli were used for cue and target presentation. The split of go/no-go targets was even. In SST participants were instructed to press left button when left arrow was presented and right button when right arrow was presented. In case of an auditory stop signal, presented after the go signal in 25% of trials, they were instructed not to press either of the buttons. Initial stop signal delay was 250 ms and it was adjusted by ± 50 ms based on success/failure in the previous stop trial. Standard procedures were followed to obtain NEO-FFI, SPQ and BIS-11 data.

Results and Discussion

We found no correlations between PPI and any behavioral nor a traits measure. However, we found a novel correlation ($\rho = -0.225$, $p = 0.012$) between PPF and GNG reaction time delay calculated by comparing valid vs. invalid cue trials. Another correlation was found between GNG and SSD. Multiple correlations between various traits were found as well. No links other than stated were found between different levels which suggests that while all measures measure a part of the broad concept of inhibition, they are reflecting mostly independent processes.

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Ligand-gated ion channels in addictive behaviour

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Ligand-gated ion channels (LGICs) are transmembrane proteins increasing permeability to particular ions upon ligand binding. LGICs are essential elements of neurotransmission and are involved in various neuropsychiatric disorders [1]. Each protein is coded by a specific gene, variations of which translate into functional differences. Thus, genes can be molecular windows into neuronal pathways. Variants of certain genes (genotype) are linked to certain behavioural traits (phenotype) [2]. Links between certain receptor subunits and behavioural function were previously established. Variants can contribute to aberrant function [1] [2] [3].

The thesis will examine whether computer-assisted analysis of human-derived data from multiple publicly available sources (such as DisGeNet, Allen Brain Atlas, The Human Genome Project, Genes2Cognition) confirms known genotype-phenotype links and establishes new connections. We will look at associations between regional specific gene variants and chosen behavioural markers such as behavioural disinhibition/impulsivity, novelty seeking and stress reactivity. This will let us explore connections between gene expression and behavioural traits, for example, those that are exaggerated in addiction. We hypothesize that multiplexed analysis of data will strengthen the evidence for associations between ligand-gated ion channel subunit encoding genes and specific dimensions of addictive behaviour. Genetic variants, gene expression in neuronal and glial cell types in defined brain regions, and behavioural markers corresponding with

addiction will be analysed, aiming to gain insight into possible linked pathways.

Merging Genome-wide association study, systematic literature review, integrated theory and complex systems with data-driven feature selection we hope to establish described associations. Subdivisions of behaviour (such as impulsivity in addictive behaviour) and associated anatomical regions will be identified through a literature review. Database research will follow, where genes will be associated with behavioural markers and regional expression. Further, social and phenomenological aspects of addictive behaviour will be addressed, exploring their influence on characteristic behavioural traits and their connection with recognized genes. We anticipate novel insights and hypotheses about LGIC genes with the aid of very recent data - with emphasis on genes for which only weak associations with phenotypes exist.

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Match me if you can - continuous dynamics of learning to coordinate auditory-motor rhythms with a partner

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Introduction

People in every culture not only listen to music, but also produce music with one another. Group music-making requires that partners coordinate the timing of actions with one another. The underlying mechanisms of interpersonal auditory-motor synchrony has been studied across a range of contexts [1],[2]. Coordination dynamics are highly influenced by auditory coupling between partners: partners typically display mutual adaptation when they can hear one another, whereas “leader-follower” dynamics typically emerge when not all partners can hear one another [3]. Although the dynamics of interpersonal auditory-motor synchrony are well-described, most work focuses specifically on coordination of discrete movement and sound, even though continuous motions and sounds are much more common in real world contexts.

Methodology

This thesis investigates the phenomenon of how partners use auditory information to coordinate the timing of continuous motions. Pairs of individuals will coordinate the timing of continuous sound-producing movements under different auditory feedback conditions. These conditions are (i) uncoupled (participants only hear themselves), (ii) unidirectional 1 (both

participants hear participant 1), (iii) unidirectional 2 (they hear participant 2) or (iv) bidirectional (they hear each other), which can be compared to literature of discrete motion and sound [3]. Further, learning (i.e. less relative phase-offset) across trials will be assessed and compared for the different conditions.

Hypotheses

We hypothesize that a “leader-follower” dynamic will emerge for the unidirectional conditions, as well as a “hyper-follower” (both follow each other) dynamic for the bidirectional condition. These predictions stem from work on discrete movements [3]. In addition, a learning effect across trials is expected, meaning that the relative phase-offset between the partners will be smaller for the last block than for the first block of trials. This might be especially pronounced for the bidirectional auditory feedback condition, as this provides the most feedback information.

The thesis will help to tackle the question, how people manage to successfully adapt to one another.

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Convolutional Neural Network in FTIR Histology

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Introduction

The state-of-the-art method for cancer diagnosis and study is histopathology, which involves examining tissues and cells by an expert pathologist. However, it is possible to access quantitative data about the tissue through the use of Fourier transform infrared (FTIR) spectroscopic imaging techniques, which allow us to work with both spectral and spatial information about various parts of the tissue. The analysis can be conducted with the use of convolutional neural networks (CNN) — to date one of the most popular deep learning techniques for image classification. Our research is focused on building a CNN which is able to take advantage of both spatial and spectral information about the tissue and classify with high accuracy major cellular and acellular constituents of tissue [1].

Methods

High- and standard-definition FTIR images of samples of breast tissue are used for the research. The samples were previously examined and marked by expert histologists. As in the research [1], we will use both SD and HD images (6.25 μm and 1.1 μm per pixel, respectively).

The data is first preprocessed following established protocols: piecewise linear baseline correction is applied, then the spectra are normalized and finally principal component analysis is used to reduce dimensionality of the data, which results in

keeping the components capturing more than 90 percent of the variance. After that the data is tested using different supervised and unsupervised classifying techniques, such as k-nearest neighbors, support vector machines, decision trees, random forests, naive Bayes and neural networks. The results of these tests will be compared with the results from classification by CNN.

Key part of the research will be the construction of CNN, with two sets of convolution and pooling layers and a fully connected ANN. Hyperparameters such as optimization method, weight initialization, batch size and normalization, activation function, number of training epochs and other implementation details are going to be kept as close to the original research as possible in order to obtain similar results.

Expected Results

We will compare the results of classification obtained through different data preprocessing techniques with the research [1], in an attempt to establish the key components of data preparation. Furthermore, we will assess the appropriateness of using CNN versus other classifiers and determine whether CNN is able to extract meaningful features and use spatial as well as spectral aspects of the data, performing significantly better than traditional classifiers. Finally, it is expected that the results of the tissue component classification will be matched to the high accuracy results in the original research.

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Compatibilist's intuitions on Zygote argument: Using survey and interview

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Introduction

Not believing in free will may lead to negative impacts such as increase cheating, aggression, reducing helping behavior, and lower the feeling of attitude [1]. On the other hand, people who believe in free will perform better at work and academic settings [2]. However, in the field of neuroscience, several experiments found out that the unconscious is leading the conscious behavior which supports the view of determinism [3],[4]. If the universe we are living in is determined, how could it be possible for us to believe in free will at the same time? This may lead to my research question: how to think as a compatibilist? I will answer this question by examining what are the compatibilist's intuitions toward the Zygote argument and how do they come to the conclusion of disputing the Zygote argument?

Method, Conclusion

I will use surveys and interviews to find out the logic and the psychological mechanism behind how compatibilists go against the Zygote argument and to inform us the way of believing in the existence of free will even in a deterministic world.

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EEG Connectivity in Patients with Broca's Aphasia

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Introduction

Brain connectivity measures provide insight into the communication of functionally distinct brain areas. Language comprehension problems of individuals with Broca's aphasia indicate that a failure in communication has occurred. Broca's area serves as a bypassed node when it comes to the maintenance of words in working memory networks, which is an essential part of language comprehension [1]. One electrode or one source can be considered as a node in EEG research, and the intensity of the connection between the two nodes can be measured using correlation, coherence, or other statistical formulas [2].

Our objective is to compare functional and effective brain connectivity before and after rehabilitation.

Methodology

In our research, we will use high-density EEG data from the research of Gorišek Rutar et al. [1], recorded with 128 electrodes, in which the impact of Broca's aphasia on one's working memory was examined. The data consists of 10 patients' records of working memory based on the Sternberg task [3]. Our study is focused on functional and effective brain connectivity analysis. The latter is used to analyse directed information flow, so the interaction of the nodes, whereas, in the former method, only the amount of information is accounted for [2]. First, we will preprocess the existing EEG data, and extract the

maintenance and rest periods. Second, we will compute the weighted Phase Lag Index (wPLI), a measure based on phase synchronization in which all possible pairs of electrodes, within a region of interest, are used to get functional brain connectivity [2]. To obtain effective brain connectivity, we will use the Granger Causality [2]. In the end, we will use linear modeling and other statistical methods to analyse the results.

Projected Results

We expect that the brain connectivity measures after rehabilitation will show an increase in the number of nodes involved in the task-solving in the vicinity of Broca's area and that this will be positively correlated to the average number of items successfully stored during the task.

Discussion

One of the main issues of studying functional connectivity in EEG data is the difficulty to draw inferences due to the real-time changes occurring in the central nervous system [2]. In order to avoid such mistakes and make the most of the high temporal precision of EEG data, the focus of our study will be analysing the connectivity changes not only across the tasks but during the tasks as well.

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Learning Improvisation to Deal with Unexpected Situations

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Introduction

Dealing with uncertain situations is inevitable and can be unpleasant in professional as well as in personal situations, causing anxiety, making it more difficult to respond and adapt quickly and effectively. Due to rapidly changing circumstances, organizations are constantly forced to evolve, adapt and improvise [1]. The main idea of applying improvisation in organizations and business areas is that improvisation is a set of skills needed when we are faced with unforeseen and unexpected situations in everyday life and can therefore be used in business interactions. However, it is still unclear how exactly improvisational skills can be learned. The project's aim was to gain insight about their benefits through experienced international experts from different domains selecting interdisciplinary approach, hoping to discover how to learn them.

Method

The data used for the analysis were collected through 15 online video interviews with various experts who have practical experiences applying and living by improvisational principles in their domains. Workshops followed after the interviews, where interviewees introduced and led practical demonstration of improvisational activities. The obtained data were analyzed using Atlas.ti Cloud, a software for qualitative analysis using codes and categories, following the grounded theory approach. Accordingly, the interviews were transcribed and imported into the software

where they were processed individually using codes, categories and memos of phrases, sentences and sections connected to improvisation that seemed important and relevant. The analysis followed five main research questions focusing on what improvisation is, which skills are needed, can they be learned and should they be applied in mentioned areas. Analysis extracted individual answers to form an overview of a general answer. Interviewees were asked open-ended questions, letting them discuss how their domains connect to improvisation, how they use it and what seems important to them while still keeping a pre-formed frame of pre-identified themes.

Discussion

The analysis showed that the phenomenon of improvisation is complex because it demands profound insight in emotions, social skills, communication, creativity, flexibility and subjectivity. Improvisation is not a replacement for long-term planning. And yet, in today's situations where you have to predict uncertainty it is important for organizations and people to be flexible and adaptive, having the ability to react in the moment. However, given the specific set of skills necessary for improvisation, further research should focus on specific learning mechanisms for developing improvisational skills.

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Happy Places, Happy People?

The effect of modest forms of social interaction on the subjective quality of experience in public spaces.

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Introduction

Just being surrounded by others positively affects individuals' subjective well-being [1]. In public spaces such modest forms of social interaction are among the most frequently observed activities and constitute an essential part of a vibrant urban life [2]. Consequently, there has been growing interest in disentangling how the built-environment influences its users' subjective experiences and potentially enriches the quality of urban life. Therefore, *this thesis aims at investigating the effects of modest forms of social interaction on the subjective quality of experiences in public spaces.*

Theoretical Contextualisation

The thesis delves into the topic by drawing on two main theoretical pillars: The embodied cognition approach and the theory of optimal experience embedded in the field of positive psychology. Optimal experiences are generally characterised by a complete absorption in current activities that provide possibilities for skilful learning and reward. Furthermore, it has been discovered that social feedback and external stimulation play important roles in eliciting positive experiences [1]. The embodiment perspective strongly emphasises the importance of lived human experiences as well as the circular dynamics between the human mind, body and environment. In coherence with both frameworks, it is hypothesised that enhancing the quality of

experience involves providing possibilities for meaningful experience, which in turn can be generated by modest forms of social interaction in public spaces [3].

Methodology

The thesis aims at generating an explanatory model by combining theoretical concepts with first empirical insights derived from a case study two Viennese public spaces; the Wientalterassen and the Alois-Drasche Park. A mixed-methods approach consisting of a stationary activity mapping and participants surveys and semi-structured interviews will yield snapshots of momentary subjective experiences in public spaces and thereby feed into the model.

Expected Findings

The resulting model will not just provide further insights in how we perceive and experience our built-environments but will also shed light on the debate about qualitative differences of public spaces. Based on prior literature research it is expected to find that many people consider public spaces as possibility to engage in indirect forms of social interactions and therefore intentionally decide to spend time at the sites. Furthermore, it is hypothesised that those people will report positive experiences and moments of flow while being in the chosen public spaces.

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Individual Differences in Attention Control & Visual Working Memory

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Introduction

Previous studies asserted that humans could maintain representations of three to four items at a time in visual working memory (VWM) and this limit varies across individuals [1,2]. The ability to control attention and minimize distraction has been suggested to be one of the primary factors determining an individual's VWM capacity. This research derives from a larger study that is based on the approach that immersive virtual reality (VR) environment can enhance attentional control and VWM capacity. Our aim is to explore the aspects that may reveal insights on the individual differences in attention control and VWM by focusing on the neural correlates of attention deployment and attention suppression with respect to the trainings.

Study Design & Objective

In the experiments, the subjects of the test group carried out three training sessions in CAVE (Cave Automatic Virtual Environment) within five weeks whereas the control group didn't receive trainings. The trainings focused on manipulating participants' ability to ignore the task-irrelevant stimuli and remember the task-relevant information. Three sessions of the change detection task (CDT) with easy and difficult tasks were carried out by the participants of the test ($n=15$) and control ($n=15$) groups.

The objective is to identify the individual differences based on participants'

performances, task-load and primarily on trainings in order to address the following research questions: 1) Does VR training affect early and late attention mechanisms? 2) How do the attention control and VWM capacity differ from person to person in CDT? The research questions are investigated via an exploratory approach with the focus on the training, performance and task-load.

Methods & Analysis

The study combines neurophysiological and behavioural investigation. The behavioural analysis involves the accuracy of the responses and reaction times. Neurophysiological analysis is based on the electroencephalogram (EEG) recordings and focuses on the event-related-potentials (ERP) that mark the early (N1, P1) and late (PD, N2pc) attention processes.

Discussion

The results of the study will reveal insights on individual differences and attention control within the change detection paradigm and VR trainings. We hypothesized that better VWM performance derives from better attention control. With this respect, we expect to find differences in attention control among high and low performers and detectable changes on the ERPs that mark early and late attention processes over the different testing sessions.

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Analysis of gender biases and debiasing BERT models

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Introduction

Natural language processing is a modern approach to processing language with computers, more specifically in the field of machine learning. There are different approaches to natural language processing that use different models, one of which is BERT – Bidirectional Encoder Representations from Transformers. These models learn on language by analysing corpora of texts for example Google News. The models architecture gives the it the required freedom to successfully learn by itself, but also means that the results are not self-evident and that the trained model has to be examined and researched. While the models work remarkably well, it is difficult to precisely say why and further research is required.

Research of trained models shows that they capture syntactic, semantic and some generalized world knowledge. Within the research of captured semantic knowledge it has also been shown that these models capture various human biases. With this in mind, this project aims at examining a Slovenian BERT model for biases and debiasing it. Although the trained biases of the model are obviously present in the training data, the wide variety of practical applications of a biased model can have harmful consequences. Using such models for analysing job applications for example, requires the model to be debiased.

Methods

One of the most commonly used method to

research language biases in such models is fill-in-the-gap probes. Fill-in-the-gap probes are questions of type “Paris is to ____ as London is to England”, expecting the model to return the word France. Using this form of questions, we can ask the model “Man is to pilot as woman is to ____” to measure gender biases in professions. In this research I intend to use the set of questions considering gender profession biases prepared and used in the work of N. Garg [2] and examine the biases in a Slovenian BERT model.

If biases are shown to exist the next step of this research is to fix them. This is done by either examining and fixing the weights of the relevant heads, or adding another to the end of the model to fix the biased predictions.

Expected results

Based on previous research of different BERT and other natural language processing models, which have all shown detectable biases, I expect to be able to detect gender biases regarding occupation in a Slovenian model. I also expect to be able to fix all detected biases by adding another layer to the model.

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What's in a pun?

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Punning jokes are a form of humorous wordplay based on semantic ambiguity between two phonologically similar words – the pun and the target – in a sentence context where both meanings are more or less acceptable [1].

When analysing punning jokes, one major aspect is phonological features of the pun and the target. Previous research attempted to quantify and compare these, looking at correlations with acceptability and understandability. Additionally, semantic features are to be considered when examining the success of a punning joke [1]. However, to date there has been no comprehensive empirical investigation of the influence of phonological and semantic features on the perceived funniness of punning jokes.

The Present Study

Thus, this study aims to quantify and compare phonological and semantic features in a punning joke and assess their influence on its perceived funniness. This will be done in an explorative manner using different methods from computational linguistics on a set of punning jokes rated for funniness in pairwise comparisons. Based on previous phonological analyses of puns [2] it is hypothesized that lower phonological distance will be associated with higher funniness ratings. For semantic distance and fit within the sentence context, there are no directed hypotheses yet.

The Bigger Picture

There is a considerable number of other factors influencing the perception of funniness of punning jokes [3]. These

include sentence and discourse context, speaker-listener relationship, or cultural background. But also, individual differences such as personal taste in humour, or language proficiency are likely to play a role. Therefore, as additional outcome, an extensive model of factors involved in humorous processes associated with punning jokes will be created. For this, previous empirical and theoretical findings from humour studies will be summarized and different paradigms from cognitive science will be applied.

Implications

Language and humour are higher cognitive processes and strongly connected to social communication. By doing research in these areas, new insights about the nature of human communication, interaction, and cognition can be gained. Further, findings can be applied to develop computer software for identifying, creating, or translating puns.

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Personalization of Persuasive Technology Based on a Decision-making Style - Promotion of Energy Conservation

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Introduction

Due to the dangers of climate change, energy management behavior is an important, yet incredibly complex process depending on different values and drivers motivating the behavior. Persuasive technology (PT), defined as an interactive application, designed to bring desirable changes, without using deception or coercion, can be used to change the behavior of energy consumers in residential buildings [1]. PT is most effective when it is successfully personalized, and tailored to an individual's preferences. PT can be tailored to an individual's decision-making style (DMS), which can be measured using different psychological constructs such as Need for Cognition (NFC). NFC measures an individual's »tendency to engage in and enjoy effortful cognitive processing« [2]. I will explore the following questions: i.) Do participants with the same attitude towards the environment differ in NFC score? ii.) Can persuasive design be personalized based on an individual's DMS to increase its impact? iii.) Are participants with different NFC scores experiencing the designs differently?

Methods

In the pilot study, recruited participants will be presented with a questionnaire that will assess their DMS (using the NFC scale), and their environmental attitudes (using the Environmental Attitude Inventory scale).

Based on their scores they will be assigned to one of the groups, given two different designs (matching their DMS and non-matching their DMS), and asked to assess the design's persuasibility. After that, a subset of individuals will be invited for a semi-structured interview, to gain insight into participants' subjective experiences and learn how to improve future designs. In the second part, a field experiment will be done. Additional 120 households will be recruited and given the designs, that match their NFC scores. Their energy consumption will be measured before and during the intervention.

Conclusion

First, I expect to find differences between participants' NFC scores. Second, I hypothesize that individuals with higher NFC scores will prefer designs that will be based on arguments, while participants with lower NFC scores will prefer designs that will be focused on less cognitively demanding persuasion strategies. Due to the importance of the role PT plays in motivating pro-environmental behaviour, increasing its impact by personalization based on DMS, could facilitate decreasing an individual's carbon footprint.

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Dark Patterns in Website UI design: Cookie Consent Banners

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Introduction

Dark Patterns in UI design are commonplace anytime we browse the internet or use services on websites. They are “a user interface that has been carefully crafted to trick users into doing things...they are not mistakes, they are carefully crafted with a solid understanding of human psychology, and they do not have the user’s interests in mind” [1]. An example would be preselected or highlighted buttons on websites manipulating users’ attention. Employing these patterns makes sense from a business perspective, but this practice is not user and human-centric. Dark patterns have been used widely in consent-obtaining mechanisms such as cookie banners in the last years.

Research question

Recent research has identified that while people generally care about their privacy, rational privacy decision making is obstructed by a large number of cognitive and behavioural barriers i.e. biases, which are exploited by dark patterns [2]. Recognizing and categorizing these mechanisms can help us design and implement bright patterns into user interfaces. These work in an opposite way to dark patterns, with the user's best interests in mind. Experiments demonstrating that bright patterns are effective in changing participants' behaviour in a positive way regarding privacy decision-making in cookie consent banners

are promising [3]. Our experiment expands on such research by testing additional types of dark and bright patterns, for which there are currently no data, to discover user-centered design practices for cookie consent banners.

Method

Each of the student participants who will visit a real-world Austrian e-learning platform will interact with one of several banner variations or a default, control banner. Each of the variations has been altered to nudge users into behaving in a certain way by utilizing either a dark and bright pattern. This is mostly done by changing the layout, colour, prominence and position of the buttons on the banner.

Expected results

We expect that participants will, when faced with a bright pattern, be more wary and thus give consent at a smaller rate or at least take more time considering the request, when compared to the control variation and especially when compared to the dark pattern variations. This will enable us to recommend best practices when designing cookie consent banners.

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Analysis of Activity Flow over Resting-state Functional Networks

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Resting-state fMRI is a neuroimaging method used to analyze spontaneous brain activity in the absence of an explicit experimental task. It usually focuses on functional connectivity, which is defined as the temporal correlation between neuronal activity of anatomically distributed brain regions. These analyses have revealed that various brain regions form relatively stable functional networks, but the specific connectivity patterns can differ between subjects and can change over time, even during a single fMRI recording session. These changes could correspond to the many diverse cognitive states that participants can experience while they are at rest. It would therefore be important to develop methods which can give us some insight into the first-person experience of the participants and explore how it relates to functional brain networks and their transformation over time.

The analysis of specific cognitive states and their emergence over time could be conducted similarly to task-based fMRI methodology. However, there are some notable differences in the analytical frameworks of task-based and resting-state approaches, which represents a difficulty for the integration of these approaches. One proposed analytical tool that could bridge the gap between them is *activity flow* [1], which describes how task-evoked neuronal activity spreads over resting-state functional networks. Specifically, we are interested in applying this tool to the analysis of *flexible hubs* [2], and their effect on the connectivity patterns of resting-state networks. These

hubs, such as the fronto-parietal and cingulo-opercular networks, were shown to play a role in coordinating and reorganizing functional connectivity networks during goal-oriented activity [3], so we are interested if they perform a similar role in the absence of an explicit task goal as well.

This thesis is a part of a broader research project, which will also include the development and adaptation of experimental instruments for assessing participants' cognitive states and first-person experience during rest. The aim of this thesis is to develop analytical tools for studying activity flow and functional connectivity networks alongside the development of the first-person methodology. Finally, we will integrate and evaluate these methods in a pilot experiment, which will combine task-based and resting-state fMRI approaches.

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Mathematical techniques to reveal cognitive mechanisms of auditory looming bias

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Introduction

Yes? Can you hear this voice inside your head? And can you tell precisely, where is it emerging from? This thesis offers an interdisciplinary perspective on the cognition of hearing. Scientifically in more detail: on the mathematical interface between auditory cognition and neural activity.

Auditory Looming Bias

Recognizing sounds from an arbitrary environment and processing them mentally, requires a highly complex cognitive system. Previous empirical work [1] investigates in the phenomenon known as “auditory looming bias” (ALB), which states that listeners are more sensitive to approaching sounds, compared to receding ones [2]. Whether this effect, that gets explained as product of evolutionary pressure, is a perceptual bias for changes in distance, or a direct reaction to sound intensity remains to be controversial. Nevertheless, this study tested subjects in multiple scenarios with looming sounds, thereby measured behavior and EEG, while listeners judge motion direction [3]. As a result, ALB occurs as reaction to perceived motion in distance, rather than distance itself.

Mathematics of psychophysics

ALB can get induced by changing the spectral cues, while the intensity remains constant. Astonishingly this appears only if the stimulus holds continuously over time. Building on empirical data [1] and in order to reveal the spatio-temporal dynamics of the brain, this thesis explores and compares quantitative methods like granger causality, or phase transfer entropy [3]. With it elaborating the precarious differences between correlation and causality. That is important for describing the brain and the mind, such that they could be mapped onto each other in order to explain their relations and functions.

Conclusion

Learning more about the psychophysics and mathematics of acoustics, leads to various applications in science, medicine and industry. Based on these premises, the thesis overviews the potential of neural connectivity to provide highly informative constraints on brain computational process. Moreover, it critically discusses the influence of temporal- and spatial continuity of hearing and how to process metrics within the realm of cognition in general. This challenges theoretical frameworks and might serve as an explanatory and interdisciplinary bridge between neural connectivity and auditory cognition.

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A distorted reality: depressive disorders and the perception of the world

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Introduction & context

Mental disorders are increasingly becoming a problem of modern society: various studies and statistics show a clear increase in the number of individuals living with mental illness through the last decades, the number reaching 1 billion globally, and growing.

One of the most common types are depressive disorders, affecting 300 million people worldwide. These come in different types that can be distinguished by the different number of symptoms occurring, as well as their intensity and permanence (APA, 2013). They have serious consequences for both individuals and society, and should as such be perceived as a shared issue.

Aims & methods

My master thesis will be divided into theoretical and empirical parts. In the former, relevant terms such as mental health, mental disorders, perception, etc. will be described. I will study different models and use the method of meta-analysis to try to find common points to form a detailed interdisciplinary bio-psycho-sociological one.

In the latter part I am going to present the perception of depression in modern society, both by the general population and clinically-diagnosed depressed people, by using a combination of statistical methods and grounded theory approach partially-structured expert interviews.

In the first part, participants (N = 100) will fill out a specially designed questionnaire that will provide various data: personal, demographic, self-assessment (mental state, knowledge about mental disorders, attitude) and examination data. This data will enable the calculation and presentation (R-Studio) of different correlations between specific parameters, e. g. correlation between socio-economic status and experiencing depression, correlation between self-estimated and scientific knowledge, etc.

In the second part, clinically-diagnosed depressed people (N = 10) will be interviewed. The aim is to get diverse first-person data with a focus on the following questions: how are their lives affected by Major Depressive Disorder; how do they think society perceives them; and how experiencing stigma and discrimination looks like in praxis.

Outlook & further research

The topic is relevant both to cognitive science and the wider society. Research in the field of mental health has significantly improved our understanding of mental illness in recent decades, yet advancements in the treatment and management of symptoms remain, along with many other challenges. In the case of depressive disorders, science is determined to create a unified model that would clearly and fully explain these complex mental illnesses and account for failed treatments. This endeavour includes trying to understand affected individuals, their inadequate treatment in public health systems and the all too frequent occurrence of stigmatization and discrimination.

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Effect of Stress Inducing Vr Games On Immersion and Presence

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Introduction

Presence and immersion are the key characteristics of virtual reality (VR) experience. The immersion is defined as an objective ability of VR to block out as much real world as possible and show virtual world as plausible as possible, in order to make user perceive the virtual world as the real one. Presence is the subjective part of VR experience, the user's feeling of "being there". It is affected by user's personal characteristics, such as age, previous experience, or emotional state. Thus, some state of presence can be achieved without immersion, however full immersion is elevating state of presence in user. [2] [3]

Aim

The aim of this paper is to offer insight on how immersion and presence will be affected by stressful experience in VR. Our hypothesis is, that strong emotional experience, in this case fear and anxiety induced by stressful game will elevate levels of presence, while levels of immersion will remain constant in between groups.

Methods

In the experiment, 60 participants will be tasked to experience one of two VR games, stressful game Richie's Plank experience or low stress game NatureTreks VR. Groups of players will be chosen semi-randomly to

remain objective. Number of participants in each group will be same. Electro-dermal activity (EDA) will be measured during VR experience. After VR experience, participants will be asked to fill out questionnaire about their sense of immersion and presence during VR experience. [1]

Results

As was shown previously [1], stress inducing VR games can lead to elevated state of presence. This stress can be self-reported through questionnaire or measured by EDA. Results from questionnaires will be analysed and compared to results of EDA, in order to support our hypothesis.

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Intentions and Affordances in Action Prediction

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Introduction

Comprehending and predicting people's intentions is important when we want to conduct actions in an efficient way. The properties of the actor and the environment, allow us to predict different results by ruling out difficult outcomes as the action unfolds [1].

We understand social perception as a predictive process, in which the brain is continuously imagining hypothesis of the action being observed against the stimuli confronted [2]. These hypotheses comply with the expectations of efficient actions, and they are triggered when the action is incongruent for the observer [3]. According to the affordance-matching hypothesis [1], action possibilities or affordances can inform action understanding.

Methods

In this study, we seek to assess, whether joint affordances may guide action prediction, when the subject is observing the action from a first-person perspective. Participants will be presented with a video of an actor manipulating an object on a table between them. The subject will see the actor performing one of multiple actions: drinking from the object or grasping to pass it to the subject. The way that the actor performs the grasp will be the first cue for the subject to predict and understand the actor's action. Thus, the experiment will be set in a 2x2 structure, where one action will always be more congruent than the other: action

(drinking vs. pass) and grasp (drinking vs. pass). Using touch screen responses and explicit judgement we will look at the representation of perceptual bias judgements towards the subject's own expectations [3].

Discussion

The grasp-type of the object might afford the subject to predict the actor's intention, but this should be overridden quickly by the actor's movement of drinking or passing. We would expect the subjects to easily anticipate the end state of these actions while they are in progress, but the incompatible grasp will make this end-state uncertain. Moreover, we focus on whether, despite an incompatible affordance due to the actor's grasp-type and action movement, it inhibits the kind of anticipation and prediction of the observer [1], [2]. With this study, we aim to achieve an understanding of the role of affordances prediction and intentions of others on basic spatial processes in joint actions.

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Functional Connectivity of the Amygdala's Subnuclei with Different Parcellation Approaches

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Introduction

In humans, advances in neuroimaging contributed to the successful differentiation of ten subnuclei of the amygdala [1]. However, the amygdaloid complex deep within the brain is mostly investigated as a single structure, thereby neglecting the functional differences. Useful conclusions about a regions functional dissociation can be obtained by studying the intrinsic functional connectivity at rest. Some researchers already investigated the functional connectivity of different amygdala subdivision [2], [3] however no consensus about the different parcellations exists. This is because of two reasons: 1. For a precise delineation of the subnuclei a high signal quality and increased spatial resolution is indispensable and 2. Different brain atlases lead to diverse subdivisions. The aim of this research is to investigate to which brain areas the amygdala's subnuclei are functionally connected and how this is influenced by the parcellation strategy.

Methods

38 healthy volunteers underwent a 7-minute ultra-high field resting-state scan at 7T. With an optimized preprocessing pipeline the signal to noise ratio could be improved. Regions of interest (ROI) will be defined according to different publicly available atlases comprising amygdala parcellations. A seed based intrinsic functional

connectivity analysis based on Pearson's correlation of the timeseries will be performed. First and second level analysis will yield significant connectivity patterns. Further analysis will help to disentangle similarities and differences between parcellation strategies and subnuclei.

Expected Results

Ultra-high field fMRI makes it possible to balance the epistemological fine line between specificity and sensitivity in order to obtain meaningful results about the amygdala's connectivity which can hence shed light on different or similar functional roles. It is expected to replicate the connectivity patterns reported in [2], [3] in which divergences as well as convergences of the subnuclei's functional connectivity exists, as for example the ambivalent relation to the thalamus and the positive relation to the insula, respectively. However, the results of the investigations differ. Therefore, it is hypothesized that different parcellations of the amygdala subnuclei will influence the connectivity pattern and hence explain the inconclusive results.

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Kinaesthetic Approach to Teaching Electrical Engineering in High School

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Introduction

The kinaesthetic/creative movement approach to teaching is based on findings that bodily movement (muscular movement) promotes learning and understanding of complex and abstract concepts. It is based on the embodied view of cognition (4E cognition – embodied, embedded, enacted, extended) that includes the sensorimotor system as a part of our cognition [2].

Hypothesis

In the master thesis we will use the creative movement approach to teach electrical engineering concepts in high school. We base our study on the hypothesis that kinaesthetic in electrotechnical high schools promotes understanding of complex physical concepts, leads to higher motivation and participation in class and contributes to higher scores in written assessments.

Methods

We came up with a case study where lectures would be delivered using kinaesthetic method to half a class of students (experimental group) and using the ex-cathedra approach to the other half of the class (control group). The study

methodology includes kinesthetically taught lectures, written evaluation of knowledge (test) and a questionnaire to evaluate the social and participatory effects. After the lectures, both groups of students would answer the questionnaire about their experience with the teaching process and their subjective perception of the knowledge they gained. The class would later on also write the written examination where there would be several exercises connected to the concepts that were taught with the creative movement method. The analysis of qualitative data collected with the questionnaires and the quantitative data collected with the written examination (in the form of points gained on relevant exercises) will show us valuable details of students' experience and knowledge obtained with the creative movement/kinaesthetic method [1].

Expected results

We expect the kinesthetic teaching approach will lead to greater participation of students, enhance the social relations between students and help them understand sometimes difficult and abstract concepts better. We are continuing with the development of different movement-based presentations of electrical and mathematical concepts and studying diverse options for possible future research (e.g., collecting data from students wearing biometric sensors).

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Design of Human-Chatbot Interaction in Stressful Scenarios

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Introduction and Problem

Along with the extensive automation and optimization that AI offers to the industry, it also generates much negativity among users. Studies show that this negativity is associated not with the maturity of technology itself but primarily with unset user expectations and missing design of the interaction [2]. Human-AI Interaction (HAI) as a research area emerged in the 2000s and has an actively growing community, developing numerous studies and guidelines [1], slowly obtained by daily practice. Currently remains uncovered the influence of affective emotional states, in which users are often interacting with AI. Quantitative objective data is also not in place as a measurement of the interaction design effect. In this study, we are developing improved human-chatbot interaction design and testing on users under stress conditions to which extent it can reduce levels of sympathetic arousal associated with stress.

Approach and methods

We use a full factorial experimental design with two independent variables - improved interaction design (V_1) and stress factor (V_2). Levels of skin conductance response (SCR) serves a target variable. Based on existing research, we choose five design means and use them for developing a RASA-based conversational AI model. The chatbot assists participants in a quiz game, where they should answer ten questions taken from the “Jeopardy!” dataset. Time limitation and countdown are introduced as

a stress factor. The experiment is conducted in 4 groups of participants, age 18-44, without anxiety disorder and similar conditions, without professional experience with chatbots. Control group has $V_{1,2} = 0$ condition; test groups have factors combined as “default design/stress”, “improved design/no stress” and “improved design /stress”. The SCR is measured by skin impedance medical device [3]. Block design contains one stress phase framed with two relaxation baselines. Additional data sources are self-report of the participants and session logs.

Discussion

Expected results should reveal lower levels of SCR in groups with improved interaction design comparing to groups with the default one. The delta between median SCR in the “improved design/no stress” and “improved design/stress” groups will provide further valuable insights on the HAI design effect.

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Voice Referencing Abilities in Domestic Dogs (*Canis familiaris*)

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While domestic dogs are capable of communicating intentionally and referentially by understanding and responding to information provided by participants in the communicative context[1], the extent to which dogs can do so with vocal cues is not yet fully researched. The experiment aims to investigate how successfully are dogs able to use different types of vocal cues carrying referential information about the location of the hidden reward to locate it, thus highlighting cognitive capabilities of dogs in processing sound direction information and engaging in interspecies social communication. The existing body of research is expanded by testing various types of communicative cues.

Method

37 dog-owner dyads participated in 4 experimental conditions, each consisting of 10 consecutive trials. Dogs had to locate the reward (food) hidden in one of the two presented containers relying only on communicative cues provided by the demonstrator. The conditions differed in the identity of the demonstrator (experimenter or owner), type of verbal cue (context relevant words with tone forms expressing encouragement versus context irrelevant words spoken in neutral tone without emotional marking) and whether visual cues were used (pointing). The following conditions were examined: 1.) experimenter pointed to the container with the reward, 2.) experimenter spoke context relevant words with an en-

couraging tone towards the container with the reward, 3.) the owner spoke context relevant words with an encouraging tone towards the container, 4.) experimenter spoke context irrelevant words with a neutral tone towards the container with the reward.

Results

The performance was monitored by cameras recording from 4 different angles to assess the successfulness of each dog in using the cues to locate the reward. As one of the two components of social referencing is referentially looking towards the informant[1], the attention span during the demonstration was measured as well, with latency of reaching the chosen container used as a certainty measure.

The predictions are that the dogs will display a statistically significantly higher than chance success rate in conditions 1, 2 and 3, but not in condition 4.

Possible limitations are the slight variations in demonstrator performance and that the distance between the dog and the containers was the same for each trial, which did not take into account large variations in the sizes of the dogs.

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How Grounded Cognition Can Accommodate Morality Without Emotions, Free Will, and Other Minds

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Views that considered moral judgments to result from conscious reasoning processes dominated the discourse in moral psychology until the *social intuitionist model* (SIM) was introduced [1]. The SIM proposes that we arrive at moral judgments via emotional intuitions. When confronted with an action, we introspect our emotional reaction to it. If it is positive/negative, the action is judged to be morally right/wrong. While reasoning is allowed to lead to moral judgments in rare occasions, its role is in most cases limited to producing post-hoc justifications of the moral judgments arrived at through intuitions [1].

Recently, an account for the grounding of moral concepts that complements the SIM on a physiological level was proposed [2]. It conceives of emotions as interoceptions of patterns of bodily changes that arise in response to certain stimuli. Emotions, thus conceived, are postulated to ground moral concepts such as RIGHT or WRONG because the latter are constituted of the sensorimotor activation that results from perceiving an intentional action plus one's emotional reaction to it. The activation of RIGHT or WRONG in response to an action amounts to the moral judgment that the action is right/wrong [2]. One drawback of [1] and [2] is that they imply that beings without emotions (such as robots, potentially) do not exhibit morality. In my thesis, I engage in theoretical and conceptual analysis with the goal of

substituting the emotions used to ground moral concepts in [2] for a non-emotional evaluative component. Currently, I attempt to do so via *change detection* between the consequences of an intentional action and the agent's goal-state, their visualization of how they want the world to be. If little/substantial change is detected, the action is judged as morally good/bad. As this change detection is automatic and unconscious, moral judgments still result from intuitions. This allows the generalization of my account into an intuitionist account that preserves the benefits of [1], while avoiding its drawback.

Additionally, I will show that the account I develop works without presupposing that moral beings believe in *free will* and *other minds*. Free will is implicated in our assignment of intentions to others. It is widely assumed that morality does not make sense without it. Similarly, without belief in other minds, one has no reason to consider any other being as morally relevant, which should lead to degenerate moral judgments. By arguing that there are reasons to assign intentions without free will, and to subscribe to proper moral judgments in spite of not believing in the existence of others, I free morality of not only the requirement of emotions, but also of belief in free will and other minds. This is an important theoretical advantage as long as it is not definitively proven that free will and other minds exist.

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Posters

Sarcasm detection with deep neural networks

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Introduction

The research entitled 'Computer-assisted multilingual analysis of news discourse with contextual word insertions', led by dr. Marko Robnik Šikonja, focuses on text analysis based on neural language models; Within this broader project, I focused on machine detection of sarcasm as part of my apprenticeship. Sarcasm is a form of language where the literal meaning of a text is not true, but rather its exact opposite and it must be understood solely in terms of context/semantics. Thus, successful detection of sarcasm sets an important and interesting milestone in language comprehension by artificial intelligence. Such models have also not previously been used for the Slovenian language. My objective was to create a model for machine analysis of sarcasm based on state-of-the-art neural language models called BERT. I used the version called CRO-SLO-ENGual BERT [2], which is intended for cross-lingual transfer. My task was to put together a small test set of sarcastic comments in Slovene (110 examples from comment sections of news-outlets). Then I adapted the model for the detection of sarcasm, used an existing English dataset of 1791 examples [1] for training the model and tested it on my dataset.

Methods

As a classification task, the model receives a text and predicts if it is sarcastic. During training each input word is converted into a unique numerical vector and transformed into a numerical vector

space, based on the similarity between words, that are often used together. In this way the neural network can process the meaning of words.

Results and limitations

I expected the performance of my cross-lingual approach to be slightly lower, compared to existing approaches (F₁ scores of 70-90%), due to the cross-lingual recognition of sarcasm and a relatively small tuning dataset, which was the main limitation of the project. My cross-lingual model did not recognize any sarcasm in Slovene, based on evaluations of precision, recall and F₁.

Conclusions

One possibility that the model failed, is that the perception of sarcasm is currently not cross-lingually transferable due to its contextual nature. Alternatively, sarcasm might not be a universal linguistic phenomenon, as detection was successful when learning and testing took place in a monolingual sense (F₁ 94% on the English set and 52% on the Slovene set). It is also possible that the two datasets were too different in content.

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Use of Different Types of Learning Strategies in Self-Regulated E-Learning

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Introduction

The rapidly growing field of information technology gave us the opportunity to transfer the learning processes into an e-learning environment. A greater need for students to self-regulate their learning processes emerged, as many studies [2] have shown its importance in improving academic performance. An important part of self-regulation are learning strategies, which are techniques students use during learning to make their encoding process more effective [1].

First and second author participated in a part of the research project called "Efficiency of Different Types of Scaffolds in Self-Regulated E-Learning" (project number J5-9437, funded by the Slovenian Research Agency, project leader Cirila Peklaj), which investigates how learning outcomes in an e-learning environment are associated with the use of specific types of self-regulatory scaffolds. The participants in the project were Slovenian primary school students attending 9th grade. Their task was to learn an e-learning unit from the field of science. Afterwards, they took a test that assessed their knowledge. The students were divided into six groups based on the scaffolds they received. The first group had no scaffolds, the second had cognitive, the third metacognitive, the fourth motivational, the fifth had two of each type of scaffolds, and the sixth group had all of them. During

the process some participants were taking notes. Of all participants ($N = 304$), 205 took notes (127 female).

Method

Our part of the research was a qualitative analysis of the notes, based on the Weinstein and Mayer's [1] model, which involves coding three groups of learning strategies (rehearsal, elaboration, organizational) on basic and complex levels. After a training period (reading literature, learning the coding scheme, solving test examples), we independently coded 1/3 of the notes. Reliability analysis (Krippendorff's $\alpha = 0.98$) showed appropriate consistency between us, resulting in each individually coding half of the remaining notes.

Results

The analysis revealed that the most commonly used strategies in the notes were complex rehearsal and complex elaboration strategies. Based on previous studies [2], we expect the overall results to show higher academic achievement correlated with cognitive and metacognitive scaffolds, as well as the use of organizational strategies, especially complex organizational strategies.

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How Can You Be so Sure?: Metacognitive Assessment of The Dunning – Kruger Effect

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Introduction

The Dunning – Kruger or unskilled and unaware effect is a cognitive bias that occurs when low-performing individuals overestimate their performance, while high-performers underestimate it. [1] The UAE effect has been identified across various domains and populations. The goal of the project will be to examine the occurrence of the UAE effect in typewriting game in the self-assessment using metacognitive judgments facilitated through metacognitive interviews.

Experiment

25 non-native English-speaking participants will take part in an online keyboard typing game on their computers. The game will consist of three rounds in which the participant will be instructed to rewrite the provided English text. Participant's speed and accuracy will be measured, however not displaying the performance to the participant in the speed category and displaying feedback in the accuracy category. A set of self-assessment questions will follow the experiment. The set consists of questions asking them to self-evaluate their performance in general and in comparison to the other participants in the experiment. A basic demographic questionnaire will follow. The participant will proceed to a metacognitive interview which will examine her/his reasoning of the self-evaluations provided. The interviews will be coded with categories based on

reasonings behind their self-evaluation. Also, multiple categories will be created based on differences in participants' performance and self-evaluation score. The key research question is to find a relationship between coded qualitative categories and performance-evaluation differences. We assume that people underestimate their performance due to low self-confidence and unawareness about the performance of others. Those who overestimate their performance are expected to have not enough domain knowledge. The results will be presented at the conference.

Conclusion

Although we are investigating an otherwise generally very well-documented effect, the metacognitive aspect of the Dunning – Kruger effect has not been widely described in literature we found and the first time in the context of typewriting in this study. [2] We believe that examining this aspect will not only expand the knowledge about the effect theoretically but also practically, for example when proposing corrective strategies such as giving feedback. [3]

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Adaptive feedback in computer-based learning environment

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Introduction

The aim of the project is to propose a design for an adaptive feedback computer-based learning environment aimed to improve student's selfregulated learning, especially goal setting and learning motivation.

Theory

Self-regulated learning is a cyclical process containing three phases: preparatory, performance and appraisal, with metacognition operating at each one. In line with this, through a guided self-narrative goal setting task, students will be asked to verbalize in writing their motivations and personal goals (for their studies, but also more broadly), rank-order their priority, set milestones for achieving them, think about how to do so, and eventually reflect on their progress [1] The study of learning motivation has progressed substantially over the past decades. The Achievement Goal Questionnaire is one of the results of this research. It takes the widelyagreed upon split between mastery and performance focus, and elaborates on each dimension. The latest version of this model, socalled 3x2 AGQ model, will be used in this project. [2] Studies have shown that several of the Big-Five traits, especially at the facet level, predict the preferred individual motivation fairly well. [3] Through a standardized Big-Five test, a personality profile of the student is created, which is combined with the motivation measure in the individualized feedback, as well as used

separately to help students understand the make-up of their personality.

Adaptive feedback

The adaptive feedback of the computer-based learning environment is proposed in terms of pop-up notifications and reminders, based on the student's specific motivation blend, their Big-Five scores and results of the goal-setting task, providing individualized support in the process of learning and problem solving. One of the assumptions is that if this intervention proceeds successfully, student's overall motivation and SRL will naturally increase. Research on SRL interventions supports this assumption.

Conclusion

We believe that through this environment students will be able to better understand their own strengths and weaknesses, their motivation for studying, and the goals they wish to achieve. The adaptive intervention is meant to guide them through this process in an appropriate way. This proposed intervention is aimed primarily at entry-level university students; however, it should also be applicable in other educational stages.

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Ant Cognition: An Examination of Self-organization

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Background

Digital image processing, train scheduling, protein folding, formation-based routing of deliveries, packet forwarding in information networks: What do these diverse control problems and the foraging behavior of minute ants have in common? The short answer: ant cognition. *Ant colony optimization (ACO)* involving *stigmergic* pheromone trails are studied extensively to grasp the internal principles of complex behavior of ant colonies.

Purpose

In physics and biology, *self-organization* is defined as a dynamic set of nonlinear features that materialize from local interactions of individual units [1]. The bottom-up *agent-based modeling* (ABM) approach strives to develop computational models out of individual agents situated in specific environments to study complex systems. ABM differs from textual and *equation-based models* (EBM) in terms of decentralized coordination [1] and focus on empirical investigation [3]. The study of the run-time dynamics of ABM in physics and engineering has contributed the notions of entropy and information processing but otherwise reveals the “intentional stance” of the observer rather than cognition. Biological and computational agent-based models, however, *might* cognize: Similar to agent-based systems, in *autopoietic* systems, cognition is not generated by the nervous system but is the structural coupling of situated agents with their

environment in invariant constitutive relations [2].

Method

Our primary aim in this project is to metabolize the ABM mindset and its application in computational cognitive modeling, rather than aiming for any novel scientific discovery. We employ (i) the methodology of *constructionist* learning proposed by Seymour Papert, where the epistemological bulk is distributed into problem-based building blocks; (ii) ABM as proposed in [3], to generate and analyze emergent phenomena with the NetLogo programming environment; and (iii) an interdisciplinary perspective across biology, philosophy, experimental physics, computational modeling, and automata theory to examine autopoietic systems [2].

Expected Results

After gaining some orientation of the field and setting up the tool for hands-on experimentation, at the time of writing, we are narrowing down the subset of identified candidate models, which are to be used to study in detail how the related published results have been obtained.

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Interventions to reduce people's susceptibility to fake news and conspiracy theories

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Introduction

If we want to fight the spread of fake news and conspiracy theories, we must first understand what they are and why are people willing to believe in them. The concept of fake news can be understood as referring to viral posts, that are based on fake accounts made to look like a news reports, or as intentionally and verifiably false news articles that could mislead readers. Conspiracy theories are closely related to fake news. The literature mentions many predictors for belief in fake news and conspiracy theories, but [1] are suggesting that the most important ones are political partisanship and ideology, reasoning, and heuristics. There already have been done studies trying to use interventions that could reduce people's susceptibility to fake news and conspiracy theories using interventions as priming critical thinking [2] by exposing participants to simple questions, that should enhance their ability to think rationally when rating the accuracy of news headlines using both real and fake news. Another intervention is based on the inoculation theory [3], where some counterarguments are offered to the recipient of the information, to prevent the persuasion. In the context of fake news, their recipients are first exposed to some true information, so they would not fall for the misinformation when they encounter it.

Methods

In this project, we combined the two above-mentioned interventions and created an experimental design for a study in which we are planning to discover if detailed inoculation of the participants into the topic of vaccines against

COVID – 19 would be an effective intervention against misinformation, that is widely spreading in society. The detailed inoculation would be done by using an interactive video interrupted by questions with obvious answers mentioned in the video and compared with priming critical thinking intervention by simple questions to see if a more detailed and more engaging intervention would have a greater effect against the participant's belief in fake news. For this experiment, we will need 300 participants, who would be split equally into three groups, control, and two experimental groups, each testing one of the interventions. We hypothesize that (1) both interventions will decrease the belief of the participants in fake news when compared to the control group, (2) using detailed inoculation by interactive video as the intervention will have a greater effect than simple questions used for priming critical thinking (3) the efficacy of these interventions will be influenced by participant's identification with political ideologies and that (4) the type of media that participants trust will influence the efficacy of these interventions.

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Personality Traits and Risk-Taking Behaviour in Social Trading

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Background

In recent years, we have experienced significant growth in the number of trading platforms. At least dozens of them are based on social trading with the possibility of copying. Copy-trading provides millions of subscribers with information about others' activity, success rate, and ability to copy them directly. These are the main characteristics of such platforms that invoke a specific type of behaviour (i.e. excessive risk-taking). Imitation as a behavioural heuristic has been proven as an attractive decision-making process under certain circumstances and traditional investing.

In the latest study, the authors tried to identify who decides to become a copier. Results have shown that risk aversion plays a determinant role. The more risk-averse people are, the more likely they are to copy others. However, even though these people revealed low tolerance for risk-taking, they have taken on greater risk with copying [1].

It has also been shown that cognitive abilities and personality traits are related to risk-taking behaviour. In general, behavioural finance literature suggests four main factors that influence investment behaviour: overconfidence, risk tolerance, self-monitoring, and social influence [2].

Aim

In our research, we would like to extend the previous studies' results focusing on personality traits to identify which ones lead to extensive risk-taking and imitating others

[3]. We aim to find the correlation between personality traits risk-taking behaviour in social trading

Methods

The research will involve 50 economics students with an interest in trading using a social trading platform. Our experiment will consist of three parts. The first part will feature a standard risk elicitation exercise and an online questionnaire that measures personality traits [3]. In the second part, participants will actively use the chosen platform – eToro and report on their activity. The last part consists of a questionnaire about the chosen strategy. The results of multiple questionnaires will be compared with the collected data from trading activity.

Implications

The results will have important implications for understanding the factors influencing young adults' financial decisions and offer insight into the characteristics of their decision-making.

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Effects of deep brain stimulation of globus pallidus internus on cognitive functions in Parkinson's disease

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Introduction

Patients with Parkinson's disease (PD) experience diversity of non-motor symptoms, including cognitive impairments such as difficulties with attention, memory recall, executive functioning and processing speed [1]. Non-motor symptoms are often present before clinical diagnosis and they most likely appear with progression of disease [2] decreasing independence and quality of life of individuals with PD [1]. In advanced stages of the disease, the most effective treatment is deep brain stimulation (DBS) of subthalamic nucleus (STN) and globus pallidus internus (GPi) as main targets [3]. Purpose of our research is to investigate effects of DBS of GPi on cognitive functions as it is not as commonly used as STN DBS. We aim to contribute to the understanding of GPi DBS and its effects on cognition in patients with PD.

Methods

In our study, we plan to assess 10 PD patients, who are being treated with bilateral DBS of the GPi for at least 4 months. A control group of 10 non-surgical PD patients undergoing usual medical treatment will be included to control for the effects of the disease and its progression. With standardized tests we plan to evaluate general cognitive impairment, memory, visuospatial skills, attention and language at the baseline and 4, 8 and 12 months after

GPi DBS. In the same time periods we will assess patients undergoing usual medical treatment. At the baseline, we will also assess depressive symptomatology and presence of apathy symptoms as exclusion criteria. Statistical analysis will be performed in statistical programming language R.

Expected results

Based on previous research we expect that DBS of the GPi will improve general cognitive functions. We expect no significant worsening in memory, attention and verbal fluency in the experimental group after GPi DBS. With positive results using different assessments, we could conclude that GPi DBS could be used more frequently as a target of DBS in PD, not only for improving motor symptoms, but also as an option with fewer side effects as STN DBS on cognitive functions.

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High-accuracy neuronavigated TMS

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Transcranial Magnetic Stimulation (TMS) is an established non-invasive brain stimulation (NIBS) technique that enables to interact with structure–function relationships across the whole gamut of cognitive functions and their associated cortical brain regions [1]. TMS is based on focal, strong magnetic field changes from brief, high-current pulses through the TMS coil that modulates (either increases or reduces) excitability.

Its effects and measurable outputs can be used for research and clinical purposes. Those include presurgical functional mapping, treating major depressive disorder (MDD), assisting in the diagnosis of diseases associated with motor dysfunction and promoting motor recovery after a stroke [2]. Nevertheless, clinical applications typically show modest test-retest reliability.

Although TMS offers the advantage of unrivalled focality, common approaches do not take into account interindividual differences in the correspondence between scalp landmarks and underlying brain anatomy [3]. Moreover, the standard placement of the TMS coil against the subject's scalp is sensitive to movement and misalignment.

To prevent this, TMS neuronavigation systems link Magnetic Resonance (MR) images and real anatomy, allowing 3D

interactive visual guidance [3]. In this study it is employed in conjunction with a tailored software to ensure optimal positioning of the coil and, as a proxy for the physiological changes from TMS application, peripheral electromyogram (EMG) is recorded placing two electrodes in the first dorsal interosseous muscle (FDI) during stimulation of the primary motor cortex (M1).

In order to assess whether an increase in neuronavigation accuracy will increase the reproducibility of EMG recordings, 15 healthy subjects will undergo MRI scanning and two neuronavigated TMS rounds with different accuracy settings. In each round, nine targets around the M1 hotspot will be stimulated 20 times each. Trial-to-trial variability will be assessed across the different accuracy setting sessions.

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Online Youth Activist Groups in Slovenia

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Introduction

Young people are attracted to a more individualistic and unconventional style of political action, which means that researchers need to expand the conceptualization of political action [1]. In this context, it is important that researchers recognize the internet as a key resource for expressing activism and mobilizing organized groups of young people [2]. The project Youth Media Repertoires: Social, Political and Cultural Aspects of Digitized Everyday Life is designed to determine the attitude of young people towards political engagement based on the application of the concept of »media repertoires«. A media repertoire provides an analytical framework which enables the operationalization of media consumption patterns and draws from findings of both qualitative and quantitative approaches [3].

Methods

The goal of a working group within the broader project was to identify online youth activist groups and prepare a report and a spreadsheet containing their characteristics, which will serve the researchers in the next phases of the project. The methods applied were qualitative ethnographic observation and analysis of publicly available data on informal politically active groups on various social networks. In simpler words, we browsed the internet and identified 32 online youth activist groups in Slovenia.

Results

Online youth activist groups were

categorized into 5 categories according to their common characteristics. The categories were "Youth", which contains mostly children and high school students, "Offsprings", containing offsprings of established political parties, "Zlomi", relating to a specific type of groups which are active only on Instagram, "Students", relating to groups that consist mostly of students and address student-related issues and "Anonymous", which consists of only one group – Anonymous Slovenia. The characteristics of each category are explained in detail in the final report and spreadsheet. The report and the spreadsheet are the final result of this working group's research. Both documents will further serve as a guide for the selection of key group members with whom the researchers will conduct in-depth interviews in the next phases of the project.

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Affective Norms for Slovenian Words (ANSW)

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Introduction

We are adapting the Affective Norms for English Words (ANEW) lexicon [1] to Slovenian, with the goal of creating the Affective Norms for Slovenian Words (ANSW) lexicon. This will provide the first set of normative emotional ratings for this language and will include more than 1000 words in the Slovenian language. Our goal is the creation of the affective measures dataset with the statistical analysis of the affective evaluations of words, which will be rated in terms of valence, arousal, and dominance. The affective ratings obtained in the project will provide an important set of stimuli for the Slovenian language research, as it will be made publicly available.

Methods

The stimuli set of words was composed from two sources: we used 678 of the most frequent words from a Slovenian corpus called GigaFida [2] and 956 words previously used in the original ANEW [1], which were translated into Slovenian. 101 words were repeated; thus, we used a total of 1533 words. We divided them into 6 randomised parts of 256 words each (the last part has 3 words less), where each group of participants will rate the words based on the SAM questionnaire, which includes: valence (happy - unhappy), arousal (low - high stimulation), and dominance (non-dominant - very dominant). The testing will be performed

with the OpenSesame program, where words are presented in a randomized order and evaluated by the participants. Each word is assigned a SAM score on a scale of 1 to 9. A rating of 1 denotes highly negative and 9 denotes highly positive score [3]. The testing will be performed online via the users' browser which will record the participant's keyboard response ranging from numbers 1 to 9. Finally, we will conduct a statistical analysis of the results for which we will use RStudio.

Results

The study is currently ongoing, and the data collection is just about to start, thus no results are available at this point.

Conclusion

The aim of this study is to provide a set of publicly available normative emotional ratings for many words which will be useful for the further investigation of the Slovenian language.

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Literary Analysis of Slovenian Female Poets' Poems for Youth Based on a Cognitive Theory

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Introduction Female poets have played an important role in the development of Slovenian poetry for youth with their originality and innovativeness on all levels of verbal text, in spite of social barriers they were met with [1]. Picturebooks (including illustrated poetry for youth) as an art form have a unique character due to the intertwinement of two levels of communication: verbal and visual, which offers cues for cognitive analysis [2]. Previous research [3] has resulted in 11 cognitive categories that are common to different linguistic, cognitive, literary, and neuroscientific theories: child and adult, human face, basic visual elements: colors, lines, and light, space and background, symmetry, feeling of aesthetics and emotions, universality, verbal art, and the interaction between verbal and visual levels [3].

Aim and implications of the project This empirical research project has two parts. The aim of part one is to identify Slovenian female poets, active between 1848 and 2021, and to create a selection of their poems based on literary-criticism and literary-history criteria. The aim of part two is to analyse the chosen poems based on the previously identified cognitive categories. Applicative value of the research is in understanding literature for youth from a cognitive point of view.

Method Part one of the research is based on

a literature review. Slovenian poetry was divided in 6 time periods according to social characteristics of the era. Relevant literature was chosen for each period considering the type of medium used to publish poems at the time: magazines, collections of poems etc. Poems by each poet were selected. The poet Svetlana Makarovič, one of the most popular Slovenian poets, was chosen for poem analysis based on the 11 categories mentioned above.

Results The result of part one is a table with data about 236 poets: name, last name, date of birth and death, the period they belonged to, the publication they published in, and a selection of 3 poems by each author. The second part, the analysis of chosen illustrated poems by Svetlana Makarovič, showed major similarities between cognitive analysis of picturebooks and illustrated poems for youth. Both mediums are multimodal and combine the interactions between verbal and visual communication, as well as the interaction between child and adult readers. Some of the notable differences include style of writing, e. g. rhymes.

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Towards virtual environments for HRI

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Human-robot interaction

With technological progress, robots, and human-robot interaction (HRI) are becoming an increasingly important area of life. As social robots they could work in healthcare, teaching or assist humans in everyday life. The growing number of encounters of HRI is the reason why research has to focus on the way humans perceive robots, specifically social robots, and the HRI itself. Researchers have observed several factors influencing HRI, of which one especially important one is physical embodiment.

Physical Embodiment

Social interaction with robots can be accomplished in embodied and disembodied ways, whereas the latter approach is broadly used in areas like cognitive robotics. Comparing embodied and disembodied social agents, Lee et al. [1] found that participants rated both the agent itself and the interaction more positively when the robot was physically embodied compared to a disembodied robot. Further, a meta-analysis conducted by Li [2] comparing different agents in HRI to further investigate the influence of embodiment, indicated that physical presence in the room, and not physical embodiment alone, results in more favourable responses from participants. Hence, the influence of embodiment must be considered when designing HRI, even if it is not always safe or desirable for a robot to be physically present. Virtual Reality (VR) could be a way to avoid these problems and still create an immersive environment for HRI. Additionally, it would allow for cognitive robotics to evolve from training

robots in simulators without human influence, to taking advantage of HRI.

Experimental Design

I propose a design that replicates a study on gaze following in HRI [3], while distinguishing between different levels of embodied robots. Replicating the study I will build on an existing design that showed significant effects of robot gaze cues in a simple reaction time paradigm. I will measure multiple variables such as reaction time, accuracy, gaze following and robot perception, in a mixed design, to better understand the effect of interacting with a fully embodied, a in VR embodied or a telepresent robot on HRI. My hypothesis is, that an advanced level of embodiment will result in greater shared attention with the interaction partner, indicated by increased gaze following, as well as faster and more accurate responses in cued reactions.

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A Model of Counterfactual Predictive Processing

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Introduction

Nowadays, most artificial agents rely on deep learning algorithms, supervised or non-supervised, as well as reinforcements ones. The results achieved by current AI systems are nothing else than astonishing, yet there is room for improvement. Two are the main drawbacks of the current status quo, namely – the lack of explanation of how an artificial agent decided to execute a certain action, and the large amount of data that is necessary, in order to “learn”. One possible improvement could be AI that is based on counterfactuals. In this project, we present a computational model of counterfactual thinking (CT) by taking the predictive processing (PP) approach to cognition. Our main goal is to achieve a simplified cognitive model that will make more accurate estimations in comparison to its statistical opponent. To achieve that, we connected the common aspects of Counterfactual Thinking [3] and Predictive Processing theories [1]. In addition, we conceptualized and implemented an AI task environment, as well as evaluation criteria.

Methods

Our task environment consists of three agents in total. The first one is a footballer who tries to score a goal. There are two relevant factors for this task, namely, the direction of the ball and the power with which was kicked. The other two agents are observers that try to predict whether the

footballer will score or not. They have access to all values of the dependent variables (direction and power), as well as the outcome of every attempt (goal/no goal). However, one of the agents predicts the future through a statistical mean formula, while the other one uses the counterfactual approach.

Main hypothesis

We think that the predictions of the counterfactual model will be more accurate than the statistics-based model. In addition, we believe that less than 250 cycles will be necessary, in order to achieve these results.

Evaluation

The evaluation criteria is based on a transition model which is defined through an algorithm that runs within “N” number of cycles. The cycle starts with two predictions generated by the observers, after which the footballer executes an attempt to score a goal. After the attempt, the two observers register the result, as well as update their previous history of attempts made by the footballer (if any). The moment when both observers update their history is the end of the cycle.

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Effect of Acute Psychological Stress on the Association Between Skin Barrier Recovery and Heart Rate Variability

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Introduction

Stressful situations affect our health and wellbeing. The interface between psychological and physiological processes is a promising research field to investigate the effects of stress. The skin functions as a barrier and thus protects against extrinsic influences while reducing loss of water. Acute psychological stress inhibits the recovery of the skin barrier function (SBR) after impairment [1]. Heart rate variability (HRV) is associated with the autonomic nervous activity and can be used to assess psychological stress [2]. It was found that SBR and different parameters of HRV are mutually associated in healthy subjects. This suggests an impact of the autonomous nervous system on cutaneous homeostasis [3]. Nevertheless, there is yet no evidence for an association of these parameters after exposure to an acute stressor. The present study investigates the connection between HRV and SBR during relaxation after induced psychological stress.

Method

Until now, the study includes 15 healthy female participants aged 18 to 35. After being exposed to an acute psychological stressor via the Trier social stress test (spontaneous interview and mental arithmetic) the participants relax for 60

minutes. The HRV values consist of percentage recovery rate of HRV from peak stress until after the relaxation period. SBR is calculated from values of transepidermal water loss (TEWL) from a disrupted skin area on the forearm. A tape stripping procedure damages the stratum corneum by removing a tape strip from the skin. The SBR value is extracted from measurements of TEWL before and several times during the following relaxing period. In the statistical evaluation, a correlation between recovery values of HRV and SBR will be analyzed.

Discussion

As the study is currently ongoing, no results have yet been obtained. A possible correlation between SBR and HRV can shed light on the interrelation between the autonomous nervous system and skin barrier function after a psychological stressor.

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Triadic Tacit Communication Game

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This project is focusing on the emergence (development) of communication and the role of deception in it. Deception and lying are a big part of our everyday lives and we may not even realize it. Let us take sarcasm as an example. We are using it to say something that has the opposite meaning of what we want to say, mostly when we want to make fun of someone or are just irritated. According to some researchers [1], [3], deception may have played an important role in the emergence of communication and language. Deception does not necessarily have to be used in a negative context – to survive, people and animals have to deceive another party. In this case, deception is beneficial. What part deception played in the emergence of communication is yet not a well-explored field in cognitive science; therefore, it needs further attention. Language games are a great tool for studying communication and language since they can be used in a computer simulation with agents.

A language game (also called a secret language) is a system of manipulating spoken words to make them incomprehensible to the untrained party. One of the widely known language games is for example "Pig Latin".

There are some language games [2] for studying communication and its emergence, but they are made for two players – Sender (S) and Receiver (R). In this project, I will look deeper and elaborate on Knight's work [1], where he suggests that deception played an important role in the emergence of communication. Triadic Tacit Communication Game (TTCG) takes this into account - a third player is added, the

Eavesdropper (E). The main idea is that the S tries to communicate with the R so that the E will not decode their communication. Therefore, the S and the R attempt to create a new communication system, to reach their common goal - deceive the E. They cannot use conventional communication like talking, writing, chatting, etc... TTCG, like its predecessors, is implemented as a computer interface, 3x3 grid, where the S and the R have the same goal - communicate without the E breaking their code. Their communication is purely graphical - the S sends information to the R just by moving a token in the grid. At the beginning of each game, desired destinations of S's and R's tokens are marked on the playing area. S's task is to indicate to R what is his desired destination is, therefore, where he should move his token. E sees every S's movement and tries to figure out the desired destination of the R. If E figures out the desired destination, meaning, he moves his token into the R's goal position, the code was successfully broken. When S's turn ends, the E loses the ability to see the opponent's movements. He will regain this ability once it is the S's turn again. Since all three players cannot use conventional communication, cannot use the same computer, the TTCG is implemented as a web application, which can be accessed from anywhere with a stable internet connection. All the players' movements are logged into a database.

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A Sustainable Human-Centric Framework For Digital Transformation

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Introduction

In 2015 the term Industry 4.0 was coined, shedding light on the pervasiveness of large-scale automatisisation, the overall exploitation of excessively generated and collected personal data, the development of the internet of things (IoT) as well as the propensity to replace human intervention and action at various stages of life. The reliance on self-sustaining and self-correcting algorithms and computational applications created the shift to so-called data-centricity. The core of these new technological approaches heavily relied on the exploitation of data collection and automatisisation derived from it [1]. However, the overall shortcomings and threats of data-centricity became increasingly apparent, for example, as a result of the problems arising from predictive policing and data privacy concerns [1]. These developments impose an imperative to shift from data-centricity towards human-centricity [2].

Yet, the current conceptualisations of human-centricity remained inchoate. Therefore the incentive of this research is to derive specifications for a sustainable human-centric framework. Considering that human-centricity is a multidimensional and interdisciplinary phenomenon that needs to be addressed from various scientific perspectives, a multidisciplinary approach will be employed.

Methods

Based on a systematic literature a database for corpus analysis will be created. Next relevant concepts/entities associated with human-centricity will be derived from the corpus using Python 3.7.3 and natural language processing techniques (N-grams, sentiment analysis, machine learning).

Implications

A multidisciplinary approach may help overcome the shortcomings of current human-centric definitions and allow the conceptualisation of a human-centric framework. A solid framework of human-centricity would allow to solve the optimisation problem for beforehand three mutually exclusive constraints namely a) maximising data-protection or data-use, b) maximising the benefits for institutions or people and c) minimising risk or maximising new opportunities for applications [3].

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Simulating Behaviour of Urban Traffic Participants

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This project is set to simulate traffic for many different cities across Europe. From these simulations we will acquire insights into how the traffic behaves on a large scale by running simulations of many thousands of agents (cars, buses, taxis etc.) on existing infrastructure.

We are using a program called MATsim as a primary traffic simulator, because it is the most flexible of all. Even with that flexibility, it is still not general enough. Therefore, we will extend its functionalities.

So far, we have been reading the literature and discussing the architecture of the extended functionalities. Primarily we have been focusing on integrating belief-desire-intention (BDI) agents into MATsim. In short, the BDI part is responsible for programming the brains of agents, while MATsim simulates the physical part [1]. Otherwise this project will be mostly based on previous work from [2], where they already extended MATsim functionalities for simulating bushfire evacuations instead of just simulating everyday traffic.

BDI system is a well understood paradigm for modelling intelligent agent decision making. It is based on Bratman's theory of human practical reasoning [3]. This paradigm is easy to implement because of its hierarchical nature and is appropriate because of balancing its time on selecting plans and executing them.

As mentioned, BDI agents control how people behave in traffic. What we want to

include are people's choices of transport mode (car, bus, taxi, bicycle...), the route they take (via city centre, via detour) and planning activities during the day (home-work-store-movie-home). In the literature we have found BDI system used mostly for behaviours connected with solving the weaknesses of MATsim, because it cannot respond to a changing environment. MATsim alone cannot respond to critical events such as bushfire evacuation, because it does not support within-day replanning.

We expect to have a working simulation of multiple cities in Europe. Based on real traffic count data from each city we will construct agents and their activities throughout the day. We will construct a more general framework using MATsim and BDI agents so that it will work for all cities. Therefore, next steps in our research are completing the framework design, programming the framework, adding real data to our simulations and publish the results.

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Enhancement Myths: Two Narratives to Mitigate Risks

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Every world is, in part, a human construct. According to Popper, a human world can be thought of as comprising three parts [1]. First: the physical universe, second: human self-consciousness (subjective experience) & third: products of the human mind (language, myths, stories, names, theories, etc.) [1]. My definition of myths comes from Lloyd Geering; they are cultural creations (stories) that shape society, behavior and understanding of our environment [2]. For a large part of our history, myths have been created unconsciously. Today we have the opportunity to formulate new myths consciously.

In this theoretical research, I am focusing on myth creation as an important tool to deal with cognitive evolution through enhancement technologies. I hypothesize that cognitive enhancement has always rested in the ability to access and process more information efficiently. The development of language, and subsequently the ability to write can be regarded as information explosions in this aspect. The internet has also made access to information much easier, and has increased the pace of technological growth. Brain-computer interfaces will probably be the next.

I will begin by speaking about the internet. This is because it carries many of the same features of mind-computer interfaces. The rise in cases of anxiety and depression in younger generations can be correlated to increased internet, and social media use [3]. The internet is crucial to the modern economy and society in general, but how

are we to mitigate the risks from its usage? I propose two myths/ worldviews that can help us in this regard.

Attention as a valuable resource: Very few today, treat their attention as such. The internet has given rise to advertisement-based business models that profit by keeping users glued to their platforms. Cognition rests on the ability to access and process information. Through constant distraction, we no longer give ourselves time to process, without constantly feeding on new information. This is already impacting mental health, especially so for addicted users [3]. With the advent of brain-computer interfaces; the need to view attention as a limited resource, will become all the more important.

Relaxation is a valuable skill: In an increasingly goal driven ideal of success, increasing individual productivity has become a project to 'bio-hack' ourselves to cope with increasing our up-time, while minimising down-time. I define relaxation as an ability to calm the nervous system (increase parasympathetic activity). Health issues related to stress are on the rise, and it is only partially because we have little time off. We are so stimulated, that even during our off days/ holidays, we are constantly trying to fill our time with some activity or the other. Over the long run this is causing imbalances in our neuro-endocrine system. Relaxation is a skill that must be practiced and refined; not something that occurs naturally.

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Can a more realistic decision-making situation (COVID-19) alter framing effect among young adults?

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Introduction

The COVID-19 pandemic outbreak has fundamentally shifted the circumstances we live in. This shift also offers a unique opportunity to test the famous Asian Disease Problem (ADP) [1] in a more ecologically valid setting. In the original experiment [1], participants were presented with a hypothetical scenario, concerning spread of a contagious disease. They then had to decide between two medical treatments, one with fixed outcomes and one with risky outcomes. The ADP investigates how the framing of a decision problem, presented in terms of either lives rescued or lives lost, influences the decision outcome. Although many replications have already been made during the COVID-19 pandemic, there is a lack of understanding of the differences in the framing effect between different age groups. Therefore, the present study investigates the framing effect among young adults (students). While this group is not deeply affected by primary (health) consequences of the pandemic, it is more vulnerable to secondary (socio-economic) consequences, arising from the preventive measures [2]. The study investigates if there are differences in the framing effect and risk tendency between (A) a more realistic and a hypothetical situation and (B) between the general and young adult population. Additionally, the influence of individuals' personalities, emotional states, health and socio-

economic circumstances on the framing effect outcomes and risk tendency are explored.

Methods

The study involved 427 participants (63,9% female, age mean = 21,73, SD = 2,53). It was performed as an online questionnaire involving the hypothetical (original), and more realistic ADP situation, based on domestic COVID-19 situation data. To address the second research question, we included a personality questionnaire, perceived stress scale and questions relating to an individual's health and socio-economic affectedness by the pandemic.

Results and Discussion

Preliminary results suggest that there are differences in decision outcomes between the hypothetical (original) scenario and a more realistic one. The difference is most evident in the negatively framed scenario, where in the hypothetical scenario 63,01% chose the riskier treatment option, while in the more realistic scenario, only 38,94% favoured the risky option. This indicates that risk tendency is much lower in more realistic settings among young adults. The underlying factors causing this shift are yet to be explored.

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Measuring Multimedia Exposure: A Preliminary Study

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Introduction

Many authors agree that measuring multimedia exposure (MME) is the key to understanding the effect of multimedia on humans. Average U.S. adult spends more than 12 hours per day interacting with different media as shown in the report of the global leader in market measurement company Nielsen [1]. Yet there is yet no generally accepted way of measuring MME. While the fast technological advances fragment the media landscape into evermore diverse channels and platforms, thus making it harder to measure the MME, it also offers an opportunity for better measurement techniques [2]. The aim of this interdisciplinary study is to further investigate the short-term effect of MME in the context of advertisement through physiological and psychological measurements of likability, attention and emotional reactance.

Methods

The study of *likability* will explore the link between pupil size and likability. The assessment will be done by linking observations of pupil size to the level of likability gathered from participants' responses. The study of *attention* will investigate the link between visual attention and engagement. This will be done by assessing behaviour cues (gaze direction) of the participants, which will then be linked with the level of engagement gathered from participants' responses. The study of

emotional reactance will explore the link between emotional reactance and purchase intention. This will be conducted by linking electrodermal activity to the level of purchase intention gathered from participants' responses.

The experiment is designed to mimic a living room. After each block of stimuli participants are presented with a questionnaire. The non-intrusive sensors used in the experiment are Empatica E4 – electrodermal activity wristband, Pupil Labs glass – pupil size and eye tracker, and Kinect 3 – IR camera. The use of the wearable sensors provides a novel approach to studying MME in the usual laboratory settings. The collected data will first be pre-processed and then visualized using Python 3.9 with pandas and matplotlib libraries. The outcome of the explorative research will result in commentaries to aid in future stages of the overall research.

Results

Given the explorative nature of the research, results will bring manual observations made on visualized measured data. The outcome of the explorative research will result in commentaries to aid in future stages of the overall research.

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Towards Human-Centric Ethical AI

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Background

The global digital transformation in general and the application of AI-based information systems in particular leads to serious ethical concerns regarding the societal and ethical consequences of emerging technologies. For instance, learning algorithms of AI applications might reinforce social inequalities and data privacy issues are especially pressing in times of the COVID-19 pandemic. In response to such concerns, governmental organizations, research institutions, technology companies and other professional bodies have proposed various guidelines for the implementation and evaluation of ethical AI [1]. While there is a considerable overlap between different sets of principles [1, 2], their informative value is constricted in several ways. First, the meanings of the values they pertain to are often left unclear, potentially postponing ethical issues [2]. Second, high-level principles lack applicability in specific situations, especially when they happen to be in tension with each other [2]. Third, it is unclear to what extent current guidelines are developed from a human-centric perspective and consider recent advancements in Cognitive Science.

Method

In this project, I examine current guidelines of ethical AI by means of a systematic literature review. I include both academic- and non-academic guidelines from various organizations that were published within the past five years. Thus far, my review comprises descriptive data from 52 documents.

Results

Preliminary findings reveal that most guidelines on ethical AI provide broad “recommendations” rather than strictly defined sets of rules. They are often focussed on core principles that fail to bridge the gap between theory and practice because they do not distinguish between the ethical values they are based on and their applicability in specific contexts. For example, many guidelines state that ethical AI systems should promote “end-user empowerment” but do not explicate what exactly this entails and how much weight should be put on this principle in relation to others [3]. By leaving the exact interpretations of the principles open to the parties that seek to employ them, potential disagreements in values are masked [1].

Outlook

In the next step, I aim to evaluate existing guidelines of ethical AI from a human-centric perspective. For this purpose, it might be useful to use paradigms from Cognitive Science, such as enactivism, to offer a more comprehensible view on the meaning of the current principles and how they can be implemented in practice [3].

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Bias Control in Concurrent Use of TMS and taVNS

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Introduction

The aim of our project was to ensure objectivization, double-blinding and randomisation in a bigger study where transcranial magnetic stimulation (TMS) was used to assess the neurophysiological correlates of activation of the basal forebrain cholinergic system during transcutaneous auricular vagus nerve stimulation (taVNS). TMS is a noninvasive procedure that uses magnetic fields to stimulate neurons in the brain to assess the excitability of the motor cortex. TaVNS is a noninvasive brain stimulation that is applied to areas of the ear innervated by the vagal nerve, such as the tragus or cymba conchae and is being researched as a novel treatment option for different neuropsychiatric disorders [3]. The study is being performed on healthy volunteers in order to understand the mechanisms of taVNS and predict its possible use in Parkinson's disease patients.

Our main assignment was to get acquainted with the study plan of the main study. The research questions were where could bias occur, how to prevent it and thus ensure a double-blind study and randomisation. Double-blinding is a form of preventing bias by blinding both the researchers and the subjects to the treatment allocation [1]. Randomisation is needed to prevent the investigator's influence on the treatment allocation [2].

Methods

The study is a within-subject, sham-

controlled study on 30 healthy participants older than 18 years. Each participant has to complete two sessions, during which he receives taVNS and sham VNS (sVNS) - stimulation of the earlobe [3]. Each session includes 25 minutes of taVNS/sVNS stimulation and TMS performed before, during and after the stimulation to assess the effect of taVNS/sVNS on the activity of the neuromodulatory cholinergic system.

Methods we used to reduce bias were labelling stimulation locations with codes, introducing a third person for choosing the type of stimulation, inserting the electrode in the ear, covering it with a cotton pad and putting a cap over it so that the researcher is not aware of the type of stimulation and therefore cannot be influenced by it.

Results and Conclusion

The main study is still ongoing, but we expect that by randomising the study, we have achieved a reduction of bias in the interpretation and ensuring more reliable assessment of effects of TMS and taVNS, although it was not possible to remove all bias, sVNS can have certain effects and the patient is aware of the stimulation placement.

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Computer-assisted Therapy in a Dyad Setting for Chronic Aphasia

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Aphasia is an acquired language disorder, often a chronic consequence of stroke. Regular therapy interventions allow a partial rehabilitation of language comprehension and production for nearly every person with aphasia (PWA). For chronic PWA, group and computer-assisted therapy have been found to be effective adjunctions to clinical guided therapy. Group settings encourage emotional communication, which enhances engagement, comprehension [1] and fosters language learning [2]. Motivated by the results of therapy in settings of four or more participants, this project focuses on a group of two PWA.

In an exploratory study, the effectiveness of single and dyad user settings with the digital language program ELA® (Everyday Life Activities) [3] is researched in short-term intensive therapy. ELA® was developed by neurolinguist Dr. Stark, based on the principles of experience-dependent neural plasticity. The program is used in group settings at the Viennese “Aphasia Club” for chronic PWA. Members of the club are kindly participating in the study.

The main subject is a woman with post-stroke, fluent Broca aphasia and deficits in articulation. She receives two types of therapy: “Dialogue” and “Story”-tasks in ELA® (i) as a single user and (ii) as part of a dyad with a woman, who suffers from chronic, global aphasia and minor deficits in naming tasks. Each condition is tested on three consecutive days, with two hours therapy per day. Between the single user and dyad tests

are four rest days. The procedure was selected based on the principles “Repetition Matters”, “Saliency Matters” and “Intensity Matters” by Kleim et al. [2]. Each session is analysed with respect to the amounts of repetitions and articulation errors plus qualitative statements by the main subject. Before and after the study, parts of the diagnostic Aachner Aphasia Test are tested to measure therapy success.

Preliminary interviews and trial runs with four PWA revealed a favour towards dyad therapy. The final results are expected to show an increase of repetitions, less errors and more engagement in the dyad. As an exploratory study with a small data set, the project will motivate in-depth research on therapy dynamics, shared task solving and the optimal application of ELA®.

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BCI: EEG Decoding Of Audial Perception

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A Machine Learning Algorithm

The topic of this project is the development of a machine learning algorithm for brain computer interfaces where the goal is to find novel ways for humans to interact and connect to the digital realm.

Until today the standard way of interacting with digital computers involve different sensory modalities and motor abilities. BCI aim to overcome these boundaries and establish a direct connection between the brain and digital computers.

Research on this topic is still in the early stages and there is much to be still discovered. The works of other research groups which are tackling a similar problem served as inspiration for the creation of the model [1],[2].

The aim is to create a machine learning model that can detect whether a person is subjected to a sound or not by analysing the EEG data of the person.

It is realised through python with the help of the libraries scikit-learn and MNE. We use the EEG data of one participant (126 EEG-channels, Brain Products EasyCap, Bittium NeurOne Tesla amplifier at a rate of 1000 Hz). The trial consists of 10 minutes of resting state followed by 6 chunks of 15 minutes each listening to an audio book. The continuous EEG signal is divided in 1 second epochs and the short-time Fourier transform is calculated for said timespans. Further, the data is averaged for each of the most important frequency bands. As for the model we use a logistic regression

classification algorithm that is trained to distinguish the resting state from the listening period. At later stages we will experiment with other classification algorithms.

This new model could find its applications by resembling a kind of control mechanism in which the computer only analyses a person's brain signals, when the person is subjected to a sound. Further, this model serves as a basis for subsequent development of EEG related machine learning models within the research group.

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Personality and brain laterality in common marmosets (*Callithrix jacchus*)

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Introduction

The research on animal personality (i.e. behavioral responses that are consistent over time and/or contexts and/or situations) has gained increasing attention in behavioral and cognitive biology in recent years. Research has accumulated on the relationships between personality traits and other distinct developmental and physiological variables within the comparative approach. In addition to animal personality, brain laterality has also been used as a measurable variable on which it is possible to assess consistent animal behavior. Consequently, previous research has investigated the relationship between personality and hemispheric brain dominance. For example, a specific hemispheric brain dominance (e.g. on motor activity) has been associated with the display of fearfulness and avoidance behavior towards novel objects, predator alarm calls, and social interactions [1].

Approach and Method

Therefore, this project's main objective is to investigate and validate previous analyses on the relationship between individual personality traits and brain laterality in common marmosets. The initial phase consisted in the collection of behavioral data through direct observations via video recording. The obtained behavioral data will afterward be video coded and statistically

analyzed, with an emphasis on explorative and avoidance behavior within the individual's typical social context [2]. The second aim is to collect the data regarding brain lateralization (i.e. hand preference index).

Impact

The obtained results will contribute to the overall knowledge on personality and brain laterality by employing a new experimental design using direct behavioral observations and behavioral coding (within the social context) and a controlled hand preference index assessment. Moreover, the personality assessment method conducted during the course of this analysis will contribute to the cross-validation (and comparison) of different methods on personality assessment (behavioral codings vs. trait ratings through questionnaire).

Acknowledgments

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Homo Urbanus

What it means to be human in the urban world?

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The more recent paradigms in cognitive science claim that, the world around us shapes our perception and behaviour, while our perception and behaviour shape the world around us. And the environment is a constitutive part of our cognition, development and identity.[1]

Today, we live in an urban world. Being the most immediate environment of the everyday experience, cities directly affect our functionality and wellbeing. From traffic and energy supply to workplace, from health care to urban amenities and nature, we are dependent on the city-landscape in every aspect of our lives.

After living in the wild for roughly 95% of our entire history as homo sapiens [2], this shift into an urban environment is drastic. How would the new experience shape our identity? Does the ubiquitous cement, asphalt, metal and glass distance us and cool our hearts? Will the lack of living things, from plants to insects, make it harder to connect and empathize? Do our cities make us more economically oriented and less humane? Or can they help supporting our cognition, growth and transcendence?

Ultimately, what does it mean to be human in this urban world?

In order to answer this question, this theoretical project looks into the basic human nature and core drives, as well as the

relevant concepts/ findings from cognitive science - mainly the 4E paradigm - embodied, embedded, enactive, extended cognition.

Additionally, it exams the current situation of our environment, in order to understand where we stand.

Based on these points, a vision of the future (cities) will be drawn. Following this vision, we can start thinking how to design cities/ our environment to support it.

However, there is no doubt that the future is going to be pluralistic and diverse, and it should be. This project merely aims to start the dialog for setting visions for desirable futures, so we can start somewhere, somehow.

I' d also like to emphasize that the project is not about exploring into profound depth in any area or direction. Rather, it tries to generate a broad understanding of our relationship with the environment, and how to create the environment(s) that can help the further development of humanity.

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Introducing Cognitive Biases to Environmental Valuation

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1. Introduction

My research introduces cognitive biases to the debate on value (in)commensurability in ecological economics. In this debate, policy-relevant environmental valuation tackles the issue whether a system of values (cultural, moral, economical, ecological etc.) (i) can or should be expressed in a numeric single scale (commensurability), (ii) cannot be reduced to numbers, but in which values are still comparable (weak comparability), or (iii) cannot have certain values compared and, therefore, trade-offs must be rejected.

2. Problem

In the last 50 years, policymaking and scientific research focused on (i), namely value commensurability, and the associated methods of *Willingness to Pay* (WTP) or *Contingent Valuation* (CV), in which participants get asked to monetarily value a certain part of the environment, e.g., how much money they would pay for maintaining or rescuing given elements of their surrounding natural landscapes.

These methods face a lot of problems: they distract from argumentative deliberations; they only explore potential markets for more exploitation; participants are not informed enough about the environment for making reasoned decisions; there are many “protest answers” with tremendously high, zero or no votes; there is high influence of linguistic structures over the results of the surveys; ecosystems which are distant to human populations receive very low values [1].

3. Literature Gap

After reviewing 16 publications, different reactions to these objections can be summarized as

follows:- (1) WTP/CV methods must be updated to find people’s true values and implement them accordingly;- (2) they can be treated as part of multicriteria evaluation processes;- or (3) they must be abandoned and replaced by deliberative, direct-democratic procedures.

Some of these reactions mention biases, but all in all, no effort was made to understand their role in detail, let alone to differentiate between the numerous existing biases according to their implications to environmental valuation.

4. My Approach and Method

In my approach I connected these issues with 52 cognitive biases published by the philosopher and economist Rolf Dobelli. A cognitive bias is here defined as a “systematic deviation from logic -from optimal, rational, reasonable thought and behavior” [2]. In the context of environmental valuation, I classify these biases as (a) in favour of environmental conservation, (b) against environmental conservation, or (c) both/unclear.

5. Preliminary Results

From a total of 52 cognitive biases, 14 were categorized as (a) and 2 as (b). The remaining ones could either affect both or its contribution was unclear.

For example, the bias “tragedy of the commons” stresses problems arising from situations in which individual actions lead to individual benefits and collective costs [3]. Examples are deforestation or even public toilets. Accordingly, CV/WTP increases this “tragedy” by shifting the responsibility for communal regulations to individual choices.

All in all, cognitive biases constitute important issues in the value (in)commensurability debate. They must be considered in research and policymaking based on environmental valuation.

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Tripping Insights: The Effect of Psychedelics on Depression

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Serotonergic psychedelics – psilocybin, LSD, DMT – which act as serotonin 2A receptor (5-HT_{2A}R) agonists are being recognized in psychiatry for their possible benefit for mental health problems. Typical medicine prescribed for depression (SSRIs) does not work for every patient, has many side effects and delayed latency of therapeutic action, which leaves the need for exploring new ways of treatment [1]. This study is a theoretical review of existing literature on the possible therapeutic effects of psychedelics (P) on depression, which aims to explain the underlying structural, functional and psychological mechanisms and to have an overview of previous clinical studies.

Psychedelics are hypothesised to “reset” the activity in the default-mode network, associated with general background activity and conscious states, which is increased in depressed people causing negative rumination. This in turn increases the connectivity of the brain regions that normally function independently, which help develop adaptive mechanisms in response to stressful situations and help gain new insights into behavioural patterns and beliefs [2].

It has been found that psychedelics increase positive affect and reduce hypersensitive amygdala response and attentional bias towards negative emotional stimuli in depressed people [3]. Thus, P may increase brain and emotional plasticity and negative affect may be a target for therapy. Furthermore, psychedelics enhance emotion-focused coping. Confronting

unpleasant thoughts after taking P was found to be significantly associated with decreases in depression severity, as going from avoidance to acceptance leads to therapeutic change for depressed people [1].

However, to escape the black cloud and see colours, set and setting are important and the trip should be conducted by a professional therapist. Due to limitations, a few clinical studies have been conducted, yet preliminary results are promising. For future research, it is beneficial to identify psychological mechanisms that underlie positive changes associated with psychedelics. Also, more double-blind, randomized clinical trials are needed to minimize the possible biases, such as confirmation, expectancy and sampling bias – then the future looks colourful.

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Non-invasive Stimulation Techniques in Individuals with Autism Spectrum Disorder

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Introduction

Autism spectrum disorder (ASD) is a complex neurodevelopmental disorder characterized by its wide range, including autism and Asperger syndrome, which is in general linked with significant difficulties in social communication, stereotyped or ritualistic behaviour and deficits in sensory reactivity. Non-invasive brain stimulation (NIBS) methods are nowadays often used in combination with mentioned condition, observing the effects of transcranial direct current stimulation (tDCS) and transcranial magnetic stimulation (TMS). These types of stimulations have a strong potential to be considered as a new therapeutic alternative, opening the door for other interdisciplinary approaches [1].

Aims and Objectives

Conducted review of literature stands on the variety of the studies, trying to unveil reaction after stimulating different brain regions, while an idiosyncratically wired brain of individuals with ASD is taken into account. Nonetheless, some significant research gaps have been found. One of them is higher age of participants, contrasting with the occurrence of early age symptoms. Therefore, the process of deciphering the different effects on the ASD brains, including the mechanisms of neural plasticity and also lasting effects of NIBS is the main aim of proposed research question.

Conclusions

Overall, findings are indicating improvements in various fields linked with enhanced emotional recognition and cognitive abilities. Additionally, there has been an evident progress in sociability and communication skills of individuals with ASD condition [2].

On the other hand, studies point toward the fact that there are still concerns about safety, ethical issues and tolerability [1].

Despite the mentioned limitations, usage of NIBS is very promising for individuals with ASD. And not only that. Conditions like depression, Alzheimer's disease, schizophrenia or attention deficit hyperactivity disorder may be also considered as a treatment target [3].

Hence, the outcome of this study lies in the summary of all possible effects after the stimulation process, contributing to the future research attempts.

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Simulating the Emergence of Structure in Spoken Language

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Background

Iterated learning is a form of social learning whereby “one individual learns by observing the output of learning in another individual, who learned in the same way” [1].

Previous research using iterated learning in non-linguistic contexts has shown the emergence of structure in tasks involving both children [2] and non-human primates [3]. Given this ontological and phylogenetic predisposition toward compressing information into learnable forms, the development of today’s highly structured languages may have arisen as the result of general mechanisms of cultural transmission interacting with individual cognitive limitations (information storage and retrieval, working memory etc.), rather than being due to the existence of a specialised language module.

One of the first studies to apply iterated learning to language [1] found that the pressure for learnability drove an entirely unstructured artificial written language to become highly semantically ambiguous over multiple iterated generations. However, when counterbalanced with pressure for expressiveness (i.e. word forms do not carry many meanings and meanings are therefore readily identifiable from their specific forms), these same languages will become compositional (i.e. exhibit system-level structure).

Present Study

The modelling of this apparently organic

and entirely unintentional emergence of structured language indicates a possible mechanism for the appearance of design without a designer. However, given that writing is a relatively recent innovation, the aim of the current research project is to test whether this result stands up in the spoken mode. Pattern recognition is likely to be significantly more cognitively demanding in the spoken over written language, however the spoken mode, like gestures, is much more ecologically valid in showing how actual linguistic structure may have emerged in the human lineage.

To this end, the iterative modelling method of [1] is followed as closely as possible, with the substitution of written for audio stimuli and output. An artificial language (with words randomly assigned to shapes) was learnt by the first participant (P1), who was then tested and recorded. The output of P1 was then learnt by P2, who in turn was tested and recorded. This was done for 10 generations.

Initial results suggest that the experiment is untenable in its current form, as the higher cognitive demands of the spoken mode put extra strains on learnability and lead to a degeneration of the language, even when an artificial pressure for expressiveness is imposed by the experimenter.

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Rushing in Interpersonal Musical Synchronization

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Introduction

During musical synchronization processes agents represent joint action goals; they focus on each other's actions to make accurate predictions for accomplishing a unified goal. Recent studies on the differences between solo versus joint sensory-motor processing in music-making tasks indicated that partners who play together increase their tempo during joint synchronization processes ^[1]. One of the reasons for the increased tempo during joint action is suggested to be the aim to reduce temporal variability which is accounted as a coordination strategy ^[1,2]. Drawing upon the literature on the joint synchronization processes, the study investigates whether the effects of joint task intentions are carried over to the individual actions that follow the joint actions. The objective is to examine the link between "joint-mode" and musical task effects in interpersonal synchronization.

Study Design & Methods

This study primarily focuses on the impact of producing melodies on the rushing behavior in joint condition. By measuring the simultaneous finger tapings with two different experiments, the study addresses the question of how the enhanced musical task affects the tempo in solo and joint synchronization processes. Furthermore, it aims to identify whether the agents continue imagining the other persons after the joint musical synchronization.

In our experiments, participants performed

synchronization tasks that consisted of two solo and four randomized joint trials. The tasks were generated with Max MSP software and behavioural data was obtained via Sensel Morph pads. Participants' taps were collected via an enhanced and a simple task where they could synchronize by producing a melody or high and low pitch tones. During the half of a joint trial, the auditory feedbacks were cut, leading the pairs to continue in solo condition.

Findings & Discussion

Findings of the study support the evidence on the rushing effect during the joint musical synchronization. Three pairs increased their tempo during the joint trials and slowed down when the auditory feedbacks weren't available anymore. In this sense, agents didn't continue imagining the others and joint outcomes weren't carried over to the solo trials. Findings allow us to conclude that the rushing behavior in joint musical synchronization derives from a low-level sensorimotor mechanism, which is not affected by an enhanced task.

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Self-disturbance in Depression

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Introduction

In recent years, the idea stemming from the phenomenological tradition that psychopathology alters the structure of consciousness has also gained ground in psychiatry. Most attention has been paid to the phenomenology of schizophrenia specifically changes in the pre-reflexive structure of consciousness known as minimal self. Descriptive psychopathology of schizophrenia spectrum disorders supposes a change in the very experience of existing as a subject. Parnas and Sass developed a model of three aspects of such disturbance [1]. The first aspect is known as hyperreflectivity; the second is diminished self-presence, and the third aspect is a disturbance of "hold" on the perceptual world [1]. Based on this model, two symptom checklists were developed for semi-structured, phenomenological exploration of experiential anomalies that may be considered disorders of basic self-awareness. These are known as EASE [2] (Examination of Anomalous Self-Experience) and EAW [3] (Examination of Anomalous World Experience). Recent studies [1] have shown that the categories of anomalous experience pointed out in EASE [2] are also present in severe mood disorders. Therefore, it seems to be worthwhile to explore what kind of self-disturbance might be found in depression.

Methodology

Comparative study will be based on phenomenological semi-structured interviews as suggested in EASE [2] and EAW [3]. We will gather data until we reach theoretical saturation. Interviews will be conducted with seven participants who have long-term depression and are involved in psychiatric treatment. Some of the participants have experience with more severe symptoms of depression (e.g., psychotic symptoms). Concepts gathered with saturation will then be used to point out categories in EASE [2] and EAW [3] that all the participants experience.

Results

Since the research is not yet finished, we will point out some of the expected results based on the previous research [1]. We expect that our participants in both groups will score high in categories that explore anomalies in cognition and stream of consciousness and the anomalous experience of time, events, and other people. Overall, we expect participants with more severe symptoms to score higher on all categories.

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Continuous Joint Action: What are the Optimal Parameters?

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Introduction

Continuous synchronous behaviour is a ubiquitous means of communication and cooperation observed across a broad spectrum of systems. Synchronization in the auditory domain is known to be facilitated by increasing both the sensory feedback availability [1] and the tempo at which the information is given [2]. Additionally, hints from both research lines suggest cognitive load may be a hindrance to synchronicity when subjected to suprasecond auditory tempi [3]. Further, both of the research lines have investigated this using discrete motion which, despite its success, cannot be compared to naturalistic joint action.

We aimed to perform a pilot study to investigate *continuous* joint action utilizing four auditory conditions at two tempi. In this way, we explored the question: What are the optimal parameters for successful joint action?

Methods

Two pairs of participants were separated into one of two conditions: fast (subsecond) and slow (suprasecond). Pairs engaged in a joint action task which tested partner synchronicity using a novel Bela touch-sensor system. This task included four different feedback conditions: uncoupled (each person hears *only* themselves),

unidirectional coupling (both participants hear the pitch generated by either participant 1 or participant 2) and bidirectional coupling (both participants hear *only* each other). Participants were given two goals: maintain a constant tempo and synchronize with their partner.

Expected Results & Impacts

We expect to find optimal synchronization performance when subject to bidirectional auditory feedback and at a subsecond tempo, as this combination theoretically demands the lowest cognitive load. Importantly, this could be of use in clinical settings including music therapy for Parkinson's disease and Autism Spectrum Disorder. More broadly, contributing to basic science, findings on synchronicity in social interaction could have implications for fields such as psychology, neuroscience, and artificial intelligence.

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Simulating probabilistic learning from misleading data

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Introduction

Philosophers define lying with four conditions: (1) a statement, (2) the belief that the statement is untrue, (3) the addressee, and (4) the purpose of misleading the addressee [1]. If someone is constantly lying to us, this individual can be simply deemed unreliable and ignored. If, however, truth and lies are mingled in equal proportions, choosing whether to trust this individual or not becomes increasingly difficult. This fact has been emphasized by Trpin and colleagues [1], which pointed out that the definition for lying is missing one important condition. They broadened the second condition – we usually believe that if someone is certain that their belief is more false than true, is lying, which was not mentioned in the original definition. They found that such medium-strong lies do us more epistemic harm, despite our intuition that constant categorical lies are more epistemically harmful. Following Bayes's learning rule to model lying, the research conducted by Trpin and colleagues [1] sparked debates as to whether it is sensible to consider partial lies at all, if one aims to reduce epistemic harm. What they found is that this approach is only useful when the goal is to avoid believing untruths. Hence, the current research aims to check whether, and which, probabilistic learning rule is more effective in defending against misleading data.

Method

The purpose of the research was to check whether a different and, if so, which probabilistic learning rule is more effective

in defending against misleading data. A computer model was created in which a trust system update was simulated. It executed 500 throws of 11 coins - hypotheses, each coin had its own probability. The experiment was repeated a thousand times. There were three lists of lies according to the following principles: simple lying (the player states the least probable outcome of the coin), gambler's lying (the player turns the coin secretly and states the opposite of the outcome) and clairvoyant lying (the clairvoyant knows the exact outcome and states the opposite). Based on the generated lies, Bayes's learning rule, Good's learning rule, Popper's learning rule and Explanatory learning rule were used, to see which belief system update is causing the least epistemic damage. Learning rules offer a way to update the beliefs in the light of the arrival of new relevant evidence.

Preliminary Results

Preliminary results mainly show differences in probabilistic learning rules in simple lying when the probability of lying is 1,0 - constant lying. It was found that the best probabilistic learning rule, in this case, is Explanatory learning rule with the lowest Brier penalties (i.e., the lowest inaccuracy). This result has interesting implications: it shows that if the data is misleading, then it may make more sense to use non-Bayesian alternative probabilistic rules.

In the future the computer model will be updated in a way that it will explore what happens if the source is being ignored when it is seen that it is not trustworthy, and which probabilistic learning rule is better in that case.

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Brain activity during implicit and explicit motor learning

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Introduction

One of the principal attributes of nervous system is the ability to move and to modify motor commands in order to perform the desired motion [1]. Performance of volitional motor commands is composed of distinct learning mechanisms. Implicit learning results in sensory remapping while learning based on reward prediction error can sometimes require explicit strategies to attain successful adaptation. Both contribute to sensorimotor adaptation [2]. Some theoretical and experimental studies have pointed out the role of cerebellum and Purkinje cells in implicit learning. On the other hand, dorsolateral prefrontal cortex is important in explicit learning, especially when a development of cognitive strategy is required [1].

Hypothesis

The goal of our study was to determine whether implicit and explicit motor learning affect the same neural correlates that guide motor learning, or they use different neural mechanisms. Based on the previous studies we hypothesize, that implicit and explicit motor learning occur in different brain regions. We expect to see increased brain activity in prefrontal cortex in explicit motor learning.

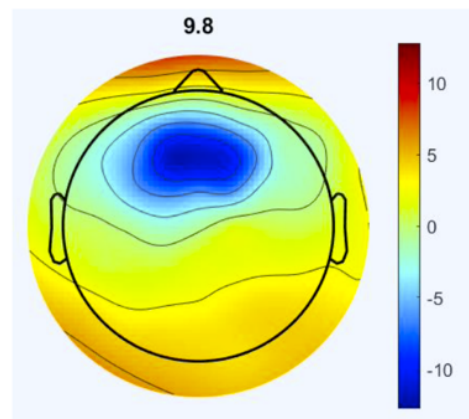
Methods

We used a visuomotor paradigm, where subjects were performing arm reaching movements while holding the handle of a haptic robot. The aim of the motor task was to hit the target on a screen with a cursor that was controlled by the motion of a hand. Subjects performed the task under two conditions. In one, they were able to see the cursor and in the other they did not see it. When the cursor was visible, the subjects received all of the sensory information, so they used implicit learning. When the cursor was not visible, the subjects did not receive any sensory information, but the information about the reward, so they used explicit strategies of motor learning. First

trials were unperturbed, followed by perturbations, that is, visuomotor rotations of the cursor to the right and to the left, and lastly there were alternating perturbations. While executing the task, the brain activity was being measured using EEG (Brain Products GmbH, Gilching, Germany), which allowed us to monitor activity in different brain regions during the implicit and explicit motor learning. The raw data has been filtered using a dedicated software (EEGlab) with a bandpass FIR filter set to 0.5 Hz – 50 Hz.

Discussion

Raw brain activity during the whole experiment is shown in Figure 1. Data will be further processed to exclude artefacts due to eye movements. Independent component analysis will be performed to compare the brain activities due to implicit and explicit motor learning.



*Figure 1 – Brain activity during experiment
The colour map represents absolute power (μV^2) in 10 Hz frequency band with red being the highest and blue being the lowest.*

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Emotions, Misinformation and Vaccination Intent

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Vaccination has saved more than a billion lives in the last few centuries. However, its intention is declining in many Western European countries. Thus, it is vital to consider what effect emotions and their elicitation by misleading media articles has on the intent to receive vaccines.

A key emotion when responding to pandemic, is fear [1]. Among the various efforts to minimize vaccination hesitancy and maximize the promotion of trust in vaccines are evidence based communication strategies where emotions play an important role. Several ways exist to promote positive and negative emotions when informing the the public about vaccination. These are cases that include managing negative emotions such as fear and anxiety and raising awareness of emotional manipulation by groups prone to spreading misinformations [2]. With wider spread of misinformation eliciting pre-existing fear, the vaccination intent might even decrease [3]. For example in the current situation in the COVID-19 pandemic most of the time the media reports have negative narration. The focus is on the number of infected and dead rather than on the number of cured, which elicits negative emotions [1]. When attempting to eliminate such emotions, altruism and prosocial motivations are important. It has been shown that positive emotions such as hope and joy can consequently help eliminate negative emotions [2].

From these basic notions, the current pilot study seeks to examine the role of emotions and misinformation when deciding wheter to

get vaccinated or not. We predict that negative emotions will impact the intentions to get vaccinated in a declining way.

To study this I will use a questionnaire which I will spread among 40 participants. The questionnaire will include general demographic questions and a short task. In it I will aim to elicit negative and positive emotions with a written narrative about vaccinations and check whether these in any way interfere and affect the expressed vaccination intent and/or vaccine hesitancy.

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Dealing with Personal Data: A Human-Centric Evaluation

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Introduction

In the current online data-economy user's personal data is exploited, the limited possibilities to enforce laws regarding data privacy is taken advantage of, and the difficulty of the matter on a legal and technical level, is used to obscure intentions [1]–[3]. Yet, the General Data Protection Regulation (GDPR) of the European Union offers a legal framework, which, if it was more practicable, would protect European citizens effectively [2], [3]. In that light, various initiatives develop socio-technical solutions to make the GDPR more actionable, and to enable users to actively participate in the data economy [1]. However, as those applications were developed only after the adoption of the GDPR in 2018, they have not come under scientific scrutiny yet. Consequently, we ask: What are current emancipatory solutions to human-centric private data protection? What are the barriers, enablers and the potential of those solutions?

Aim

To evaluate existing socio-technical solutions from a human-centric perspective this research's aims are threefold: Firstly, we attempt to understand the position of users in the data economy. Secondly, we evaluate alternative ways of dealing with personal data that emancipates the user. And ultimately, we determine how to enable users to embrace solutions to the data privacy dilemma, as well as identify barriers, drivers, gaps.

Methods

First, we will write a systematic literature review, which addresses the status quo of private data protection, new solutions to protect data, and enablers for users to engage with those solutions. Additionally, a questionnaire will be employed to identify the user's perspectives and needs regarding data privacy protection. The findings will then be incorporated in the literature review.

Implications

The purpose of this research is to describe how internet users can emancipate to participate in the global data economy. By emancipation we refer to an easy and understandable way of managing consent and collecting data, and a financial stake in the data economy. Further, this investigation sets the ground work for developers of new data solutions, politicians, and users to change the future of private data monetization.

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Identifying Non-action

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The term non-action is used in recent scientific publications from different disciplines to broadly address “the deliberate omission of an action as a mode of action”[1]. Further eastern traditions hold the concept of wu-wei, which is commonly translated as non-action or effortless action, as central principle of Daoist thought[2]. However, it appears that western academic texts neither commonly refer to wu-wei, nor to a conceptual work of western origin that elaborates on the term and phenomenon of non-action.

The objective of this exploratory study is to compare and critically discuss the multiple uses of the term, to highlight differences & commonalities, thereby forming an intuition about the means by which one can identify non-action as such.

This will be achieved by analysing selected scientific literature from the past two decades using the keywords nonaction, inaction & non-action. The literature analysed encompasses experimental & conceptual papers, encyclopedia entries from neuroscience, management, psychotherapy, psychology, parenting education, as well as discussions of wu-wei.

All phenomena presented in the selected literature will be looked at through perspectives inspired by behaviourism (What can be observed from the outside?), action theory (What is the structure of action?), psychology (Do special motivations & intentions play a role?), neuroscience (What are the neural correlates?), phenomenology (How is it experienced?) & the metaphorical approach to wu-wei[3] (Are the eastern metaphors

somehow resembled in western descriptions?).

Preliminary results suggest that the phenomena presented under the term nonaction vary largely from a 3rd person perspective. This fosters the assumption that non-action cannot be identified by a certain external form. A potential uniting factor might rather be found within the range of intentions & experience, as most similarities are to be found there. Yet, much deeper investigation is needed to start synthesizing a unified identification criterion.

Nonetheless this study provides a hint to a starting point from which a theory of nonaction could potentially be developed; one that functions within the terms and conditions of western academia while valuing the long-existing eastern concept of wu-wei.

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Modelling Procrastination: “Overloading” Productivity Programmes’ Mental Backlogs

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A Problem Universally Acknowledged

Procrastination is an issue so commonplace, it is easy to forget how little we know about it [1]. Having amassed ample experience in battling the phenomenon, we set about creating a computer model based on state-of-the-art research and our own model of “mental energy” to shed a little more light on procrastinatory behaviours, causes and solutions.

The Strength Model of Self-Control

The *strength model of self-control* [2] posits that our capabilities for self-control are limited. Each time we tap into this limited *reservoir*, we are left with a little less self-control until the moment the reservoir reaches total *ego depletion*, and control lapses completely (resulting, e.g. in procrastinatory behaviours).

Considered a tenet of social psychology for decades, the strength model has recently come under fire within the *replication crisis* in Psychology. One concern that has been raised is why probands are seemingly able to “override” their depletion, given a strong enough incentive to do so [2].

The Backlog Model of Mental Energy

Our model is similar but seeks to redress the criticisms levelled against ego depletion. We

propose that there exists not a reservoir, but a *mental backlog*, where information is digested that would be too overwhelming for a person’s conscious mind in its undigested state. If this backlog runs the risk of being *overloaded* (e.g., due to trauma, excessive productivity demands, or illness), *mental quality control mechanisms* would attempt to psychosomatically communicate this to our conscious mind. Ensuing feelings of tiredness and dissatisfaction would then be *warning signs*: While we *can* push past them (thus overriding the apparent “depletion” of the strength model), it comes at the risk of future penalties. These include long-term and chronic procrastinatory behaviours; burn-outs; psychosomatic illnesses and mental instability, depending on how severely the backlog is overloaded.

Working *with* – not *against* – Procrastination

A computational operationalisation of this backlog model of mental energy will help *verify* internal consistency and operational closure. Ideally, the model would provide insight into all three stages: how procrastination *arises*, how it *functions*, and how it can be *put to rest*.

If successfully run, our model would next need to be *validated*. Ultimately, it might shift the common view of procrastination. Regarding it not as “the enemy” but a mental protection mechanism that acts in one’s best interest could improve the life quality of many a struggling procrastinator.

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Identification of Problems and Good Practices in the Special Needs Education with Proposal for System Improvements

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Introduction

Children with special education needs (SEN) are a heterogeneous group of students who, due to their physical or mental disabilities, need additional help, support and physical, social, didactic and curricular adjustments. In Slovenia, children with SEN can be enrolled in regular educational programs, in which the implementation is adjusted and additional professional assistance is provided, or in adapted programs in special institutions [1].

Slovenian national studies [2] find that while the proportion of children with SEN increases from year to year, their educational performance is significantly lower than that of peers without special needs. This indicates the need for systemic changes in the education of children with SEN. Consequently, the aims of our study are: 1) to identify the advantages and problems of the current system of special needs education and rehabilitation regarding learning performance, social inclusion and participation of children with special needs; 2) to identify, analyse and present domestic and foreign examples of good practice; 3) based on our findings, to prepare proposal for changes to our education system.

Methods

Our sample will include educators,

counsellors, principals and parents of pupils and students with SEN from 20 % of all Slovenian primary and secondary schools. The first phase of the study requires analysis of domestic and foreign literature in order to prepare the guidelines for qualitative and quantitative instruments. The second phase envisages the preparation of questionnaires, and the third phase the collection of data. In the next phase, for the purpose of analysing cases of good practice, we will select a small dedicated sample of schools where we will conduct observations, semi-structured interviews and social climate questionnaires. The final phase will include providing the guidelines for the further development of education for children with SEN.

Preliminary and expected results

At the time of writing, we have already completed the first three phases of the project. In total, 3560 participants from 153 Slovenian institutions have completed the survey. Based on results, we expect to gain a better insight into the factors of school operation, problems and challenges of working with pupils with special needs, and the solutions proposed by students, parents and educators. First preliminary analysis of the data will be provided by the end of August 2021.

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Navigating Semantic Space

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The aim of this project is to operationalize a semantic space as an experimental stimulus set. Development of such a testing paradigm, in the form of a navigation task, will help to bridge the gap between semantic space modelling and behavioural data.

The Mapping Of Meaning

A semantic space describes statistical correlations between the meanings of concepts [1], which can be mapped geometrically (i.e. in the form of a ‘meaning map’). Various methods for extracting and modelling these relations have been proposed in information sciences, psychology and cognitive science. Ways to test these models include implementing them with computational tools and assessing their fit, ideally by comparing different models to one another, with neural or behavioural data [2]. While there have been attempts to evaluate semantic space models empirically, this is usually done indirectly [3], because there is no established procedure for observing how humans navigate semantic spaces.

Closing The Gap: The Navigation Task

One way of extracting meaning correlations is by asking participants to identify features of concepts. The resultant sets of normed features represent the ad hoc generated abstractions participants make when thinking about the target concepts [1]. A navigation task paradigm, as outlined in this project, can serve to prompt participants to navigate a semantic space based on normed features in search of a target concept. This

allows for the direct validation (via reaction times and path choices) of the ad hoc meaning model underlying the semantic space. The spatially situated design of the task builds implicitly on linguistic research emphasizing the spatial organization of meaning (e.g. frame semantics, spatial semantics, mental spaces and action-grounding).

Methods And Relevance

A rudimentary semantic space will be developed from previously validated feature sets [1]. This model will then be implemented as an online testing paradigm (i.e. a navigation task), where participants interact with the semantic space to locate a target concept. The research project is largely exploratory, focusing on the development and implementation of the stimuli. Follow-up work can serve to adapt the proposed stimulus design for large scale data collection, and for systematic evaluation of semantic space models as well as for targeted analysis of behavioural performance.

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Language and cognition: Word formation processing in Spanish

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Preliminaries

Language is seen as integrated in the human mind in terms of a mental lexicon. Different linguistic theories make different assumptions regarding which linguistic units are stored in this lexicon: some theories assume that only words are listed there, while for others, units smaller than words are represented in the mental lexicon, too. For the last-mentioned type of theories, the question is whether units smaller than words are associated with meaning (are morphemes) or are just listed as form (are morphemes). This project provides evidence for the latter claim.

All linguistic theories assume that words are formed step-by-step starting from a base (e.g., *stud(y)*) to which then affixes are attached, (e.g., *stud-ent-ship*). However, recent research in psycholinguistics has shown that an affix (*-ent*, *-ship*) is recognizable as a piece of word structure independently from a lexical base (*stud-*) or other semantic cues (e.g., the whole word *study*) [1]. In line with all this, we research two-suffix combinations (SUFF1-SUFF2, *-ent-ship*) in word-formation. (A suffix is an affix that follows the base.) The goal is to see whether suffix combinations are listed in the mental lexicon as well.

Hypothesis

Based on previous research in other languages [2], we hypothesize that suffix

(SUFF1-SUFF2) combinations are accessible in the mental lexicon as morphemes.

Method and discussion

The project replicates existing research with Spanish data (e.g., SUFF1-SUFF2, *-er-oso*) [3]. To prove our hypothesis, we designed a psycholinguistic experiment, with non-linguists native speakers of Spanish as participants. Thirty existing and thirty non-existing suffix combinations presented without bases serve as stimuli. The participants should decide as soon as possible whether a sequence of letters (coinciding with a suffix combination) is a licit termination of a Spanish word. We control the accuracy of recognition of two variables: existing versus non-existing and productive versus unproductive suffix combinations. We expect people to recognize existing and productive suffix combinations more accurately than non-existing and unproductive ones.

If native speakers know suffix combinations by heart, it implies that they identify language structure smaller than words based on general cognitive principles such as those involved in pattern recognition.

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Stable and dynamic EEG and fMRI functional connectivity patterns and their relation to individual differences

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Introduction

FMRI and EEG are widely used neuroimaging techniques for investigation of human brain function but neither of these two technologies alone provides the information necessary for understanding the functional connectivity of our brains [1]. Numerous studies have thus begun to combine different neuroimaging methods in order to investigate functional connectivity both during rest and task [2]. Since fMRI has great spatial and weak temporal resolution and EEG has weak spatial but great temporal resolution, these two techniques combined are a great method for spatially well specified estimates of functional connectivity with high temporal resolution. Another obstacle that functional brain connectivity is facing is impact of changes in mood and psychophysical states on individual's functional connectivity patterns, as they can mask the presence of neuropathology [2]. The aim of our study is to gain detailed understanding of spatiotemporal properties of large-scale brain networks through integration of EEG and fMRI signals acquired during rest and task. Furthermore, we want to explore the

longitudinal variability in spatiotemporal network properties and test the stability of identified brain networks and their properties. Lastly, we want to examine how both inter- and intra-individual differences relate to the stability of brain networks.

Methods

Five sessions were conducted with 44 young adults for our study. In the first two sessions they filled out questionnaires about demographics and life-style habits. In the next three sessions we collected concurrent EEG and fMRI data during rest and during different cognitive tasks (Stroop test, memory range test, etc.). They also filled out questionnaires on psychophysiological well-being.

Conclusion

As the project is currently in the phase of preparing data for analysis, we do not have any results so far. However, we expect that our results will enable more detailed understanding of the relationship between functional connectivity during rest and task and about inter- and intra-individual differences. In the future, by exploring to what extent patterns of functional dysconnectivity overlap with stable and variable properties of brain networks, our project could contribute to the development of neurobiological markers of psychiatric and neurodegenerative diseases.

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Intelligent Cognitive Assistant for Behaviour Change in Mental Health: A Prototype

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Introduction

Persuasive technology (PT) represents interactive motivational systems for behaviour change using various intervention strategies. It can be useful across different domains, including mental health [1]. The aim of this project was to begin designing and implementing an intelligent cognitive assistant (ICA), also known as chatbot, for attitude and behaviour change in mental health. The goal was to design an ICA that assesses the subjects' personality and levels of stress, anxiety, and depression (SAD), which is the first step towards a personalized PT.

Methods

We used the Big Five Personality Traits (BF) model for the assessment of five personality traits, and the Depression, Anxiety and Stress Scale (DASS) for the evaluation of SAD levels. First, we conducted a literature overview of the most effective dialogues, used by ICAs for SAD. Then we used Python for the implementation of dialogues, BF and DASS questionnaires, with an output of users' scores.

Results

We built an ICA prototype, which consists of a greeting and presentation of the ICA, asking about the user's motivation to use the ICA and his/her current mood in natural

language, which was designed to build trust. Afterwards, the user is asked to answer both questionnaires. Finally, the ICA displays the user's scores, which is a behaviour change technique that can encourage self-reflection. For DASS, the scores are categorised separately for SAD. For BF we derived and allocated one of four personality types, namely average, self-centred, reserved, and role model [2]. The approach included the comparison of user's BF questionnaire scores with the mean values of the BF sample database [3]. The ICA was not tested by users yet.

Discussion

The aim of this ICA prototype was to assess users' personality and SAD levels through a natural language interface. Future work should focus on how this assessment could be used for an ICA based mental health intervention.

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The Connections Between Fake News and Emotions

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Introduction

Fake news is a constitutive element of social media that has become an increasingly popular area of research, especially the degree to which reason and deliberate thought promote or impede the formation and spreading of fake news. Meanwhile, the literature on the role of emotion on belief and spreading of fake news has been widely neglected. On the one hand, research has shown that we spread fake news when we approach them with analytical reasoning, whereby using our rational capabilities we protect our own sense of identity and ideology and therefore choose to believe and spread information that matches our preconceived notions. On the other, there is promising new research that seems to imply greater importance of emotions in the role of belief and spreading of fake news, relative to analytical thinking. Momentary emotions, regardless of valence, appear to increase the belief in fake news. Anger seems to arouse more reliance on heuristics, while sadness increases gullibility in the face of deception [1].

Methods

My goal is to research what makes us prefer some content over other. I will prepare a systemic review of the existing research literature to attempt to pinpoint the emotions that make us more likely to spread and believe fake news. I will also analyse the common themes of the most viral fake news and identify the attentional capture

with the help of existing anthropological literature on cultural preferences.

Predicted results

It is hypothesized that the success of fake news is in its appeal to our cognitive and cultural preferences - these are intertwined. For example, threat and disgust related information renders fake news more believable and is more widely spread, leading researchers to believe there may be some cultural preferences for information that contains negative content [2].

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Detecting Visual Humour using Data-Driven Models

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Humour plays an essential role in human everyday communication. As AI becomes a ubiquitous part of our lives, there is a need for studying human-machine interaction to build intelligent systems that handle nuances of human communication such as humour [1]. Whereas verbal humour is studied in Natural Language Processing (NLP) with a great level of detail, visual humour gained little attention in Computer Vision (CV) despite its popularity in social media (e.g. memes) [1]. Computational visual humour research has to date focused exclusively on semantics whereas visual aspects remain un(der)explored. This is surprising because visual aspects such as form, colour, line, and scale can be sources of humour and set the visual medium apart from the textual realm [2]. In this work, we investigate whether scale incongruity, i.e. a discrepancy between expectation and actual experience of the size of an object, is a source of visual humour.

Approach

We use clipart scenes that are densely annotated and thus offer a variety of features. From the Abstract Visual Humor (AVH) dataset [1] we use 200 scenes intended to be realistic and mundane, i.e. not funny. We scale up and down one object in each scene yielding 400 distorted images. In total, the dataset consists of 200 original, 200 up-scaled and 200 down-scaled images. We obtain funniness ratings for each scene in the dataset from 5 different human annotators. The funniness score F_i of a scene i is defined as the

average of the 5 ratings for the scene.

As model input, we compute scene-level features: number of instances of each object category present within the scene, object coordinates and object size.

We train a Support Vector Regressor (SVR) and a Random Forest Regressor (RF) that predict the funniness score, F_i for a given scene i . We use k-fold cross-validation to estimate generalization performance.

Results

In our sample, distorted images are rated as significantly funnier compared to original images ($p < .001$) by human annotators. Using the ground truth rating, we find that our models do not reliably predict funniness of the scenes. The performances of SVR ($R^2 = 0.204$) and RF ($R^2 = 0.201$) are on par.

Conclusion

As expected, we find that our models do not always capture human perception of funniness. Understanding humour is notoriously difficult for artificial systems as it involves cultural knowledge and is highly dependent on context. Further qualitative analysis of the individual predictions could help to gain a better understanding of how the models succeed and fail in predicting visual humour.

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Embodiment of Artificial Organs

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Introduction

Artificial organ design is a rather new technology compared to many others. First artificial organ was designed in 1982 and it was a heart, source of life in our bodies. The main purpose of artificial organs is to enhance average life-time of human beings and help us getting closer to the ideal of immortality. Yet, this is not the only enhancement artificial organs bring about. Human enhancement is about more than living longer; it is about enhancing our qualities, abilities and possibilities in life. It leads humans to be less organic yet more prominent in the circle of life. But in the end, by means of human enhancement will we be able to stay human or are we going to become something else as trans-humans? Should there be an end for human enhancements? These are some of the main questions of this study. Moreover, enhancement through artificial organs brings up questions about equality and hierarchy. Just as not all medical developments are not accessible to majorities in the societies, artificial organs are not or will not be accessible either. Inaccessibility of such enhancements will create a greater problem of inequality than there already is, considering an average artificial organ costs around \$ 20.000 and it is not only the price of the organ but also the surgery that has to be done in order to make it a part of the organic body. This has a great chance of creating an elite society in which the lower classes will be eliminated due to insufficient treatment or in this case insufficient enhancement.

Nevertheless, the main question is how are

we going to embrace these organs and are we going to be able to accept their existence in our lives or is it going to end up failing us? In most of the attempts even our bodies are not ready to accept them. Only in 2019, at University of Tel Aviv, researchers were able to find tissue that might not be rejected by the body.

Methods and Research Process

Since this is a theoretical study, I have studied 11 articles to be able to reach a conclusion about my study. It is a very wide topic thus picking the best aspects has been a bit difficult. I found the embodiment issues related to ethics to be the most interesting.

Conclusion

In this study positive and negative aspects of human enhancement by means of artificial organs will be evaluated. The embodiment of these organs both physically and mentally is the main focus. Furthermore, effects of trans-humanism in the society will be explained and assessed.

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Please Stop Showering: Modelling Altruism in a Village with Limited Water Inflow

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Introduction

As the corona crisis came, a lot of urban residents moved to their village cottages to spend state lockdowns there. Imagine one such village. Used to their comfort, newcomers shower every day. Sadly, the ground water is not able to refill at such a rate, so the water level drops. It does not cause much harm to those living lower on the hill, but the ones living higher with wells further from the ground water find them empty. Everyone contributes to this problem, but some suffer more. Would altruism solve it? We set out to find out.

Method

We have built a model in NetLogo modelling environment, based on general modelling principles from [1]. There is a 1D village with 10 houses on a simple slope. Every day, a constant amount of water flows into the village aquifer. Then, the water is distributed to the houses – the higher the house, the less water it gets. Then, the houses decide how much water to use – either shower amount s , drinking amount d , or nothing. After that, water from all houses goes back to the aquifer and the cycle repeats. Trick is, that the amount of water inflowing is $5*s + 5*d$, so only half of the village can shower. We measure happiness of a house as $1 - \text{days since shower} - \text{days since drink}$. Drinking is included in the shower. If the house is egoistic, it always consumes as much as it can. An altruistic house that has more water

than s , looks at water volume of some neighbours and if someone has less water than s , the altruistic house will use only d amount – to save water for them.

Results

In an egoistic village, the lower half of the village showers every day (are rich) so the upper can only drink (are poor) – there is a clean *border* between wealth and poverty. Plus, the very top house is left with nothing. Mean happiness is decreasing endlessly. Altruism depends on k – the number of neighbours from each side which a house considers in its decision. For $k = 1$, the house at the *border* skips showering every few days. Thanks to this, the poorest house can drink on those days. The act of one house did not change the situation in the village but saved a life. When $1 < k < 5$, the *border* house stops showering, but nothing changes. $k \geq 5$ is needed for the rich to see the poorest and start saving. Finally, the poorest house can shower together with all altruists which consider it. Then they periodically and synchronously save and shower, restoring the mean happiness to 1. The rich bubble had to pop for the situation to change. It is supported by the fact that a smaller k was needed for the same result when the neighbours considered were from anywhere in the village, or the hill had some valleys.

Conclusion

As any model, ours was too a great simplification of the real situation. So far, it has low theoretical and practical significance. Further work is needed to link our model to other models / theories of altruism.

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