MEi:CogSci

Middle European
Interdisciplinary Master Programme
in Cognitive Science

Proceedings of the MEi:CogSci Conference 2016

Vienna, Austria

Editors:

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The conference took place at University of Vienna, on 23-25 June, 2016.

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Welcome!

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

This is the 10th MEi:CogSci Conference – and, as the very first conference, it is taking place in Vienna.

The beginnings of the MEi:CogSci study programme fell into the time of the Bologna process and higher education reforms all over Europe. This opened a window of opportunity which turned out to be a long running roller-coaster ride for all partners of the MEi:CogSci consortium. After almost 12 years of cooperating and supporting each other, our consortium has grown together.

Despite our successful developments MEi:CogSci is still very much on the move. We are very happy to announce that the ELTE Budapest has recently started its programme and now is an official partner. However, we are sad that Zagreb will no longer be an official partner – hopefully only for a while. In the meantime in Bratislava MEi:CogSci is now fully taught in English.

Teaching and learning in an interdisciplinary and international programme may sometimes hold challenges which may enable innovation in education. The success of our efforts was officially recognised by a nomination for the Life Long Learning Award in 2009, and winning the UNIVIE Teaching Award in 2013. Over the years many consortium partners were invited to share our experiences and gave best practice reports at European meetings.

After ten years it is safe to say that MEi:CogSci is internationally renowned – our graduates are getting excellent positions in academia and elsewhere, many have become founders. Our newly introduced “Alumni Talks” will be a great opportunity to get in touch with our alumni and hear what may await you after graduation.

We want to welcome our invited speakers and presenters of workshops, Jurij Dreo (University Medical Centre Ljubljana, Slovenia), Maurice Grinberg (New Bulgarian University, Bulgaria), Bipin Indurkhya (Jagiellonian University, Poland), and Tatjana Marvin (University of Ljubljana, Slovenia).

Thank you, Igor Farkaš (Bratislava) for organising the publication of these proceedings under the ISBN number 978-80-223-4137-0.

Thanks to the deptartment of philosophy for sponsoring the conference and the lecture rooms BIG I, BIG II, HS 24 & HS 26 at the University of Vienna.

In particular, we want to cordially thank Elisabeth Zimmermann, our central coordinator, for being there and holding things together!

And last but not least, it is you, Coxies, who make it happen. Your posters, talks, and initiatives will make the MEi:CogSci Conference 2016 an exciting and joyful event!

We are happily looking forward to the opportunities and challenges of ten more years of MEi:CogSci.

Selin Ersoy
Peter Hochenauer
Brigitte Römmer-Nossek
Katharina Rötzer
Cornell Schreiber

Tenth Middle European Interdisciplinary Conference in Cognitive Science
University of Vienna, Austria
23-25 June, 2016

Middle European
Interdisciplinary Master Programme
in Cognitive Science

Thursday, June 23, 2016

Afternoon Session at Main Building

12:00 – 14:00	**Registration**		
14:00 – 16:00	**Workshops**		
	↳ BIG I	↳ HS 24	↳ HS 26
	Cooperation and Social Dilemmas *Maurice Grinberg*	Creativity *Bipin Indurkhya*	Knowledge of Language and Compromised Cognitive Ability *Tatjana Marvin*
16:00 – 16:30	**Welcome & Conference Opening** ↳ BIG I		
16:30 – 18:00	**Poster Session** ↳ BIG II		

Evening Session at New Institute Building (NIG)

18:30 – 20:00	**Address by the Dean of the Faculty of Philosophy and Education** *Elisabeth Nemeth* ↳ HS I
	Plenary Talk: Context Effects on Cooperation in the Prisoner's Dilemma Game *Maurice Grinberg* ↳ HS I

Friday, June 24, 2016 (Main Building)

09:00 – 10:30	**Track A:** Attention & Memory	**Track B:** Experience	**Track C:** Animal Cognition
	↳ BIG I	↳ HS 24	↳ HS 26
	Revising Response Types in Oddball Paradigm *Peter Buzáš*	Rethinking the Nature of Social Understanding in Embodied Interpersonal Encounters *Ema Demšar*	Parent-Offspring Interaction in Common Ravens (*Corvus Corax*) *Selin Ersoy*
	Modality Specific Topographies of P3 Event-Related Potential *Filip Agatić, Maja Kapitler, Jurij Dreo*	Investigating Functional and Effective Brain Connectivity During Mindfulness Meditation *Federico Marroni, Iva Ilioska*	Conflict Management in Ravens *Sara Fabjan, Jorg Massen, Martina Stocker, Thomas Bugnyar*
	Practical Approaches to ERP Analysis in the Context of Visual Short-Term Memory *Milan Mitka*	Experiential Transitions of Waking, Sleep and Lucid Dreaming *Viktorija Lipič*	Pupillary Acttivity in Parrots *Julie Carpenter*
	Electrophysiological Evidence of Changes in Cognitive Performance During Dual-task Test After Hypnosis *Sašo Kodrič*	Subjective Experience of Different Personality Types *Polona Petrač*	Regret in Three Great Ape Species: A Comparative Approach *Doreen Schrimpf, Robert Hepach, Michael Tomasello*
10:30 – 12:00	**Poster Session** ↳ BIG II		

12:00 – 13:30	**LUNCH BREAK**		
13:30 – 15:20	**Track A:** Simulation	**Track B:** Therapy & Applications	**Track C:** Affectivity
	↳ BIG I	↳ HS 24	↳ HS 26
	Deep Reinforcement Learning for Computer Games *Matúš Tuna*	Can We Learn to Read Others Minds? A Qualitative Study on Change in Mentalizing Skills as an Effect of Psychotherapy Training *Ingrid Pleschberger*	Influence of Emotional Arousal, Valence of the Program and Commercial Break Placement on the Television Advertisement Effectiveness *Barbora Genšorová*
	Exploration of Named Entity Recognition with Fuzzy Membership Functions *Michal Páleš*	Existential Therapy: Development of an Interactive Online Program to Guide Self-Help *Lisa Holle*	Life-Satisfaction in Old Age: Exploring a Harmonious Ageing Approach *Cristina Dintica*
	Inteligent Semantic Matcher for Obziva.Sk *Adam Bilisics*	On Becoming Authentic: A Self-Guided Web-Based Intervention Based on Existential Analysis *Daniel Boandl*	The Influence of a Pet Dog on Psychophysiological Responses During a Stressful Task *Elena Gobbo*
	Multi-Agent Model of the Influence of a Population's Spatial Structure on the Emergence of Cooperation *Juraj Štancel*	Serious Games as Self-Help Therapeutic Tool for Treatment of Depression *Marcel Belovič*	Towards a Novel Dynamic Faces Stimulus for Investigating Affective Networks with fMRI *David Willinger, Ronald Sladky, Nicole Geissberger, Andre Hoffmann, Martin Tik, Christian Windischberger*
	Towards Opening Black Boxes in Behavioral Science Through Simulation *Kate Hofmann*	Therapeutic Effects of Interactive Digital Storytelling *Karolína Havlíčková*	Human Affect and Typography Aesthetics – On Qualitative Aspects of Mnemonics at the Intersection of Image and Text *Jeanna Nikolov-Ramirez*
15:20 – 15:50	**COFFEE BREAK**		

15:20 – 17:00	**Track A:** Pharmacology & Cognition	**Track B:** Motor Control & Neurorehabilitation	**Track C:** Language
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	The Effect of Social Status and Testosterone on Individuals Time Preferences *Sebastijan Veselic, Christoph Eisenegger*	Visualizing the Nigrostriatal Pathway: Using CLARITY for 3D Tissue Imaging *Luka Železnik, Maja Zupančič, Marko Živin*	Prosodic and Musical Abilities in English Language Pronunciation Learning *Magdalena Schwarz*
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	Enhancing Human or Rather Not? *Veronika Kundlová*	Task-Oriented Games for Neurorehabilitation: A Multimodal Approach *Khosrov Grigoryan*	Neural Entrainment to Musical Rhythms in Dyslexia *Tomáš Lenč*
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17:15 – 18:00	**Plenary Talk: Rules of Word Formation And Compromised Cognitive Ability** *Tatjana Marvin* ↳ BIG I		

Saturday, June 25, 2016 (NIG)

10:30 – 11:15	**Plenary Talk: Who's Afraid of Neuroscience?** *Jurij Dreo* ↳ HS I		
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	↳ HS I	↳ HS II	↳ HS III
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Thomas Grisold</td><td rowspan="5">Raiders of the Lost Work
Asura Enkhbayar

The natural habitat of knowledge is the public and that’s exactly the place where we want to release scholarly works.
In this workshop we will liberate forgotten seminar papers and theses that are gathering dust on hard drives and make them openly accessible. For this purpose we will give a brief introduction to Open Science and Copyright law. The practical part will consist of converting the papers into an open format, choosing and applying an open license and finally uploading them to an open repository for MEi:CogSci (https://zenodo.org/collection/user-meicogsci).

Sharing students' fruit of labor is not only a way of giving a stage to them and other early career researchers, but also represents science as an inclusive community that embraces openness and its role in society.</td></tr>
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Bipin Indurkhya
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MEi:CogSci Conference 2016,

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Plenary Talks

Workshop 1
Cooperation and Social Dilemmas

Maurice Grinberg
Research Center for Cognitive Science,
New Bulgarian University,
Sofia, Bulgaria

The workshop will cover various effects on cooperation in social dilemmas, focusing on the Prisoner's dilemma game. People cooperate in social dilemmas even when standard game theory would judge such decisions as irrational. Human and animal cooperative behaviour has attracted continuous interest and intensive exploration over the years. During the workshop, recent results concerning the influence on cooperation of the payoff structure of the game, information acquisition, Simpson's paradox effects, and player's role effects will be discussed.

Workshop 2
Creativity

Bipin Indurkhya
Departments of Cognitive Science and Computer Science,
Jagiellonian University,
Krakow, Poland

Human creativity has always fascinated psychologists and cognitive scientists. In the last fifty years or so, many cognitive aspects of creativity have been studied, and based on them many techniques for stimulating creativity have been developed. In this workshop, you will participate in a creativity-stimulating exercise that is based on one such technique. There are no prerequisites for participating, except to bring a fresh and open mind.

Workshop 3

Knowledge of Language and Compromised Cognitive Ability

Tatjana Marvin
Department of Comparative and General Linguistics,
University of Ljubljana,
Ljubljana, Slovenia

The workshop focuses on the nature of language deficit in AD patients with special focus on thematic-role assignment in verbs. It presents work by Manouilidou et al. (2009), where it is shown how difficult it is for AD patients to determine thematic roles with atypical verbs. Specifically, AD patients make numerous mistakes in psych verbs of the type f*ear-frighten*, where the task requires recognizing the one who is experiencing the fear, be it in the subject (***John*** *fears the lion*) or the object position (*The lion frightens* ***John***).

Plenary Talk

Who's Afraid of Neuroscience?

Jurij Dreo
Laboratory for cognitive neuroscience, Department of Neurology,
University Medical Centre Ljubljana,
Ljubljana, Slovenia

There is a new buzzword prefix being attached to everything from science and sociology to law and linguistics. The word that is at the center of all the buzzing is, of course, "neuro". But, as a famous uncle once said, with great power comes great responsibility. In this case, it is the responsibility of the current and especially future practitioners of the all arts -neuro to arm themselves with not just technical knowledge but also to vaccinate themselves against all the various ways their field of study is being misused and twisted for less noble pursuits. Following not far behind the steady increase of neuroscience's popularity is also a counter-movement composed of a heterogeneous mix of mental illness denialists, wayward dualists, punitive legalists and Chicken Littles' of all stripes warning that the sky is, indeed, imminently falling. In this lecture we will take a critical look at these anti-science movements, their origins, connections to neuroscience and also examine where their logic falters.

Plenary Talk

Context Effects on Cooperation in the Prisoner's Dilemma Game

Maurice Grinberg
Research Center for Cognitive Science,
New Bulgarian University,
Sofia, Bulgaria

The Prisoner's dilemma game is considered a good framework for studying cooperation in a wide range of social situations. The game is a social dilemma in the sense that the individualistic behaviour can lead to the highest payoff of the game at the expenses of the other opponent if she cooperates. On the other hand, if both players behave individualistically, the payoffs they are getting are lower than if they both cooperated. The talk will present some recent theoretical and experimental results in the understanding of cooperation in PD.

Plenary Talk

Thinking Like a Child: The Role of Surface Similarities in Stimulating Creativity

Bipin Indurkhya
Departments of Cognitive Science and Computer Science,
Jagiellonian University,
Krakow, Poland

An oft-touted mantra for creativity is: think like a child. We focus on one particular aspect of child-like thinking here, namely surface similarities. Developmental psychology has convincingly demonstrated, time and again, that younger children use surface similarities for categorization and related tasks; only as they grow older they start to consider functional and structural similarities. We consider examples of puzzles, research on creative problem solving, and two of our recent empirical studies to demonstrate how surface similarities can stimulate creative thinking. We examine the implications of this approach for designing creativity-support systems.

Plenary Talk

Rules of Word Formation and Compromised Cognitive Ability

Tatjana Marvin
Department of Comparative and General Linguistics,
University of Ljubljana,
Ljubljana, Slovenia

The talk discusses the status of various word formation rules by examining the speakers' perception of pseudo-words that violate these rules (data from English, Greek and Slovenian). Special emphasis is placed on the agentive deverbal nominalization in Slovenian (e.g. bralec “reader”) and the pertaining word formation rules regarding thematic roles, aspect and grammatical category. The off-line and on-line lexical decision test developed for Slovenian is used with healthy and language impaired speakers (MCI, AD). The results reveal significant differences among the specific types of rules as well as among these groups of speakers.

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Talks

Modality Specific Topographies of P3 Event-Related Potential

Filip Agatić, Maja Kapitler, Jurij Dreo
University of Ljubljana, Ljubljana, Slovenia

Introduction

P3 (also P300) is an event-related potential (ERP) measured mostly over the parietal cortex with onset from 250 ms to 500 ms after stimuli presentation. It is also the first ERP thought to be independent of sensory modality and connected to higher levels of processing, in particular attention and memory [1]. Even though the P3 stands as one of the most studied ERPs, there are still some unresolved questions regarding the origin of its underlying neural generators.

Our goal was to examine the electro-physiological correlates of attentional processes in the auditory and visual modality. For this purpose, we build on a similar study conducted at Laboratory for Cognitive Neuroscience Dreo et al. (2014) which is currently in press, and introduce some major methodological modifications. The main research question was whether attentional focusing takes place along one unified processing pathway in a modality-independent fashion, or if there are multiple attentional processing pathways for specific sensory modalities.

Methods

A high resolution EEG with 128 recording channels was used to record data from 30 healthy participants (20 female) during a classical three-stimuli oddball task. Participants were asked to mentally count randomly presented target stimuli and ignore more frequent standard and distractor stimuli. There were four different experimental conditions with varying task difficulty (easy and hard) and task sensory modality (visual and auditory). Individualized task difficulty was determined on the basis of just noticeable difference (JND) between standard and target stimuli obtained by an adaptive up and down step algorithm and not generalized over all participants as in preceding study [2]. The differences between standards and targets were in terms of the angle of inclination and sound frequency for the visual and auditory modality, respectively. Distractors were matched to targets by duration and loudness or brightness.

Results

We are currently still analyzing the data, but the final results will be available by the time of the conference.

Discussion

There are promising results from a previous study that show topographical inter-modality differences in P3 bilaterally in central and parieto-occipital regions [2]. However the mentioned study used clicking with finger as a response to target stimuli. To further test that these results are not a consequence of different motor cortex activations during clicking, we introduced mental counting as a response to targets.

References

[1] J. Polich and M. R. D. Heine, “P300 topography and modality effects from a single-stimulus paradigm,” Psycho-physiology, vol. 33, no. 6, pp. 747–752, Nov. 1996.

[2] J. Dreo et al., “The P3 cognitive event related potential has at least some sensory-modality specific generators, evidence from high-resolution EEG”, unpublished.

Serious Games as Self-Help Therapeutic Tool for Treatment of Depression

Marcel Belovič
Comenius University in Bratislava, Bratislava, Slovakia

Depression, sub-threshold depression, mild depression and other depressive disorders are very common psychological condition in today's society and are among top five leading causes of disability worldwide [1]. Apart from different causes of depressive disorders, prevention and early treatment is current research topic of many psychologists and specialist from different fields. Although evidence-based treatment exists, majority of people never really seek any treatment or specialized help. There are several different reasons e.g. clinical treatment often provides limited capacity for its services and expansion would require substantial funding. In addition available treatment is often expensive, ill-suited or in other way inconvenient. Last but not least professional psychological help is quite often considered not appealing for those who are in need of it [2]. As possible solution to this problem we propose computerized therapy by use of the Serious games, more specifically CCBT (computerized cognitive behavioural therapy).

Games and Gamification are nowadays one of the most important trends in e-learning and therapy. Serious games have become genre of its own and there are several promising examples of the computer-based cognitive behavioural therapies implemented into the Serious games helping people with mild depression any time they feel suitable, without fear and embarrassment and without essential need for therapist to be present [3]. Cognitive behavioural therapy offers wide variety of implementation into the game environment and is considered well balanced for treatment of depressive disorders.

We propose a Serious game that utilizes classic aspects of CBT and benefits form possibilities that only game environment provides. Our game's target audience are teenage children up to high school suffering from mild depressive disorder induced by wide variety of situations starting with school problems, family or relationship problems up to long-term hospitalization.

Our current work will provide detailed description of suggested game with all its mechanics and aspects with possible realization and technological background. Also we will try to compare our game with other similar well-established Serious games and estimate its effectiveness. This work serves as theoretical foundation for master thesis.

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[1] J. M. Newby, C. Twomey, S. S. Yuan Li, and G. Andrews, "Transdiagnostic computerised cognitive behavioural therapy for depression and anxiety: A systematic review and meta-analysis.," J. Affect. Disord., vol. 199, pp. 30–41, Mar. 2016.

[2] T. Fleming, S. Hetrick, C. Cheek, H. Bridgman, H. Thabrew, S. Merry, Y. Perry, K. Stasiak, and M. Shepherd, "Serious Games For the Treatment or Prevention of Depression: A Systematic Review," Rev. Psicopatología y Psicol. Clínica, vol. 19, no. 3, Jan. 2014.

[3] H. W. Giessen, "Serious Games Effects: An Overview," Procedia - Soc. Behav. Sci., vol. 174, pp. 2240–2244, Feb. 2015.

Implicit Attitudes in Native vs. Foreign Language: Critical Assessment of Implicit Association Test

Jakub Benko
Comenius University in Bratislava, Bratislava, Slovakia

Throughout history, research on human decision-making has often been plagued with conscious skewing by questioned subjects. Questionnaires or first person reports can be manipulated easily when people are confronted with discomforting questions or are not trusting towards the experimenter. Hence, efforts were made to devise experimental methods, by which this issue can evaded. One of these is Implicit Association Test (IAT) [1]. Participants are presented with a series of written or heard words which are to be classified according to two predefined categories as fast as possible. Given the reaction times and error rate in classification, it is possible to see the implicit preference or bias of an individual. Researchers claim that IAT is out of the danger of manipulation simply because there is no time for conscious elaboration [1]. IAT has been used widely in research on cultural contrasts, stereotypes or consumer behaviour, where people usually show bias towards one or another category also in real-world problems. It has been hypothesised that these effects are driven by mere statistical learning and stronger associations are reinforced by basic Hebbian processes.

With the advent of social networks a lot of psychological tests used in research have been popularised and came to wide multicultural audience. Since language is not a mere vehicle of content but also takes part in active construction of thoughts, possible data distortion can arise in language-based tests. Even simple tests like IAT are prone to this when taken in foreign language and we consider necessary exploring the boundaries of its validity. One possible explanation is, that different languages entail different associations in their usage [2].

This project has two goals: 1. replicate original findings by Ogunnaike et al. [2] in population of Slovaks speaking English as their foreign language and additionally assess whether and to what extent the proficiency in foreign language and other factors (e.g. age of first contact with language, length of exposure) correlate with bias in IAT. 2. devise an experiment where exact mechanisms might be elucidated. Here we will extract and alter defining features of spoken words and present them either using an auditory version of IAT or as symbolic representations similar to [3]. We might manipulate resulting bias e.g. by modification of pitch, stress or speech rate.

References

[1] B. A. Nosek, C. B. Hawkins, and R. S. Frazier, “Implicit social cognition: From measures to mechanisms,” Trends Cogn. Sci., vol. 15, no. 4, pp. 152–159, 2011.

[2] O. Ogunnaike, Y. Dunham, and M. R. Banaji, “The language of implicit preferences,” J. Exp. Soc. Psychol., vol. 46, no. 6, pp. 999–1003, 2010.

[3] C. V. Parise and C. Spence, “Audiovisual crossmodal correspondences and sound symbolism: A study using the implicit association test,” Exp. Brain Res., vol. 220, no. 3–4, pp. 319–333, 2012.

Intelligent Semantic Matcher for Obziva.Sk

Adam Bilisics
Comenius University in Bratislava, Bratislava, Slovakia

About Obziva.sk
Each and every person is talented. Someone is good in math, informatics or physics. Other people are more handy in car repairs, fixing plumbing, or even doing usual home chores. It does not matter what it is, as long as we love our work. As people in Slovakia discovered potential of entrepreneurship, the Obziva.sk was created. The place were demands and offers of services meet.

Motivation
It is over a year now we deployed first version of our portal and we faced many issues ever since. The biggest challenge was the problem of demands, when people instead of going through the categories on our portal decided to write on our Facebook wall instead, in hope that someone will see it. The solution had to be as simple as writing a post, hence we created our Intelligent semantic matcher, where users can write their demand in the same form as on Facebook, returning them the correct search results (matches).

Methods
The first feature of our matcher is semantics[1], the study of meaning by studying the official rules of Slovak grammar and creating our own stemmer. The stemmer is an algorithm for analyzes of the document and extraction of the words' roots by removing suffixes and prefixes, which we used to stem all the offers and any query from users.

The second step was to evaluate each word's importance, because simply counting all the same words' occurrences in offer and demand would not be sufficient. We decided to use TF-IDF[2] statistical method for evaluation of the words' importance by applying term-frequency and inverse document frequency.

What makes out matcher even more intelligent, is the implementation of supervised learning method. Since the users know best what they are looking for, we decided to give them control over the matching results, by evaluating each match whether it is correct or incorrect. The inputs were used to create relationships between words from the offer and the demand. Each relationship is represented as part of the graph, where the nodes are the words and the links are the relationships between the words.

Based on these three methods we created an algorithm for evaluation of potential matching offers for users request.

Results
For testing purposes we used demands gathered by questionnaire, and evaluated each match as correct or incorrect. To teach the matcher, we iterated all the evaluations 50 times, creating more than 7000 relationships. After the matcher was learned, we tested its accuracy and the results showed that success rate of our Intelligent semantic matcher is 47%.

References
[1] Dean Allemang, James Hendler, Semantic Web for the Working Ontologist, 2008.

[2] C. Ramasubramanian, R. Ramya, Effective Pre-Processing Activities in Text Mining using Improved Porter's Stemming Algorithm, International Journal of Advanced Research in Computer and Communication Engineering Vol.2, Issue 12, December 2013.

EDA-Based Detection of Empathic Accuracy

Filip Birčanin
University of Vienna, Vienna, Austria

Empathic accuracy (EA), the ability to empathize with another person often refers to the accurate judgments of the amount and kind of emotion experienced by another person [1]. A typical EA task involves participants (in similar studies known as perceivers) continuously judging the emotional experience of the 'target' participants, where the target individuals describe their autobiographical experiences comprised of negatively and positively charged events. Furthermore, the empathic accuracy builds on a combination of experience-sharing and mental state attribution processes including both cognitive and affective domains, whose relevance is further explained in the study by Zaki and Ochsner, 2011 [2].

The present study was carried out in two phases, with an aim to investigate if behavioral synchrony and Electro-dermal-activity (EDA) synchronization can differentiate between attentive and non-attentive listening. EDA contains information about the level of arousal, based on which emotional intensity can be inferred.

In the initial phase of this study 1 male and 1 female selected targets are asked to recall and discuss positive and negative autobiographical events, while having their EDA measured. Upon recording the stimulus videos, targets were instructed to use "Affect Dial" to continuously rate the intensity of the affective valence they had felt while telling the stories. The "Affect Dial" system was installed at the bottom of the video as a 9-point sliding Likert scale anchored at "very negative" on the left and "very positive" on the right, through which participants are able to rate the affect they had felt while discussing events and not during the events themselves [3].

In the second phase participants watched the recorded videos under normal and distracted condition, while continuously rating them using "Affect Dial" measured simultaneously with their EDA response. Our primary goal was to examine whether perceivers will react differently and get a lower EA and EDA synchronization in the case of distracted stimuli. In addition, EDA synchronization should correlate with EA in the non-distracted condition (between targets and perceivers). The final goal of this study was to emphasize the importance of attention in empathic accuracy judgments and to outline the necessity of attention training in a clinical setting (e.g. psychotherapeutic and clinical psychology education). The whole study is a minor modification of the original methodology described in [3]. The data collection process is finished, though the results of the data analysis process are expected in the near future.

Acknowledgments
I would like to specifically thank Dr. Geraldine Fitzpatrick, Dr. Petr Slovak, Daniel Boandl and the Human-Computer Interaction (HCI) group at the Vienna University of Technology for supporting this project.

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Education and Romani Children: Developing an Interdisciplinary Perspective

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In my talk I will, through an interdisciplinary perspective, undertake an explanation of the query of Romani children and education in Eastern Europe and introduce my solution to the over-representation of these children in special education.

The Situation
Roma children are disproportionately present in special schools/classes in Serbia, especially in those for children with intellectual disabilities [1]. Children are streamed based on the inadequate adaptation of instruments for screening for diagnostic purposes. These standardized measures also assume a child's exposure to certain cultural experiences. The disability label they get attached is permanent and has many negative influences on child's present and future life by affecting their later participation in the labor market and feeding the vicious poverty cycle. I believe that this covert discrimination and segregation that still continues at the educational level is a paradox of our times that needs to be explored.

Tackling the Problem
My perspective proposes that a big part of the problem lies on the side of culturally insensitive educational theories implemented in the schooling system. Even though many sociological studies have confirmed that primary education does benefit children from disadvantaged backgrounds, little has been done to address the question of the suitable method that should implemented in classroom practice. I hypothesize that the constructivist approach in preschool could be an effective method, since it takes into account the previous background and experiences of the learner. From a radical constructivist perspective, no viewpoint is more accurate than another because ontological reality is not accessible to rational human knowledge [2], which implies that no culture is superior to others. Constructivist educational principles encourage critical thinking as well as motivated and independent learning. My research question is whether constructivist teaching models, implemented in early education, could be adapted for children from disadvantaged backgrounds and marginalized groups such as Roma.

Possible Implications
An early education approach based on constructivist educational philosophy could benefit the children's transition to primary school with the conservation of cultural and individual differences. Educational methods which would take into account minority students' different life experiences and learning environments could also compensate for the experiences they are expected to have, but mostly lack, when entering primary school.

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On Becoming Authentic: A Self-Guided Web-Based Intervention Based on Existential Analysis

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Authenticity has been defined as a three-part construct, constituted of self-alienation (the difference between one's actual experience and one's conscious awareness of it), authentic living (the congruence of one's conscious awareness and behaviour) and accepting external influence (including the belief of having to meet others expectations). Being authentic has been valued throughout history and correlated with self-esteem, subjective and psychological well-being [1].

The aim of Existential Analysis, a phenomenological and person-oriented psychotherapy, is to foster one's authenticity and self-fidelity [2]. Yet, as a school of psychotherapy, Existential Analysis is mostly applied as treatment of psychological illness and not considered by many healthy individuals. Fortunately, the internet offers anonymity as well as the possibility of making information accessible to a broad audience with low costs, providing the opportunity to support people through self-guided interventions, which once established do not require a therapist. However, such interventions exclude the observation and guidance of a trained, empathic professional as well as the fostering aspects of the client-therapist relation, which are crucial success factors of psychotherapy.

So far, Existential Analysis has not been studied as a self-guided web-based intervention. To research the feasibility of application in that context a particular self-guided web-based intervention based on Existential Analysis is developed to guide healthy individuals in becoming more authentic. The impact on authenticity is measured in a pre-test, post-test experimental design using the Authenticity Scale, a validated 12-item instrument whose structure provides separate information on the three constituent parts of authenticity(self-alienation, authentic living and accepting external influence) [1].

Analysing E-Mental Health studies, attrition has been outlined as a critical issue, as huge amounts of participants drop out prior study completion. Therefore, usage metrics and determinants of attrition are gathered and analysed to identify the reasons for dropouts [3].

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Can Eye Movements Give an Insight into Our Decision-Making Process?

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To the untrained eye, playing chess may seem either simple or a thing not out of this world. On the other hand, chess experts know many if not all possible motifs, combinations of positions of chess pieces, but even they are not able to solve all chess problems. This does not apply only to chess, but also to other aspects of our life. It also shows that the difficulty of the problem depends on both the problem and the person [1].

The twelve participants that participated in our study were all chess experts with FIDE Elo ratings between 1845 and 2279. They solved several chess problems of different difficulty, which were chosen from Chess Tempo online chess platform. The difficulty of the problem was rated according to the rating system used by the Chess Tempo platform, where problems change ratings according to which players (how strong players) solved this problem and which did not. Therefore, if a user solves a problem correctly, the problem rating goes down, and the user's rating goes up, and vice versa: the problem's rating goes up in the case of incorrect solution [1]. Participants solved the chess problems on the computer and we used EyeLink1000 eye tracking device [1]. To solve the problem correctly, they had to find a winning move. After they solved all the problems, they had to rank the problems according to their difficulty and describe the process they went through while solving them (retrospection).

Previous analysis done on the data gathered by this experiment focused on statistical data. Their analysis shows that there is no correlation between player's Elo rating and their success in ranking the positions of chess problems and only a mild connection between their success in estimating difficulty of the problems and their success in solving the problems correctly [1]. They used eye tracking data mainly as a way of proving physiological evidence of the areas on the chessboard that people attended to and as a verification of a player's retrospection. We want to add on to what was already researched. We want to focus on eye tracking data and carefully examine if the eye tracking data matches the retrospections given by participants. Afterwards, we will be focusing on researching if we can predict which motif was observed on the chessboard by following the movement of the eyes. We will be using a program developed especially for this research that allows us to track eye movements across the chessboard in real time in order for us to find the moment that a person recognizes the motif present on the chessboard. There is a possibility that we will use this program also as a way to verify the retrospections gathered from the participants.

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Revising Response Types in Oddball Paradigm

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Introduction

Response oddball is a paradigm that has been successfully used in many event-related potentials studies for a bit over 40 years, first at the University of San Diego by Nancy and Kenneth Squires and Steven Hillyard. [1] The oddball paradigm is a task which uses auditory or visual stimuli and where a standard stimulus is occasionally changed for a deviant stimulus/distractor and sometimes for a target stimulus which the subject should respond to. Noticing the targets triggers an event-related potential in the parieto-occipital area at around 300ms and its usually called P3 or P300. [2]

In our current study we aim to explore the used methodology of the commonly used methods of response which are responding by pressing a button to the target stimulus and the counting of the target stimuli. We aim to test all the combinations of type of stimuli and the type of response mechanisms and we also want to add a new type of response not usually being used – responding to all stimuli by a button. Here, one button would be used for standard and distractor stimuli and another button for targets. We then aim to compare the methods and the kind of results they produce taking into account their pros and cons.

Methods

We were working with the 64-channel actiCAP EEG device for measuring the participants' brainwaves. The task we had the participants undergo had 3 blocks of trials each for every combination of type of stimuli and type of response in a randomised order, but the blocks always come in pairs depending on the type of response. In the auditory version the standard stimulus was a tone, the target stimulus a tone of higher pitch and a distractor a white noise. In the visual the standard was a colourful blob, target pictures of people and distractors pictures of non-living objects.

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Pupillary Activity in Parrots

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The order Psittaciformes, known as parrots, splits into the superfamilies Strigipoidea, Cacatuoidea, and Psittacoidea. All are highly social, monogamous, vocal learners and have a high telencephalic volume fraction [1]. Behavioral and neuroanatomical data indicate that Cacatuoidea and Psittacoidea are better at vocal mimicry with evidence suggesting that some species of Psittacoidea are the most adept. In addition to being more adept at vocal mimicry, these species exhibit a striking pupillary action that is difficult to see in Cacatuoidea and Strigipoidea. The behavior is referred to as "eye pinning" and consists of rapid constriction and dilation the pupils.

Constriction is highly visible because of stark contrast between the pupil and a bright, colorful surrounding iris. Eye pinning can be observed dramatically and reliably in at least several species with highly contrasted eyes during vocal mimicry. In the only scientific document that refers to this phenomenon, the author's parrot constricts her pupils while mimicking human speech, and on occasion about 200 ms before speaking begins [2]. In captive parrots it is also observed during vocal mimicry, mate attraction, copulation, occasionally when a bird sees an item it wants to investigate, and when birds are experiencing states of arousal likened to happiness, irritation and anger. In wild parrots it has also been observed during copulation.

At this point it is impossible to say whether the pupillary constriction and dilation of parrots is under voluntary control or simply physiological responses to changes in light and a neurological change in the bird's emotional state. As the vocal pathway is embedded within or near non-vocal motor learning brain regions, it may have influenced morphological and neurological changes in visual and motor control systems such that they now are connected in some manner or trigger neural cross talk during activation. Consequently, the contrast in the eye may have evolved to communicate aspects of the mental state to observers as it appears mostly during arousal.

My work will investigate the evolution of eye pinning. It will be primarily theoretical with an in depth evolutionary comparison of parrot eyes, brains, and behavior. I will research parrot neuroanatomy to elaborate on how neural pathways may have evolved together. As morphological data is lacking, a practical component will compare the anatomical differences of as many parrots' sclerotic rings and eye musculature through CT and MRI scans of dead specimens as is available through the University of Vienna's Natural History Museum and other resources. I hope to restart a scientific discussion on this likely nonverbal communication.

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Androgen Activity and Cognitive Aspects of Problem Behavior In Children with Autism Spectrum Disorders

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Introduction

Autism spectrum disorders (ASD) are a set of heterogeneous neurodevelopmental conditions, characterised by early-onset difficulties in social communication, cognition and unusually restricted, repetitive behavior and interests. Children with ASD often present a high rate of problem behavior. Extreme male brain theory suggests that androgens, especially testosterone, can play a role in the complex etiology of various behavioral and emotional problems in children with ASD [1]. There are some studies linking aggression with androgen activity, but there are very few studies investigating this relationship in children with ASD.

Aims

The purpose of our study was to investigate a relationship between actual testosterone levels, sensitivity of androgen receptor (AR) and cognitive aspects of problem behavior in boys with ASD.

Methods and Results

The study sample consisted of 51 boys (ages 3-15) with ASD. In all children, parents completed Behavior Problems Inventory (BPI-01) that consisted of specific sub-scales: self-injury, stereotypic and aggressive behavior. Sensitivity of (AR) was determined by the number of CAG repeats in the first exon of the gene encoding the AR. Total plasmatic testosterone levels and a number of CAG repeats were determined in the venous blood samples.

No correlation was found between plasmatic testosterone levels, CAG repeats and any of the sub-scales of BPI-01. Further, it was found that the effect of testosterone on behavior is not determined by lower, medium and higher levels of CAG repeats.

Conclusions

In the light of interdisciplinary approach we point potential limitations of current research. Testosterone is not the only one hormone that plays a role in etiopathogenesis of problem behavior and we suggest to investigate mutual interaction between testosterone and other hormones/neurotransmitters (cortisol, oxytocin) in future research. Activity of enzymes involved in testosterone metabolism (5 alpha reductase, aromatase) also influences androgen effect [2]. The presence of blood brain barrier also influences transport of testosterone into cerebrospinal fluid and levels of testosterone in periphery might not reflect the testosterone effects in brain. Moreover, some cognitive theories suggest that a specific impulse, associated with a negative or fear memory in our brain can contribute to the etiology of problem behavior as well [3]. Further investigation of complex androgen activity and the causes of problem behavior might bring more clarification to the role of increased androgen activity and behavioral and emotional problems in ASD.

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Rethinking the Nature of Social Understanding in Embodied Interpersonal Encounters

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Traditionally, cognitive science has regarded our ability to understand other people as a puzzle-solving achievement in which a person attributes intentions, beliefs and desires to another by either inferring them theoretically or simulating them by putting herself in the 'mental shoes' of the other. More recent proposals have challenged such views, suggesting that social understanding in everyday interaction for the most part does not involve deciphering other people's hidden mind on the basis of their observable behavior. Rather, others' mental states are generally apparent in their embodied actions and can be directly perceived and understood through our interacting with them [1].

My master thesis topic will revolve around the question of the relationship between social understanding and social interaction. In my talk I will present the first sketch of the philosophical grounds that will serve as a starting point for my research. At the outset I will explore the nature of social understanding from the point of view of phenomenological philosophy and cognitive science. Are competitive theories of social cognition talking about the same phenomenon at all? Can we speak of reflective as well as pre-reflective social understanding and what is the difference between the implicitly felt and conscious, explicit knowledge of the other's mind?

With support of different accounts of unreflective action and habit I will view face-to-face social interaction as a skilful activity that seldom involves reflective deliberation, thus emphasizing the habitual character of everyday social understanding. Questioning the traditional distinction between implicit and explicit memory, I will analyze the role of body memory [2] in the consolidation of habitual patterns of interaction in long-standing relationships over time. I will propose that past embodied encounters with the other shape our lived present with them, bringing about more stable interpersonal dynamics, a pre-reflective feeling of familiarity and a less explicit, more bodily character of interpersonal understanding hidden in the background of experience. However, how much does 'feeling at home' with the other really have to do with knowing their mind? In other words, can the pre-reflective experience of familiarity still be conceived of as a kind of social understanding?

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Life-Satisfaction in Old Age: Exploring a Harmonious Ageing Approach

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There are numerous life satisfaction theories and concepts in philosophy as well as in psychology. Moreover, there are differences in how Western and Eastern cultures conceptualize life-satisfaction and successful ageing. Specifically, the Western concept is grounded in a "curative" approach to ageing, where old age is seen as an extension of middle-age [1]. Recently, some philosophers have started questioning this, favoring a more Eastern approach which regards life-satisfaction in old age to be characterized by harmony and the importance of social bonds [1]. Additionally, the Western whole-life satisfaction psychological concept seems to be a misguided construct which does not reflect how people truly evaluate their lives.

This study will explore which factors play an important role in current and overall life-satisfaction, and whether this supports more the Eastern philosophical approach. Furthermore, we will examine differences in temporal perspectives and their possible influence on current and overall life-satisfaction. Some studies have found differences in how young and old adults rate their life-satisfaction in relation to different time perspectives [2]. However, within the elderly population, the factors which drive this difference have not been established. Pursuant to this, the hypotheses are as follows:
1) The quality of social relations and bonds is the main factor that drives overall life satisfaction;
2) Participants who evaluate their past life and future prospects in a positive way will be more satisfied with current and overall life.

This is a cross-sectional population-based study, where the data was acquired from an established database in the Swedish National study on Aging and Care (SNAC)-Kungsholmen in Stockholm (n=3363, age= 60-104), through nurse interviews and self-reported questionnaires. Life Satisfaction Index-Z is a 13-item scale developed with the purpose of portraying life-satisfaction in old age [3]. Scores on the LSI-Z will be related to participants' social network as well as covariates such as demographics, life-style, cognitive function, functional capacity and self-rated overall health. The hypotheses will be investigated using chi-squared test and regression analysis.

This study will shed light on which factors influence life satisfaction in old age and indicate whether an Eastern approach to life-satisfaction, focused on maintenance of social bonds, is appropriate in research on aging.

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Parent-Offspring Interaction in Common Ravens (Corvus Corax)

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Parental investment is crucial for most species' survival. Investment might be limited only to produce eggs or live offspring, which are then left to fend for themselves. In some species, one or both parents invest in substantial periods of parental care, sometimes even after nutritional independence, as in several bird species and some mammals [1]. During that time, situations arise when parents and offspring are in conflict over the amount of investment they are selected to give and demand [2]. In most cases, parents favour some offspring over others. Parental favouritism might depend on the offspring's sex or weight, as lower weight and slow growth young seem to be the one parents discard first [3].

Common ravens are long-lived, large-brained and highly social species. They reproduce once a year and parental investment continues after nutritional independence of the young. There was no previous study on family interaction on ravens. Following study primarily aims to understand main dynamics in parent-offspring interaction on ravens and further details in parent-offspring conflict. The study investigates the differences in parental care on different developmental times of the offspring; after fledging and after nutritional dependence. We expect that parental investment will decrease with time and parental favouritism will occur after offspring are nutritionally independent. Therefore, we expect to find differences in parental investment on different offspring in respect to feeding, allo-preening, and close contact.

Seven common raven (Corvus corax) families with four offspring each (42 individuals in total) are observed for the study. Subjects were housed in large, outside, identical aviaries at the Haidlhof Research Station and Konrad Lorenz Forschungsstelle. Observational data collection starts from the first day of fledging (about 6 weeks old) until they are independent from parents and dispersal as juveniles (about 6 months old). Weight and body mass of the offspring are collected two times; before fledging and before disperse. The videos from observational data will be coded with CyberTracker. The analysis will be done in R to fit the data in general linear mixed model. The current research lays the foundations for the social behaviour in raven species. The results can be used for a cross-species comparison, which could be interdisciplinary.

Acknowledgements
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Conflict Management in Ravens

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Conflict is one of the prices individuals pay for social living. Corvids such as ravens regularly fight for accessing food and rising status in the group [1]. Non-invasive methods to quantify components of stress in non-human animals mostly rely on the use of physiological or behavioral measures. At the physiological level, stress is usually measured in terms of fecal or urinary glucocorticoid output. At the behavioral level, typical measures are self-directed behaviors (SDBs) such as scratching, preening, yawning etc. [2].

The aim of this study is to explore the possible link between conflict management and stress in ravens. We determined stress levels behaviorally (via counting SDBs) and physiologically (via excreted CORT in fecal samples). Firstly, we wanted to know whether conflicts are stressful. For this we compared the behavior and CORT expression after a conflict (PC) with those during a matched control (MC). Secondly, we wanted to know if the intensity of the stress response was dependent on factors such as temporal social stability/instability, individual differences and characteristics of each conflict. Thirdly, we wanted to know if post-conflict affiliation by a bonding partner reduces the stress in victims of aggression. We predict that there will be more self-directed behaviors and higher CORT in PC than in matched controls. We also predict that stress will be reduced if the victim of the conflict gets affiliative contacts from a bystander post-conflict.

We studied 17 captive common ravens (Corvus corax) and from these, 11 different birds were victims of conflicts. Data collection was conducted between October 2015 and February 2016. Ravens were observed regularly throughout the day and also at various hours. If a severe conflict, i.e. a chase or a fight, was observed it was recorded and its characteristics were noted. After the end of the conflict a 10 minute post-conflict video of the victim was taken. Then in the time period of 50-90 minutes after the start of the conflict as many fecal samples as possible were taken from the victim. The next possible day (in which the victim did not have a conflict) a matched control video (also 10 minutes long) and fecal samples were taken in about the same time as the conflict had occurred.

Data for a total of 37 conflicts was collected. The videos were coded with Salomon coder and the behaviors were categorized as self-directed, social, environment-directed and vocalization. The analysis is currently being done using PCA (to look for possible components) and non-parametric tests.

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Bewextra Implement: A Method to Prioritize Needs to Facilitate Organizational Learning Processes

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A need can be defined as a necessity for a purpose (e.g. flourishing). Humans are usually unaware of their needs [1] but explicit knowledge about needs can facilitate organizational learning processes (OLPs). The dichotomy between needs and their satisfaction is characterized by a one-to-many relation (many possible satisfiers for a need). Explicit need-knowledge helps to escape binary decisions on a satisfier level.

Bewextra [2] is a method to assess implicit need-knowledge for OLPs and covers three steps. In Bewextra-Collect, we acquire data by asking system members to report their dreams and wishes in a workshop setting. In Bewextra-Analytic, we generate hypothesis about needs using abductive reasoning. In Bewextra-Validate, we ask system members to validate the need hypotheses. Bewextra results in a catalogue of explicated and validated but no prioritization can be derived. However, experience during several projects shows that a prioritization would be helpful for implementation.

Research Question
The following research question was derived: How could we prioritize needs to inform need-based decision-making?

Results
We propose Bewextra-Implement to assess the importance of needs along three dimensions.

1) We assess the perspective of system members on needs (I), by asking them to rate the importance of their needs: the rate of approval of the need hypotheses (I1), the perceived importance of a need by a ranking (I2) and the current level of members need satisfaction.

2) We assess an external view on needs (E). Researchers facilitating the OLP rank them (E1) and employ a sophisticated measure of clusters created in Bewextra-Analytic (E2).

3) We assess a systemic view using a cross-impact-matrix [3] (S) which reflects the leverage potential of needs in a network. This indicates whether a need has a high influence on other needs (active) or gets more influenced by other needs (passive) (S1). Furthermore, a need can be much involved in the system (critical) or not so much involved (buffering) (S2).

All resulting values are rescaled on a scale from 1 -10 and connected to a weight (α - ζ) which allows decision makers to develop different scenarios. Every need assessed results in a M-value. A higher value indicates a relative priority.

The following measure results:
$M(\text{Need } 1...n) = \alpha * I1 + \beta * I2 + \gamma * E1 + \delta * E2 + \varepsilon * S1 + \zeta * S2$.

This interdisciplinary research as part of cognitive science (focus on human needs and decision-making) helps to uncover which necessity generates the highest potential to fulfill an organizations purpose.

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Mindfulness, Knowledge Management and Collaboration

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The project is aiming to investigate the relationship between mindfulness and knowledge management, as well as implementations of mindfulness techniques into a corporate and business environment.

Mindfulness represents an "attention, paid in a particular way, on purpose, in the present moment, and nonjudgementally", or detailed and objective awareness or self and the world. One of the means of achieving the state of mindfulness is mindfulness meditation, which, for example, could be accomplished by focusing one's awareness on the physical sensation of breath [1].

Knowledge management in a broad sense is a method, used to simplify and improve the process of creating, sharing, distributing and understanding knowledge within a company. One of the key aspects of knowledge management is a collaboration, making KM an activity which enables people to create value through sharing physical and virtual space. In this research we will investigate whether the mindful meditation could improve a shared collaborative activity, helping to solve some collaboration issues and make the knowledge sharing and creation more effective.

The positive effect of mindfulness meditation has already been explored in a business context: mindfulness is able to decrease a current focus on the future and past, influencing decision-making, increasing performance and a worker's resiliency in the face of challenges. We will try to find out if how those or similar effects also emerge in a context of collaboration.

In the first stage the main focus would be put on everyday situations within a company, such as business meetings or workshops. We include a several minutes of mindfulness meditation in a working day, which co-workers will share in time and space, preferably before the next important collaborative event we are going to focus on. The control group will be assigned to another task. The meditation experience of the participants will be assessed by means of a questionnaire, and experience meditators will be excluded.

To analyse the effect of meditation on the performance, we are planning to consider such output variables as an average duration of the meeting, the amount of topics that has been covered, the average score of the mini-quiz, checking how well the new information is understood, the level of satisfaction with the workshop measured by a questionnaire, etc. To make such values comparable, we are taking into consideration only the workshops conducted separately with a main and control groups on the same or similar topics. The specific methods will be developed in the next stage.

While the workshops are mainly focused on knowledge sharing, our next goal would be to reflect upon the influence of mindfulness on knowledge creation, which could be potentially used for a further research.

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Influence of Emotional Arousal, Valence of the Program and Commercial Break Placement on the Television Advertisement Effectiveness

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Introduction

Commercials are a significant part of our life, so we think it is important for us to know how much do they affect us. In my research I examine the influence of the emotional valence of the watched program in a combination with the commercial break placement during the program and thereafter evaluation of the commercial and the product in the commercial by the viewer [1] According Owolabi (2009) commercial and the evaluation of the commercial and the product presented in the commercial is consitent with felt mood of the viewer. [2] On the other hand Marc Roy (2013) mentions that not only the content of the program can affect the commercial evaluating, but also the break placement, whether the commercial is placed smoothly or abruptly into the program. He found out that participants who experience the abrupt commercial, tend to evaluate the commercial less favourably.

Methods

I used six different groups for this study. In each group, the participants watched whether negatively charged, positively charged or neutral program and also the commercial break was placed smoothly or abruptly in every program. After that, a questionnaire about the impression of the commercial was administered to the viewers.

Results

Commercial was the most effective in groups with happy program, because their mood was affected by the show and not even the commercial break placement made them feel less interested in the presented product. Groups with sad program had slight decrease in their mood while watching and the commercial break only emphazised that feeling towards the advert. Neutral groups have been deprived with no interest in watching the program, but the sudden change to commercial increased the arousal and therefore the interest in the product. We believe that our research will be useful for the future marketing and we would like to continue exploring in this topic.

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The Influence of a Pet Dog on Psychophysiological Responses During a Stressful Task

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Introduction

A large body of evidence has shown the effect of stress on changes in various physiological parameters. Mental stress induced in the laboratory setting, using physiological and psychological stressors, can produce an increase in systolic and diastolic blood pressure and heart rate as well as changes in skin conductance and skin temperature [1]. The degree of sympathetic response can be affected by the social support during the stressor. Various studies that associated pet ownership or interaction with a pet and cardiovascular functioning have suggested reduction in cardiovascular levels and reactivity [2].

There are three main hypotheses of possible relaxing effects of interaction with an animal. First is the spontaneous relaxing effects of tactile interaction with pets on cardiovascular activity. Second is the buffering cardiovascular effects of social emotional support provided by pets and the third is a classical conditioning of relaxation response [2]. A number of studies has shown the effect of dogs on subjective stress and anxiety ratings as well as physiological and endocrine parameters [3].

Upcoming Study

The goal of our upcoming study is to investigate the psychological and cardiovascular influence of a pet dog on the owner during two different stressors. For stress inducing tasks we will use two previously used laboratory tasks that produces reliable increases in autonomic reactivity: mathematical problems as a psychological stressor and cold water task as a physiological stressor. Our participants will be dog owners (students and working population), assigned to control and experimental group. Control group will perform those tasks alone, experimental group with the presence of their dog. Through the whole duration of experimet we will record participant's blood pressure and heart rate. Before and after both stressors they will fill in the State-Trait Anxiety Inventory (STAI) and Positive and Negative Affect Schedule (PANAS) to asses their anxiety levels and mood. Based on existing literature we predict lower cardiovascular reactivity during both stressful tasks, faster recovery of physiological parametrs after both stressful tasks, lower subjective experience of the stress and better mood while the dog is present.

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Task-Oriented Games for Neurorehabilitation: A Multimodal Approach

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The use of immersive virtual environments in neurorehabilitation has increased substantially over the past several years [1]. Recent studies demonstrated the brain's capacity for functional and structural plasticity and recovery even in severe chronic stroke by using task-oriented games which have been proven effective for improving motor learning and stroke recovery by increasing user motivation during the training, and eliciting neuroplasticity [2].

Motor-imagery (MI), is an imagination of a movement and shares the same control mechanisms and neural substrates when observing or performing a movement, thus providing a unique opportunity to study neural control of movement in patients with neurological impairments [3]. It serves as a basis for one of the control paradigms for BCIs, and provides an alternative route of communication between the brain of the patient and a computer system or a device.

Patients will use an EEG-based BCI system, which will track the brain activity in realtime. Additionally, the patient will receive multimodal feedback through functional electrical stimulators (FES) attached to the hands, and the avatar movements in the virtual environment. This provides a feedback loop and facilitates motor recovery through neuroplasticity.

Within the scope of this project, a scientific study will be designed to investigate the efficacy of control via the BCI and embodiment of the player with the virtual avatar, resulting in an improved neurorehabilitation outcome. The study will assess objective factors such as EEG measures and in-game activities, and subjective measures such as user engagement through a questionnaire. The results will be integrated into the existing neurorehabilitation platform.

The goal is to develop a BCI controlled adaptive multimodal neurofeedback paradigm using immersive virtual environments and motor priming.

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An Interdisciplinary Research Study Linking Depression, Platelet Function and Cardiovascular Disease

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Depression is an acknowledged risk factor for cardiovascular morbidity and mortality and studies have found a high prevalence of depression in patients with cardiovascular disease [1]. Platelet function has been found associated with both depression and cardiovascular disease and may be a potential link [2]. However, the exact mechanism linking depression and cardiovascular disease remains poorly understood [2].

This project is part of a clinical study performed at the Johns Hopkins Medical Institution which included 300 patients with stable coronary artery disease (155) and with acute coronary syndrome (145) whose level and symptoms of depression were assessed by Beck Depression Inventory Second Edition (BDI-II) and Structured Clinical Interview for DSM III-R. For this project, the relationship between specific cognitive and psychological aspects of depression and serotonin related platelet function among cardiovascular disease patients is investigated. The 2-factor analysis method is used for the analysis grouping symptoms into a cognitive-affective factor and a somatic factor [3]. The cognitive-affective factor is composed of 14 items including pessimism, suicidal thoughts, indecisiveness, and feelings of worthlessness among others. The somatic factor is comprised of 7 items including changes in sleep pattern, appetite change, and fatigue among others. SigmaPlot Version 12 is used for the statistical investigation, considering $p \leq .05$ as significant.

This research study is of high clinical relevance for patient treatment especially the treatment of acute coronary syndrome patients with psychiatric comorbidity such as depression. Furthermore, this research study is important for improving our knowledge in the mind-body mechanism linking depression and increased cardiovascular risk.

Acknowledgements
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Therapeutic Effects of Interactive Digital Storytelling

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The aim of the study is to investigate possible therapeutic effects of Interactive Digital Storytelling (IDS). The underlying idea of the study is to explore how storytelling can be used to manipulate mental states of individuals. More specifically, it seeks to answer the question of how storytelling can be utilized in dealing with trauma that the idea of our own mortality provokes. The question will be approached qualitatively by using the method of textual analysis of narratives and storyboarding. The result of the study is not the development of a specific tool (e.g. a story), but the development of a storyboard that can be later used for an implementation using IDS techniques.

Consideration of death is undoubtedly one of the foremost sources of anxiety for people because of the ongoing struggle between the will to live and the knowledge that they die. According to an existential psychologist Rollo May, humans fear death because they cannot comprehend their own lack of existence [1]. Death is fearful, however, culture provides the means and strategies to reduce this fear. Current studies suggest that the modern Western society is less and less accepting of death and that it perceives it as something that needs to be avoided or hidden [2]. Since people cannot live indefinitely in a psychologically and culturally induced state of denial it is a challenge for psychologists and other researchers to discover the pathways to death acceptance.

IDS is an emerging field which aims at developing systems in which storylines are not predetermined and can be influenced in real-time by the actions of the users. It is most commonly used for educational or entertainment purposes, however, research suggests that storytelling can be used as a tool to help people cope with difficult or traumatic situations [3]. This study aims at contributing to the current research with an innovative approach because the idea of integrating interactive systems with death acceptance has not been studied so far.

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Towards Opening Black Boxes in Behavioral Science Through Simulation

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Behavioural science draws conclusions through the results of behavioural observations. In particular, it is trying to predict animal's internal states and processes based on indirect measurements and/or observations of the animal's behaviour. Cognitive science endeavors for years on revealing the content of the black box, as revealing the inner workings between input (stimuli) and output (response).

The aim of our project is to implement a framework with models that are imitating an animal's behaviour and to evaluate, which model fits best animal's behaviour. Hopefully, this will allow us to reveal the inner workings on the basis of very simple observations. An example of similar framework is a prediction of human goal inferences [1].

The evaluation framework is composed of two components: models and evaluation. The framework's input will be the data, that describe a simple animal's behaviour in a form of trajectories in space and time. Models are fitted to the data, which in term generates new trajectories with fitted parameters. The newly generated trajectory will be compared with the original one and the evaluation method returns the information about which model fits better to the inputs. The selected model potentially reveals the underlying inner structure.

We defined two basic families of models; one is expressing beliefs, desires and defines a model of its planning process and the other is simple dynamical model. The former is interpretable but full of assumptions, while the later could not reveal rich inner structure.

The novelty of the project is an update of similar frameworks to our scenario, which includes a replacement of subjects' predictions with model's predictions and an unique design of evaluation method that compares original and predicted data and evaluates the comparison.

In the development phase, the framework will be fed with the artificially generated data. With the implemented solution and the data, for which is known whether they are describing the reflexive or goal oriented behaviour, are going to try to answer the question whether an animal has a cognition.

The long term aim of the project is to feed the tool with real experimental data, for which it is not known which processes are governing behaviour. The implemented solution will serve as an additional research tool in an experimental work, that is performed in the laboratory.

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A Web-Based Intervention in Existential Therapy: Development of an Interactive Online Program to Guide Self-Help

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Psychotherapy is a discipline in which know-how and understanding have grown immensely since the beginning of the 20th century. Expertise however is gained by relatively few individuals and forwarded only to small subsets of all the people that could benefit from it.

With the Internet a new medium of communication has risen and with it, almost inescapably, the field of E-Mental-Health. Self-guided web-based interventions are applications that allow for psycho-education, interactive exercises, psychological testing and forums over online platforms. They operate without direct support of a human therapist [1].

We are developing a web-based intervention on the basis of Existential Analysis, a humanistic therapeutic approach established by the Austrian psychiatrist Viktor Frankl and further developed by Alfried Längle, head of the Society for Logotherapy and Existential Analysis (GLE). While many web-based interventions have been devised on the basis of Behavioral Therapy, the possibility of offering humanistic online support still lacks exploration and thorough researching.

Our intervention is designed for students who experience existential frustration, a state characterized by the felt meaninglessness of a person's life or work [2]. Even though it is not a pathology it may cause students to experience problems to concentrate, procrastination, anxiety or depressive tendencies. Furthermore, whether a person has a self-transcendent purpose for studying was found to strongly influence their determination of conducting given tasks [3].

Assistance in overcoming episodes of existential frustration is one of the crucial strengths of Existential Analysis. Our intervention is designed to guide self-help of students who do not visit a counselor by providing interactive questionnaires and exercises that follow psychotherapeutic methods.

Through the depicted process we want to research interdisciplinarily how expertise from Existential Analysis can be implemented as a web-based intervention. The work combines the areas of Psychotherapy Research, Pedagogy, E-Mental-Health, Human-Computer-Interaction and Computer Science. The intervention is implemented and improved in a fashion of rapid prototyping. For a first evaluation a pre-and post-test study with the "Test for Existential Motivation" (TEM) is conducted.

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How Do Language and Accent Influence Children's Toy Choices?

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One of the most obvious indicators of group membership is the language one speaks [1]. Language plays an essential role in how we divide the world into social categories. Moreover, spoken language and accent with which someone speaks provides information about an individual's national, social, and ethnic group identity [2].

Developmental research has recently shown the importance of language and accent when it comes to social evaluations and early-life preferences. For example, 5–6-month-old infants look longer at an individual who previously spoke in their native language with a native accent, relative to an individual who previously spoke in a foreign language or a foreign accent. Further research also showed that when offered identical toys by a native and a foreign language speaker, 10-month-old infants preferentially take toys from individuals who previously spoke to them in their native language. These experiments provide evidence for an early-developing social preference for members of one's native language group compared with members of a foreign language group [3].

The aim of this pilot study was to investigate how language and accent affect children's toy choices, with the research question being if there is an in-group sensitivity for the native over the foreign accent. In the following preference task, two models were sitting side by side, in front of the child. Each of the models talked to the child in one of the conditions; native language with a foreign accent and foreign language with a native accent. Then, the models held up two identical toy animals and lowered them as if offering them to the child. Children's first reach to one of the toys was recorded and coded offline.

Thirty-five 4–5-year-old monolingual native Hungarian children (14 females, M = 4 years and 8 months, range: 4 years and 0 months; 5 years and 4 months) participated in the study. Data from 24 additional subjects was obtained but not included due to sampling issues.

Results showed that children did not show selectivity in the preference task; they took toys about equally from the individuals of the two accents. The reason for these results will be further discussed in the talk. Moreover, the present study has several limitations that should be addressed in future research.

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Electrophysiological Evidence of Changes in Cognitive Performance During Dual-task Test after Hypnosis

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Introduction

Increasing number of studies which employ hypnotic means to discover neural mechanisms sub-serving cognitive processes displays a possible trend for future research in certain fields of cognitive and clinical neuroscience [1]. Experimental dual-task (DT) paradigm is used to examine possible effects of hypnosis (H) on cognitive performance in a visual three stimuli oddball task (O) as the primary and a simple working memory test (WMT) as the secondary task. Implementation of effort justification paradigm (EJ) grants additional validity of the results in performance oriented experiments. Research aims to extend comprehension of H [2] and examine appropriate changes in P3 waves that are relevant to explore any possible effects on some basic cognitive processes (attention, discrimination, working memory). Interestingly, there has never been any H research which would use O and EJ paradigms published yet.

Method

Research design utilizes a non-invasive electroencephalograph (EEG) to record electrical activity of the brain and event-related potentials (ERPs) during three repeated measures of DT performance. Experiment starts with first DT test as control (OC) and continues with crossover sequence of the two treatments (H, EJ), so second and third tests are preceded by either receiving basic medicinal H treatment (OH) or watching non-specific relaxation videos as a form of EJ (OEJ). Task performance efficiency is determined by participant responses to target (accuracy (ACC), reaction time (RT), false alarms (FA)) and reported figure of memorized displayed distractor stimuli (MD) along with statistically significant differences between ERPs during OH in comparison to ERPs during OEJ or OC.

Preliminary Results

Behavioural results in OH compared to OC and OEJ did not show any statistical significance for ACC, RT and FA. Although the test was designed as a cognitively demanding task for our participants, eight of them achieved excellent results in all WMTs and everyone retained or improved their score after H treatment. Preliminary analysis of ERP data showed statistically significant changes in P3 waves during OH but further analysis, that will include ten more participants, is needed to elucidate relevancy of diminished or potentially beneficial soothing effects of H on cognitive performance in DT tests.

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Differences in EEG and Autonomic Nervous System Activity as a Potential Biomarker in Depressive Disorders

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Introduction

Depression is a mood disorder, characterised by sad mood and loss of interest in daily activities [1]. It commonly affects many patients with neurodegenerative diseases such as Parkinson's disease (PD) or Alzheimer's dementia (AD). In those disorders, depression might be the first symptom before any other clinical abnormalities are detected which makes it difficult for clinicians to assess the underlying aetiology of the depressive disorder [2]. It is broadly recognised that a degree of cognitive decline and EEG abnormalities are present in neurocognitive disorders. However, in patients with depression recent research reports have shown also a dysfunction in autonomic nervous system (ANS) activity [3], which is most often measured through skin conductance (level of perspiration) and heart rate. Comparing EEG patterns and ANS activity might therefore be a useful biomarker to differentiate neurocognitive diseases in the early stages when depression is the only clinically evident symptom.

Aim

The aim of our study is to determine, whether there is a significant difference in patterns of central nervous system activity and ANS activity between patients with depressive disorders of different aetiologies. Potential differences could subsequently be the basis for developing software able to detect them and could help with differential diagnosis and choosing course of treatment.

Materials and Methods

Approximately 40 patients of each group with clinically diagnosed classical depression with no underlying neurocognitive disease, depression in Parkinson's disease and depression in Alzheimer's disease will be recruited at Neurological Clinic Ljubljana outpatient service and examined upon agreement to participate. We will measure a quantitative resting EEG, skin conductance, heart and breathing rate. Control group will be selected based on gender and age composition of the patient group. Same measurements will be performed on control group and compared between each other.

Expected Results

We expect to find significant changes in ANS activity connected to depression and to find EEG abnormalities in patients with underlying neurodegenerative disease. We don't expect to find EEG changes in patients, where only depression without underlying neurodegenrative disease is present. These findings might contribute in differentiating between the aforementioned neurocognitive disorders and diagnosing them with higher accuracy.

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Enhancing Human or Rather Not?

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Why Does It Matter?
The future human-enhancements does not only mean the superhuman powers for the rich people, easier life for the disabled ones and better tomorrow for everyone. The side effects of such technologies will have an impact on the whole society, not only on the enhanced but also on the unenhanced ones. With all these possibilities, an important question arises: Should we allow this to happen? The opinions differ from radically conservative and against any "unnatural" changes, to extremely liberal ones allowing a people to make any modifications that they desire. As for the "middle path" between strict regulation and individual liberty, many important pros and cons are discussed and judged [1].

An Enhancement or a Common Tool?
What is an enhancement and what is not? Will there be a reason to distinguish a watch on our wrist and an implant with the same functions on the same wrist? There may be many arguments referring to „unnatural“ enhancing, but some of the functions have became part of our everyday lives and their influence is already present, no matter the device. However, not all of such improvements are as innocent as they may seem. For example, using a common digital camera in certain places can be banned much easier than a special smart contact lenses with a build-in camera, when they will also be used as an replacement for the glasses. Also, the line between cures or replacements that are necessary for some patients and the subjective enhancement within "healthy" people can be really thin: a medication called Ritalin used by patients with attention-deficit hyperactivity disorder also works as a cognitive enhancer in healthy subjects [2].

Classification
Clearly, there is no easy way to tell right from wrong. All we can do is to take the risks and benefits into consideration and confront them with our moral values. There are many categories of an enhancement that may be discussed separately, such as internal and external tools, temporal or permanent, devices critical for a normal functioning (such as prostheses after a limb loss) and those which we can add by choice (for example a mechanical heart created to eliminate the heart diseases [3] instead of the one we have, no matter if healthy or not), chemical (or organic based) substances vs. electronic devices etc. With clear division, we can review the various arguments in a whole different way.

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Examining the Effects of Estradiol on Risky Decision-Making Using the Columbia Card Task

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Introduction

The steroid hormone estradiol is the primary female sex hormone. It is mainly responsible for the development of reproductive tissues and therefore women have higher estradiol concentrations compared to men. Although previous studies suggest, that testosterone, the primary sex hormone in males, affects decision-making under risk [1], it could also be that the effects of testosterone can be explained through indirect effects of estradiol, which gets synthesized from testosterone through aromatase.

Methods

So far, the only studies examining the effects of female sex hormones on decision-making under risk were done with women, who naturally have fluctuating hormone levels [2] which are hard to control for. In order to reduce variance associated with the menstrual cycle, our sample will consist of healthy young men with naturally low estradiol levels. While previous studies base their conclusions on correlations between estradiol serum concentrations and risk taking, we aim to conduct a placebo-controlled study by increasing estradiol levels via administration of estradiol gel.

Experimental Task

Decision-making under risk will be assessed using the Columbia Card Task (CCT). In the CCT, participants are facing a deck of 30 individual cards which have to be turned over one by one. The deck consists of "good" and "bad" cards. For each "good" card, the participant receives a certain amount of points. Once a "bad" card is turned over, they lose the whole amount of points accumulated during that trial. The more cards the participant is willing to turn over, the higher is the risk of losing all points on a particular trial. The CCT has a "hot version", where participants get feedback after each card is turned over and a "cold version", where there is no feedback provided and participants have to decide beforehand, how many cards they want to turn over. A huge advantage of the CCT is that it does not only assesses risk taking, but also how the complexity of information provided (amount of gain per card, amount of "bad" cards) influences risk taking.

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Neural Entrainment to Musical Rhythms in Dyslexia

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Across languages, dyslectic individuals show difficulties in representation and/or processing of speech sounds . Recently proposed "temporal sampling framework" (TSF) suggests that this phonological deficit may arise from reduced sensitivity to speech prosody and syllable structure [1]. State of the art neural models of speech perception suggest that auditory system "samples" continuous speech by entraining (phase-locking) endogenous neural oscillations to its spectro-temporal modulation patterns at different timescales. TSF proposes that dyslectics may exhibit atypical entrainment at slow frequencies (<10 Hz), corresponding to syllable and prosodic structure of speech. This would explain observed difficulties in perceiving speech rhythm and its acoustic correlates.

Low-frequency neural entrainment to the stimulus temporal structure has been similarily proposed in musical rhythm perception [2] and thus TSF predicts deficits also in tasks involving processing of musical rhythm. Dyslectics indeed show difficulties in behavioral tasks requiring rhythm perception, sensorimotor synchronization, and also impaired neural entrainment to simple isochronous stimuli.

When listening to musical rhythm, humans are able to perceive steady pulse (beat) to which they synchronize body movements (e.g. foot tapping). Listeners usually perceive multiple hierarchically nested levels of periodicities (integer ratios of the beat frequency) in the same rhythm, called meter. In syncopated rhythms, the beat is not predominant in the acoustic structure and top-down processes are required in order to establish the beat perception. Neural entrainment to meter can be captured by frequency tagging approach measuring steady-state evoked potentials (SSEP) in scalp EEG [2].

As no study up to date investigated neural correlates of meter perception in dyslexia, the current study aimed to examine neural entrainment to musical meter in adult dyslectic (D) and control (C) participants. While EEG was recorded, subjects listened to either syncopated or non-syncopated rhythm. It was hypothesized that overall magnitude of SSEPs at meter related frequencies will be lower in dyslectics. This effect was expected to be more pronounced in the syncopated rhythm condition, as it places higher demands on the brain network that is supposed to process temporal structure of sound.

Preliminary results (N = 7 D and 11 C) did not support either hypothesis. However, unexpected differences were found in very low frequencies, what might be explained by differences in perceived meter between groups. Higher number of participants is needed to confirm this effect.

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Experiential Transitions of Waking, Sleep and Lucid Dreaming

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Introduction

The experiential world of sleep and sleep onset has so far received little attention. During the process of falling asleep, we pass through consecutive transitional conscious states. Subjects often report hypnagogic imagery and a progressive loss of awareness of the external world. Other subjective experiences of moving towards sleep include the loss of control over one's thoughts and thought processes, the loss of reality orientation and a loss of time perception [1]. Conversely, the experience of deep and dreamless sleep can be explained as pure temporal experience. It is characterized only by the subjective experience of time, the phenomenal now and the sense of duration, but devoid of any further intentional content, such as perceptual objects or events [2].

Aim and Research Design

My endeavour is to shine further light on the phenomenological features of sleep experience and dreamless sleep. The focus will be on the transition from being aware to being unaware, more specifically the change from being awake to being asleep and what this tells us about the nature of consciousness.

In addition to observing the time spent during falling asleep and waking up, I am going to concentrate on the experiences of lucid dreamers, particularly on the change in the structure of experience during an experiential shift from lucid dreaming to lucid dreamless sleep. The participants will be given the instruction to report their experience immediately upon awakening by focusing on any type of feeling or qualitative state they have experienced prior to awakening. The goal is to direct their attention towards the felt qualities or phenomenal character of awareness itself [3].

The reporting technique will consist of home diaries following spontaneous awakenings. Other possible ways of reporting the experience will also be in the form of a drawing or any other kind of visual presentation of the experience. Later in short temporal proximity I will carry out in-depth phenomenological interviews with the participants. The aim is a phenomenological enrichment and refinement of the current understanding of sleeping experience, waking and dreamless sleep. The purpose is to try and expand sleep research to include dreamless sleep experience and try to do a preliminary outline of what the experiences entail.

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Measuring Empathy in Relation to the Attitudes Towards Refugees

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The refugee crisis that hit Europe is a significant social phenomenon. This work is an attempt to react on the discussion elicited by this crisis. The negative attitudes of the majority of Slovak population towards the refugees were an appropriate object on closer research from the viewpoint of the connection of these attitudes to the empathy of people, since the empathy is perceived as a key factor of the approach towards the other people; also in the public discussion, the empathy was often being connected with the attitudes towards the refugees. These facts were a good enough reason for conducting a research with the research question whether there is a statistically significant correlation between the empathy and the attitudes towards the refugees. The work offers The Empathy Quotient Questionnaire from Simon Baron-Cohen localised for Slovak language by backward-translating the English original which is one the work's contributions. [1] The next one is a newly created questionnaire of the attitudes towards the refugees. Both questionnaires use Likert's scale. [2]

After the theoretical specification of the problem, the results of the research are presented in the research part of the work. 163 respondents living in Slovakia took part of the research. The results give three following conclusions. First, there was not found any statistically significant correlation between the empathy and the attitudes towards the refugees – neither in case of men, nor in the case of women. Second, the higher empathy of women as of men was confirmed and this difference was statistically significant. Third, the attitudes towards the refugees were not found to be significantly different by sex of the participants. However, the structure of these attitudes was different among the sexes. This work is a contribution to the public discussion on the problem of refugees and offers the options for the next research.

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Assessing Attentiveness Based on EDA-synchrony

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A possible way of measuring emotional responses in humans is electr-dermal activity (EDA). We are interested in finding out whether and how this may be used in the realm of attention.

The current study is designed to assess whether empathic synchrony and skin conductance (EDA) synchrony appear during attentive listening. Prior studies by Marci et al[1] showed that perceived empathy of counselors and skin conductance of patients and counselors showed positive correlation during therapy sessions.

Zaki et al[2] showed that verbal information is critical for empathic accuracy (EA). EA is the level in which people can judge the emotional state of another person.

EA is positively correlated to attentive listening. I hypothesize that there is a connection between EDA and EA. In the current study participants are required to view audio/visual footage. The control group is distracted in order to evaluate the relationship between EA and EDA.

Acknowledgements
Special thanks to Petr Slovak and IGW for supporting this project

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Investigating Functional and Effective Brain Connectivity During Mindfulness Meditation

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The practice of mindfulness meditation consists of non-judgmentally monitoring the content of one's experience in the present moment. This practice is related to changes in the structure and activity of the brain. FMRI studies have shown that meditators exhibit both immediate and long term differences in their functional connectivity [1]. Two important networks affected by meditation are the frontoparietal network (related to monitoring and attention control) and the default mode network (related to resting state and mind wandering). The frontoparietal network has been shown to be consistently active during meditation. Conversely, the default mode network decreases its activity significantly [2]. Activation of the frontoparietal network during meditation decreases with advanced levels of expertise, suggesting a decrease in the effort necessary to hold a meditative state [1].

Using TMS/EEG, a combined technique that consists of stimulating a brain area while recording the electrical activity of the brain, it is possible to evaluate effective connectivity (i.e., how brain areas directly influence each other) by observing the time resolved reaction to the stimulus in areas participating in the network. This technique can reveal whether areas that activate at the same time are in fact causally connected to each other, or whether they operate in a more independent fashion [3].

We will target the dorsolateral prefrontal cortex, part of the frontoparietal network, with a TMS pulse below the motor threshold. In this way, we can map the spreading of the activation signal in other nodes of the networks of interest. Two groups of subjects will participate in our experiment: one composed of experienced meditators, and one composed of beginners instructed to perform the same meditation exercise. We intend to compare resting state to mindfulness meditation both within and between subjects. First, we will study connectivity changes in experienced compared to inexperienced meditators during resting state and meditation. Second, we will compare connectivity during meditation against resting state in the two groups. The importance of testing the effective connectivity of these networks is to reinforce previous research findings, test their conclusions, and shed light on the mechanisms of mindfulness meditation.

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Practical Approaches to ERP Analysis in the Context of Visual Short-Term Memory

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Introduction

We provide an overview of practical approaches to the analysis of event-related potentials (ERP)[1] and demonstrate the use of such methods in the context of visual short-term memory (VSTM), which is the capacity for holding a small amount of visual information in a readily available state for a brief period of time and limited to about two to five objects at any given moment.

Inter-individual differences in humans performing short-term memory tasks can be attributed to different factors including different stages of the memory process, namely encoding, maintenance, resistance to interference, and recall.

Methodology

We analyse which of these stages is the strongest predictor of performance measured by response accuracy using data from a short-term memory task, in which 28 subjects shortly observed a visual target stimulus which was then covered with a mask for three seconds and had to be retained in VSTM. Then, they were presented with a probe stimulus and had to judge whether it was rotated clockwise or counter-clockwise with respect to the target, and indicate their decision by a key press [2].

We describe time-domain analysis and statistical methods developed to make reliable inferences based on electrophysiological data which contain many observations, and present the methodology and results of our sensor-level exploratory analysis from start to finish (data handling, time-locked averaging, statistical design, multiple comparisons correction, etc.) using FieldTrip, an open source software package for the analysis of M/EEG data [3].

Results

The main result is a consistent area of strong correlation ($r > 0.5$, $p < 0.01$) between the response accuracy and the amplitude of the respective ERP in the time window between 376 and 552 ms after the onset of the target stimulus, i.e. during the late encoding stage and extending shortly into the maintenance period, over the medial part of the frontal lobe.

Conclusion

Our results suggest that the capacity of VSTM relies mostly on the efficiency of information encoding. The summary and practical extensive demonstration of analytical approaches to ERP may provide useful guidance for further studies linking cognitive and neuronal processes.

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Human Affect and Typography Aesthetics – On Qualitative Aspects of Mnemonics at the Intersection of Image and Text

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While there is a wealth of research in the field of art history and reading, the investigative effort at the intersection of research on lines, images and text is at its infancy and located in the young field of neuroaesthetics [1]. How are shapes, lines, and "patterns" in the world affecting our cognitive and affective processes? And is there a type of aesthetic quality to cognitive offloading techniques that contributes to the production of meaning?

In order to inspect the correlations between perception, typography and affect this study is employing EEG and eye-tracking methods. The aesthetics of typographic design and the potential consequences on human affect are studied via four questions:
What is the epistemological surplus of aesthetics in text perception?
How can visual quality help us learn and memorize better?

How can science be conducted/communicated more effectively?
In what ways is knowledge development affected and structured by visual qualities, and are there differences between age groups?

60-100 subjects are presented with 1 motive in 3 versions alternating neutral and aesthetic typographic stimuli.

Each motive is seen only once for a duration of 20 sec. Using EEG and eye-tracking data, in conjunction with interviews and self-report questionnaires, the difference in perceiving "neutral" text and typographic design is compared while neural underpinnings of the aesthetic episode are gathered.

Understanding typographic design and its representational effects (as a large projection field of non-verbal imagery and cognitive structuring [2]) can help explain human situated cognition [3] and elucidate the building blocks involved in the construction of images and composition of text. Understanding how we see and design our knowledge helps us understand how we experience the world and how we think. One of the goals of this study is to explore the links between visual representation and emotional connotations and to determine the effect context plays on the communication of science and knowledge acquisition. Moreover its aim is to contribute to a better understanding of the emotional component of the aesthetic episode and its evolutionary origins.

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Exploration of Named Entity Recognition with Fuzzy Membership Functions

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The main motivation behind this whole project is to build a fully functional text analyzer which would be able to change selected text into a graph, with fully extracted entities and entity relations (ER). The timeframe selected for this project does not allow more than partial fulfillment of the expected roadmap, so only the first part shall be handled by this paper.
For reasonable understanding of this task, one will need certain amount of knowledge in fields of linguistics and, optionally, also philosophy of language, as it would prove useful in delving deeper into the subject.

Recognizing named entities like Persons, Locations, Organizations, Dates and Times in text is very useful in mining information and data from electronic resources like documents or tweets. The ability to extract these types of data is called named entity recognition (NER). Even though NER is quite well defined and known, it is still not entirely solved, as the current approaches do not provide a perfect effectivity and precision in terms of an existing generic solution that would be able to attain sufficiently high scores on wider range of data sets. The problem currently lies in the very dataset-specific approaches, that makes the final algorithm rigid and not portable through different data sets or languages.
We propose and test an approach that uses support vector machines (SVM)[1,2] for classification with help of fuzzy membership functions[3], which define the membership in terms of probability and are supposed to remove some of the problems of SVM classification. That being the set of two class classification problems[2]. Also, we compare the ability of our approach to classify correctly the entities with standardly used machine learning algorithms and approaches.
After we have created a sufficiently generic algorithm capable of classifying entities in text effectively, regardless of the provided dataset, the next step will be to explore the possibilities of entity relation extraction and the optional use of fuzzy approach.

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Moral Decision-making in Virtual Reality

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Investigating human moral faculty has proven a difficult research endeavor. Due to differences between what people actually do and what they want others to think they do, whenever moral considerations are involved, self-reports of moral behavior are unreliable. Experimental expectancy effects and self-deceptive illusions held by people effectively prevent them from reporting accurate facts and motivations when inquired [1].

Therefore, indirect methods of studying human moral intuitions have been developed. The most widely used method consists of presenting subjects with written vignettes and asking them what they or other story characters would or should do. Unfortunately, the dilemmas described in these texts are very often unusual or altogether unrealistic, what leads to frivolous treatment by subjects [2].

Distinctive features of situations involving moral considerations are the environment itself being risky or characters operating under pressure. Virtual Reality (VR) has been argued to be a panacea to recreate and control such real-world situations for research purposes, by referring to relative ease of manipulating the environment [3].

To critically assess this approach, we develop a non-immersive desktop-based virtual reality system using the Unity Game Engine. Within this 3D environment, the user controls a character from a first-person perspective. The scenario is set in a company producing car accessories, and the player needs to decide whether to engage in production of counterfeit goods. Interactions with non-player characters make use of a menu-based dialogue system, revealing the player's appraisals and mental representations of the situation, as well as the justification of their moral decision.

This pilot study aims at the development of a grounded critical understanding of theoretical, empirical, and methodological issues in the design and implementation of such a scientific VR-based probe. If warranted by fundamental assessments of the first prototype and later incremental findings, we successively also address usability and player engagement, reliability of decisions, and first validation our research hypothesis of expected differences of VR- and vignette-based outcomes.

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Debiasing Logical Reasoning About Meat Eating

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Many studies have found emotions to impair logical reasoning. However, veterans have been shown to improve reasoning on syllogistic problems when the content was related to personal experiences, suggesting an attentional effect on cognitive processes through highly emotional topics [1]. It remains to be answered how self-relevant emotional content may cause an improvement in reasoning tasks.

In this master thesis, two experiments explore deductive reasoning on syllogisms related to different food choice groups. Manipulating logical reasoning variables by means of experimental interventions is assumed to explain the factors that improve resistance to miserly processing, i.e. support people to give the normatively correct response [2].

In line with [1], emotional content that appears to be self-relevant is hypothesised to serve as a signal that directs the appropriate analytic cognitive style, i.e. motivation to engage effortful reasoning processes, towards processing information. Approaching this suggestion in a non-clinical sample, a syllogistic reasoning task about common food choices was designed and pre-tested (N=235) to allow for comparison of divergent effects of emotional content on logical reasoning depending on four groups: meat eaters, meat reducers, vegetarians, and vegans. Each group has been associated with specific responses to stimuli related to meat eating. For example, most meat eaters but fewest meat avoiders endorse rationalisations that meat consumption is "natural", "necessary", "nice", and "normal" to morally justify a dietary practice that is under public debate [3].

In the first online experiment (N=402) we used a 20-minute auditory mindfulness meditation intervention to improve performance in logical reasoning variables compared to an audiobook control group. Self-relevant emotional factors are hypothesised to partially moderate effects of analytic cognitive style on boosted resistance to miserly processing, explaining the stronger improvement in reasoning about food choice related syllogisms than in neutral syllogisms. There were both performance-based and self-report measures for logical reasoning variables and self-report measures for attitudes towards meat eating. The data has yet to be analysed.

In a second experiment we attempt to replicate findings by means of presenting affective pictures to manipulate the level of self-relevance of emotional content in the syllogistic reasoning task.

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Subjective Experience Of Different Personality Types

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Introduction

Pristine inner experiences are salient phenomena (including seeings, hearings, inner speakings, tickles, sensations, feelings, etc.) that are directly apprehended by people in their everyday environments. [1] At every moment, a person selects/creates some very small number (often just one) of those potential experiences to form that moment's actual pristine experience. Different people do that in different ways. [2]

The aim of this study is to examine inner experiences of different personality types - based on Jungian personality theories. Isabel Briggs Myers and Katherine Briggs developed his theory and created 16 types combining 8 Jungian functions. The MBTI is an instrument to determine an individual's personality type based upon C. G. Jung's theory of psychological type. [3]

Methods

Data will be obtained from 48 participants (3 for each personality type) using Descriptive Experience Sampling (DES), a method for exploring inner experience. DES subjects carry a random beeper in natural environments; when the beep sounds, they capture their inner experience, jot down notes about it, and report it to an investigator in a subsequent expositional interview. [2] Each participant will record his subjective experience for two weeks.

I consider that this research can be used to evaluate the Jungian personality theory .

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Can We Learn to Read Others Minds? An Exploratory Study on Change in Mentalizing Skills as an Effect of Psychotherapy Training

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Responding to a strong need for longitudinal studies of psychotherapy training, the Society for Psychotherapy Research Interest Section on Therapist Training and Development (SPRISTAD) initiated a multi-site longitudinal study of development in psychotherapy trainees. This study aims at tracking progressive change over time in trainees as therapists, to identify factors that facilitate or impede trainee development by gathering quantitative and qualitative data from a wide range of training programs.

An essential component of any therapeutic treatment is the relationship between therapist and client. One concept that has become prominent in order to promote a secure attachment climate within psychotherapy is mentalization. Mentalizing describes the human ability to comprehend mental states of one's own and others [1]. It is seen as one of the core competences of psychotherapists since the ability to understand the mental state of others is crucial to intervene. Therefore, alike clients, therapists themselves have to have/develop them [2].

Research Question (RQ) and Hypothesis (H)
As a contribution to the SPRISTAD study in Austria, this master thesis will compare the mentalizing skills of psychotherapy trainees in an early stage with experienced psychotherapists and assess the differences.
The following RQ can be derived: Do mentalizing skills in early stage psychotherapy trainees and experienced instructional therapists differ?
H: We expect to find a lower level of mentalizing skills in early stage therapy trainees compared to experienced professionals.

Method
Since psychotherapy training in Austria is diverse, we will cluster the training institutions according to their methods (analytical, humanistic, systemic, and behavioural). We will recruit 5 students per cluster. Accordingly, we will recruit 20 training therapists as experts. The qualitative method to assess the mentalizing skills will be the Brief Reflective Functioning Interview (BRFI), which will be rated using the Reflective Functioning Scale (RFS).

Objective
Since mentalization combines many theories related to cognitive science (empathy, metacognition, theory of mind), the theoretical part of this thesis should critically discuss this approach and outline strengths and weaknesses.
As a whole, we expect to find supporting results to draw the conclusion that psychotherapy training has an effect on the development of mentalizing skills acting as a starting point for further research in this field.

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Press Start for Change – Exploring the Subversive Potential of Digital Game Design for Challenging Normative Attitudes

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Social injustice often manifests in an internalized attitude of resentment against individuals that are perceived to deviate from culturally established norms with regards to gender, race or sexual orientation, among others. Considering the normative function of entertainment media in general, both their inherently interactive aspect as well as their rising popularity indicate that digital games bear an especially promising potential to not only reinforce, but also transform these norms and attitudes [1].

The advance of gamified information systems for educational or advertising purposes suggests the promotional strength of play-based content delivery to circumvent a users refusal or lack of intrinsic interest to engage with a topic. Given the resistance often encountered when explicitly addressing particularly sensitive matters, social intervention games should profit from a persuasive strategy that is in line with the hedonic principle of gameplay – i.e., not conveying a message overtly, but by virtue of their design [2, 3].

For instance, immersive character and narrative design could conscientize players for aspects of inequality that don't lie within their usual experience realm. Further, contrasting current norms with virtual alternatives could implicitly reveal their contingency and thus foster critical thinking. While the (predicted) success of these games has been linked to similar cognitive and affective responses [1], research on how to systematically aim for such transformative impact is still in its early stages: the "Embedded Design" model [3] offers broad strategies, but has so far only been applied to non-digital, multi-player games.

How to Sneak a Message Into a Game

The present study explores the possibility to specify and refine these guidelines for designing small-scaled and low-threshold digital games that account for the restrictions in temporal and material resources commonly faced by an adult target audience. Based on additional literature, a set of contemplable guidelines will be worked out, implemented and tested within a simple example game, whereas methodology and validation criteria employed by [3] will be adapted so as to suit this work's scope. As the main challenge of ensuring both subtlety and efficiency is not only imposed on the design, but also the evaluation of such games, we hope to gain insights for further investigation on both of these levels.

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Regret in Three Great Ape Species: A Comparative Approach

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Background
In humans, regret is a negative emotional reaction that occurs when a decision maker selects between two options and realizes that a selected action has led to an outcome that is less favourable than the alternative one [1]. It is important to distinguish regret from disappointment: both deal with the realization that an outcome is worse than expected; regret, however, entails the additional awareness that a less valuable outcome is the result of one's own erroneous actions, whereas disappointment is not based on a decision maker's fault [2].

There has been relatively little research on regret in non-human animals and it is not known whether they are capable of experiencing regret. In this study, differing results in the three great ape species could give an explanation about the evolutionary development of humans' closest living relatives.

Methods
Twenty-eight great apes (fifteen chimpanzees [Pan troglodytes], seven bonobos [Pan paniscus], six orangutans [Pongo abelii]) were tested. All subjects live in stable groups in the Leipzig Zoo. The apes' internal state of arousal was measured via changes in their pupil dilation by using an eye tracker. This method has proved successful in non-verbal infants [3], therefore it seems suitable for great apes as well. Subjects were presented with two cups and a food reward hidden from view under one of the cups. They were tested in four different conditions:
(i) Choice – ape: Subjects had full access to the cups and could choose either one.
(ii) No-Choice – ape: Subjects were not able to choose a cup (control condition).
(iii) Choice – human: Subjects were watching a human choosing a cup.
(iv) No-Choice – human: Subjects were watching while a human was unable to choose a cup.

The conditions were chosen to separate regret from disappointment: the apes should show less arousal in the two human conditions than in the two ape conditions.

Results
Testing is still in progress and preliminary results will be shown. We expect significant differences in the apes' arousal responses between the choice and no-choice control condition. We also presume significant differences between the ape and the human condition.

Conclusion
The study is trying to demonstrate that great apes are capable of showing regret when realizing that their chosen action has led to a less valuable outcome. It can contribute knowledge to the origins of humans' cognitive abilities in general and the field of emotional research in primates in particular.

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Prosodic and Musical Abilities in English Language Pronunciation Learning

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Learners of English as a second language show considerable differences in their ability to acquire a native-like accent. While some imitate foreign accents with ease, others struggle to achieve this goal despite intensive training. This variance has been linked to several factors, for instance age of learning, motivation, anxiety, and auditory working memory. The structural similarities between music and language and observations of shared neuronal networks [1] have sparked interest in the role of musical abilities in the context of foreign pronunciation learning. Indeed, several results indicate associations between the two abilities [2]. However, the previous focus has been on segmental phonology, whereas studies on supra-segmental prosodic features such as intonation and stress are scarce.

The present study aims at identifying potential links between perceptive musical abilities and the acquisition of perceptive and productive English prosody skills. It is hypothesized that perceptive musical abilities correlate positively with prosody skills. The sample consists of advanced Austrian university students of English who complete a four-month English pronunciation training course. The experimental design includes the measurement of perceptive musical abilities, as well as repeated measurements of English prosody skills at the beginning, in the middle and at the end of the course. Perceptive musical abilities (discrimination of rhythm, melody, pitch and volume) are tested with the Profile of Music Perception Skills (PROMS) test. English prosody skills (discrimination, imitation and free production of English stress and intonation patterns) are operationalized by native-speaker ratings of subjects' recorded listening and speaking tasks. In addition, potentially modulating variables (age of learning, general speech imitation talent, prior experience with playing instruments and singing, motivational and attitudinal factors, and auditory working memory) are measured with psychological performance tests and questionnaires.

The results of the present study are expected to show positive correlations between perceptive musical abilities and English prosody skills. The findings will be integrated with neuroscientific and linguistic theories of language and music processing and will contribute to theoretical models of prosody perception and production. From an application-oriented perspective, support for a connection between musical aptitude and prosodic abilities could inspire research on the usage of music exercises in the English pronunciation classroom.

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Multi-Agent Model of the Influence of a Population's Spatial Structure on the Emergence of Cooperation

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Introduction

Cooperation is a fundamental factor in many systems, including human society. Cooperation plays an important role in different mechanisms, so it is not surprising that it is an active area of research in a variety of fields like Sociology, Economy, Biology, Philosophy and Computer Science. Game theory has become a powerful framework for investigation of this social behaviour. Commonly well known Prisoner's dilemma [1] is the game that attracted the most of attention. In this game, two players have to decide if they are going to cooperate or not. Players are rewarded with R = b - c in mutual cooperation, where b represents benefits to the recipient and c represents cost that incurs to the cooperator. Otherwise, in mutual defection, both players get P = 0. Unilateral cooperation results in profit T = b for defector and S = -c for cooperator. The ranking of the four payoff values is T > R > P > S. However, it is often difficult to assess the proper ranking of the payoffs for different behavioural patterns in real life situations. This has led to a considerable gap between theory and experimental evidence, and to an increasing discomfort with the Prisoner's Dilemma as the only model to discuss cooperation [2].

Model

In order to investigate the cooperative behaviour in every possible situation we, prepared our model which consists of a square lattice 10 x 10 in the form of a torus where every site is occupied by a single individual. Each agent engages in a pairwise interaction with one of the agents within Moore neighbourhood. They play one of the five social games namely the Prisoner's Dilemma (T > R > P > S), the chicken game (T > R > S > P), the assurance game (R > T > P > S), the altruist's dilemma (T > P > R > S), and the privileged game (R > T > S > P) based on Heckathorn's definitions [3].

Results

We tested our model with different parameters in total 1800 simulations. Results suggest that initial density of cooperation in population has a big influence in Prisoner's Dilemma. Similarly, beyond certain threshold of costs parasites persist in the population. The ability to form clusters enables cooperators to persist, that is same as in assurance game. The ability to give rise to compact clusters lacks in the chicken game, on the other hand there exist filament-like clusters and cooperative individuals. The altruist's dilemma strongly favors defectors and, to the contrary, the privileged game favors cooperative behaviour.

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The Neuro-Cognitive Basis and Social Manifestation of Violence and Compassion

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The social problem of violence recently considers the issue also from the neuroscientific view. Moreover, teo forms of behaviour such as cooperation and sompassion have similar bases in developmental, cognitive and cerebral regulation to the meschanisms which are activated also in violence, even though that they result in radically different way. [1] The aim of my project is to introduce violence-reduction mechanisms and provide understanding of the phenomenon of violence in the society with interdisciplinary analysis of the biological, cognitive and social factors that together form a human being in a holistic approach. The main research questions arise as Is it possible to avoid aggressive behavior through social learning, social information to develop compassionate and cooperative behavior? Can experience change brain structure and function? Could norms cognitively channel human emotional responses? Could we say that violence can exsist in a cognitive neurobiological way?

Firstly, I would like to stress a clarification between concepts and classification of aggression and violence. Aggression is a behavior that force to cause damage or threaten to cause it to the psysical or psychological integrity of another living being. One the other hand, the definition of aggresion is harmful behavior by individual towards another and we could identify it to the behaviour of different animal species. In other words, aggression could be understand on the basis of the adaptation. It differs in the animal studies as (i) intraspecies aggression (between individuals of the same species) or (ii) interspecies aggression (between different species). Human aggression is defined as behaviour directed ar another individual with immediate intention of causing harm.[1] However, there could be a criteria problem of subjectivity of intention, which is known only through the aggresor's own recognition. However, violence is a type od social aggression which is penalized through legal sanction and societal norms. The creation of healthy physical envrionments promote the all-round development of society members, supported by empathic education that promotes understanding of other's situations. In cases of intermittent explosive disorder, some cases of epilepsy and even acquired socipathy, we have to bear in mind that many manifestations of aggression and violence are correlated to psychosocial context of inequality, but some of the also to organic disfuntions which could influence aggressive behavior. We could say that individual manifestations of human harm are also based on psychopathology as well on psychology and neuroscience.

Due to ongoing experimental design only theoretical background is reported here.

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Deep Reinforcement Learning for Computer Games

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Motivation

Designing an artificial agent that can autonomously perform actions and learn with minimal amount of supervision is one of the biggest challenges in the field of artificial intelligence. One of the approaches to this challenge is reinforcement learning (RL), which is a subfield of machine learning concerned with the question of how should a system (an agent) select actions in some environment so as to maximize the cumulative value known as reward. An agent has to infer the optimal action from a reward that is determined by the environment and from observations of the state of the environment. Although there are many algorithms for learning optimal action selection function or policy, only the recent advancements in the field of deep learning made it possible to learn policies from the high-dimensional representations of complex environments. Our primary focus is on the Deep Q Learning algorithm [1], which uses deep neural networks to learn optimal policies based on the high-dimensional representation of the environment [1]. So far, Deep Q Learning was used for learning policies in various domains such as arcade games, robotic control tasks or board games. We think that deep reinforcement learning algorithms like Deep Q Learning could be used as a basis of a controller in more complex tasks, for example in autonomous car control.

Method

There are three main goals that we want to achieve in this work. First, we examine the theoretical basis of RL algorithms including the biological significance of this concept. Secondly, we examine discrete and continuous versions of the Deep Q Learning algorithm. We also consider potential extensions of the Deep Q Learning algorithm based on the current development in the field of deep learning. More specifically, we consider the possibility of endowing Deep Q Learning agent with the core cognitive competences or "ingredients" of the human intelligence that are necessary for artificial agents in order to act as competent agents in an environment. Among these competences is developmental start-up software, learning by rapid building of the models of environment and fast thinking [2]. Thirdly, we attempt to replicate and improve upon some of the results from [1] in the realm of arcade computer games. For this purpose, we use our own Python-based implementation of Deep Q Learning algorithm.

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The Effect of Social Status and Testosterone on Individuals Time Preferences

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Introduction

It has been consistently proven that most of our decisions are malleable through informational and normative influence that individuals exert over us. Social status is known to play an important role in this. Those with high social status may influence those in a low status position, but not vice versa [1]. The role of hormones in this has so far been neglected. Herein the hormone testosterone seems particularly relevant, given its role in a host of social behaviors, via its proposed role in promoting an individual's motivation to seek and maintain a high social status (for a review, see [2]).

Therefore, we would like to test whether a manipulation of social status (high, low), and of testosterone levels (via administration of testosterone or a placebo), will influence an individual's decision-making in a delay discounting task; thus effectively modulating time preferences.

Delay discounting tasks are widely used in cognitive science to determine how strongly a person devaluates future rewards by having participants decide as to whether they prefer a smaller immediate or a larger delayed reward. Research so far has shown that a hyperbolic discounting model is best fitting to actual decisions people make. Because we would like to modulate individuals' time preferences, and expected effects are assumed to be fairly small based on previous research, we will need to develop very precise measurement tools. For that purpose, we will adapt an existing procedure [3] that involves a Bayesian updating approach, which is expected to yield the required precision.

We predict that participants receiving testosterone will be less strongly influenced in their choices compared to participants receiving placebo. We also predict that the hormone effect is most pronounced in individuals with a high status, and that the hormone effect is reversed in individuals with low status.

Results

This master thesis topic is at an very early stage and therefore no data has yet been gathered. Possible caveats of the design will be discussed in the talk.

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Brain-Computer Interface Based on Mu Rhythm Desynchronization Using Motor Imagery

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Introduction

Synchronized activation of neurons enables us to recognize patterns of electrical activity over the human cortex. Frequency patterns detected over the motor cortex include the mu rhythm and sensory-motor rhythm (SMR). Mu rhythm is synchronized neural activity in the motor cortex ranging from 8 to 13 Hz and differs from classical alpha waves in functionality and location [1]. During planning or executing of hand movements or finger movements as well as during hand motor imagery without performing the actual movements mu rhythm gets desynchronized [2]. We tried to implement a brain-computer interface based on mu rhythm desynchronization connected to motor imagery. The goal of this research was to determine whether the specific procedure used to implement the BCI produces results which would be sufficient for the BCI to be used in motor imagery based neurorehabilitation after stroke. We hypothesized we would be able to detect a statistically significant decrease in the mu rhythm during the motor imagery condition.

Method

Since mu rhythm properties are individual specific and dependent on spatial and temporal components, multi-way decomposition method PARAFAC can be used to recognize mu rhythm component for each subject based on their EEG data. PARAFAC is a generalization of principal component analysis (PCA) to higher order arrays[3], which enables better modelling of interactions between dimensions and is better suited to reveal existing latent data structure compared to many conventional 2D decomposition techniques[4]. The mu rhythm component extracted with PARAFAC can be used to estimate the amplitude of mu rhythm in real time and use it to control an artificial arm.

To test the BCI, we compared amplitude of the mu rhythm between two conditions: relaxed resting state and imagined movement. A significant decrease in mu rhythm during imagined movement condition would validate our BCI procedure. We compared two different procedures for aquiring the mu rhythm component from the EEG data. In the first one, ten different actual movements were used. In the second procedure, one imagined movement was used – the same movement which was later imagined during BCI sessions.

Results

None of the two procedures produced statistically significant differences in mu rhythm amplitudes between the two conditions. However the difference was much larger in the second procedure. We conclude this method of BCI implementation is not suitable for use in neurorehabilitation without further improvements.

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Towards a Novel Dynamic Faces Stimulus for Investigating Affective Networks with fMRI

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A common task employed in fMRI for recruiting emotion-processing networks is the emotion discrimination task (EDT) introduced by Hariri et al. [1]. Each stimulus consists of a triplet of faces, a target face in the upper center and two faces below that have to be matched with the target face. As control task simple object discrimination is used, in which two different objects have to be matched to a target object. The EDT robustly activates the amygdala and other emotion- and face-processing areas, however little is known about how dynamic facial expressions can be employed for studying these networks.

We therefore created a new paradigm, which makes use of dynamic faces (i.e. involving face motion) and dynamic objects as target stimuli to test whether it will recruit the same brain areas as the static stimulus. The single frames of the animated faces were computed using a neutral expression as start, morphing into one of seven different emotional expressions (angry, contemptuous, disgusted, fearful, happy, sad and surprised). As control task we employed polygons superimposing whirled faces in which the target object shape was a circle slowly being transformed to one of the matching polygons.

To explore the efficacy of the newly developed dynamic faces task we conducted a fMRI pilot study including 15 healthy participants. The single task items included randomized target emotions and were presented consecutively in randomized order together with the control task. Each item was presented until one button was pressed but not exceeding 5 seconds. The subjects were instructed to press a button as soon as they found the right choice for the target expressions or objects. A new set of faces or objects was presented after the button press. The study was conducted on a 7T Siemens scanner and the analysis was performed in SPM12.

In the time between the onset of the presentation of the dynamic face and the button press we found significant activation in the amygdalae, the fusiform gyri and pSTS and provide evidence that our dynamic faces stimulus based on a computer-based morphing method can recruit networks involved in face processing. These findings are consistent with the literature, whereby these brain regions play a significant role in processing emotional content of faces [2]. Nonetheless, to examine the full potential of the dynamic faces task more complex fMRI paradigms are desirable in the future.

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Visualizing the Nigrostriatal Pathway: Using CLARITY for 3d Tissue Imaging

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Introduction
One of the most important dopaminergic pathways is the nigrostriatal pathway, a.k.a. the nigrostriatal bundle (NSB). The NSB contains the axons of the dopaminergic (DA) neurons which project from the Substancia Nigra (SN) to the striatum. This means DA neurons span a rather large distance going from SN where their somas lie to the striatum to which they projects. Understanding this pathway and the DA neurons within is crucial for understanding motivation, movement and behavior in general, while also being a key component in understanding the pathology of Parkinson's disease.

Method: CLARITY Technique
The reason why tissues are not transparent is that the lipid membranes within the cells scatter light thus making the tissue opaque. CLARITY [1] works by embedding the tissue in a bis-/acrylamide gel, which fixates the proteins in the gel matrix. The lipids can then be removed from such tissue using an SDS clearing solution, which acts as a chemical detergent, leaving the proteins in the gel.

The tissue cleared this way thus becomes transparent, and can then be labeled Immunoflourescently (IF) and imaged in depth using confocal, two-photon or COLM microscopy. Images obtained can then be used to reconstruct a 3D structure of the tissue.

NSB as a Model
The NSB is similar between humans and model organisms like rats and mice. This enables us to experimentally study the NSB, both in vivo and in vitro. In order to study DA neurons we need to preserve them whole. Yet, the shape of the NSB presents a challenge. Results from a pilot study in our lab show that the canonical sagittal cut does not preserve whole DA neurons.

In the literature [2], [3] there seem to be variable solutions to this problem all involving cutting at various angles. We follow from that idea and add another possible cutting angle. Cutting sagittally at about 45° from the midline might improve the amount of the preserved neurons and seems to do so according to initial results.

But in order to fully verify that the neurons in our angled cut are preserved we will employ CLARITY technique, which will enable us in depth 3D visualization of the tissue with thickness ranging from 100 to 400 microns.

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Posters

The Kitsch Switch: Why Do Some People Like (or Not Allow Themselves to Like) Thomas Kinkade's Art?

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Introduction

The word "kitsch" has originated in Germany to criticize a type of art that is considered poor in taste and whose products are associated with decorative, mass commodities or cheap entertainment. [1] Kitsch is typically rich in superficial sentimentality, often presenting to the observer highly charged imagery that triggers automatic, unreflective emotional reactions, happy scenes or bright colors that create an immediate positive response. Kitsch is an interesting phenomenon because it tends to lead to polarization, dividing the masses who respond positively from critics, who mostly define Kitsch as "bad art".

One of the best example in recent times is represented by the successful American painter Thomas Kinkade. He's been America's most collected artist and recipient of several millions of dollars' for his art. On the other hand, his paintings are almost universally hated by experts. This raises the question of why Kitsch art tends to elicit such diverse reactions.

Method

In our study, we will assess Kitsch from several angles. First, we will consider personality and the question of what psychological profiles like Kinkade's art? Equally interesting is why others hate it. Through personality, mood questionnaires, we'll try to evaluate the importance of different factors that may be involved in these individual differences. This will be assessed through online study in which individuals rate Kinkade and other Kitsch/non-Kitsch art.

Second, we will consider the cognitive process of viewing Kitsch and formulating a liking decision, which may involve the meeting of top-down and bottom-up components. Based on previous literature [3] it may be that individuals do have an immediate liking of Kitsch, based on automatic processing of visual components. However, after some time, certain individuals may rebel against this assessment based on their personal taste, experiences or meaning. We have labelled this a Kitsch switch, which will be assessed by varying exposure from very short (millisecond) to longer durations and looking for changes in liking. We will also use EEG to look further for differing peaks of activity.

Finally, we will follow a previous study [2] which showed that repeat exposures to Kinkade art lead to a decreased liking. This finding contradicts previous studies which found an increase in people's attitude towards a stimulus which they've been exposed to several times, due to increased fluency. For our study, we will use a within-block exposure to art type, rather than repeat exposure to the same paintings, which may be a better test of diminished liking. This will be coupled with a more systematic set of evaluation factors to determine what changes over multiple exposures, and which could explain the changes in liking.

Expected Results

We expect to collect a dataset of viewer art ratings, as well as personality factors and neural data which can answer the above questions and which can be used in one to two journal publications.

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Investigating Speakers' Accent and Phonetic Ability in Their Native Language

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Studies about speaker's phonetic ability in a second language abound: less has been done about speaker's accentedness in their native language. But many questions arise as to which features of language production make a pronunciation sound native-like: for example, a native listener exposed to the speech of a stammering native speaker will not necessarily judge this speaker as being non-native. The question of which features of pronunciation will influence the native listener's perception of accentedness of a native speaker is legitimate. Accentedness is defined as the degree to which a pronunciation deviates from the phonetic norm of a language.

The project's aim is to establish a list of the phonetic criteria that affect native listeners' perception of native speakers' accentedness. Precisely, we want to evaluate the relative influence of segmental and suprasegmental phonetic features on the perception of the phonetic ability of native speakers. Inter-individual variability at the segmental level corresponds to differences in the pronunciation of vowels or consonants; inter-individual variability at the suprasegmental level can be manifested by different intonational patterns.

Previous investigations of the relative influence of segmental and suprasegmental features on the accentedness of non-native speakers have led to contradicting results. A prosody transplantation study [1] showed that segments had a bigger effect on the speaker's perceived accentedness; however, Jilka [2] showed that low-pass filtered stimuli, in which stimuli contain prosodic information only, were enough for listeners to identify non-native speakers, e.g. speakers that deviated the most from the language's phonetic norm.

Native speakers' phonetic ability in their L1 will be investigated by measuring their capacity to imitate native speakers' speech through native listeners' judgments of speech samples. Listeners will be asked to rate on a scale the extent to which a native speaker's imitation deviates from a model speaker by specifically paying attention to either the segmental or the suprasegmental level of the imitated version of the sentence.

We expect speakers to deviate from the model pronunciation mostly at the suprasegmental level and segmental differences to go unnoticed by the listeners. We thus expect the influence of prosody to overcome the influence of segments on listener's perception of native speaker's accentedness. If so, further investigation will allow us to establish on which specific aspects of prosody speakers differed the most.

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Pain Asymbolia and Nature of Pain

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At an any given moment, we as human beings are under a specific mental state. Mental state consists of a unity of mental representations (pain, love..) and propositional attitudes (believing, hoping...).

A "conscious mental state" is a mental state one is aware of being in. It usually has a representational or intentional aspect - it is about a specific object, relates to it or has fulfillment conditions.
We divide them into perceptual experiences (seeing or hearing...), bodily sensations (feeling pain or an itch...), felt reactions or emotions (feeling anger or love...) and felt moods (feeling happy or depressed...).

Up until recently Pain has been taken as a simple and uniform experience. However, recent discoveries have proven pain to be a more complex emotion than thought. Pain has been shown to posses two distinctive characteristics - the sensory-discriminative (where/what is felt) and the affective-emotional (how it makes us feel). [1] Based on this knowledge we can divide interpretations of pain theories into objective or subjective - depending on which one is the principal characteristic. Therefore Pain can be seen either as, from a physicalists (objectivist) point of view, a purely physical state (C-Fiber firing), or from a dualist (subjectivist) view as a phenomenal (sense-data, qualia).[2]

To help us analyze the nature of pain we will look at a medical case called pain asymbolia - a phenomenon that separates the two aspects. Pain asymbolia has been associated with damage to the insular cortex and the projections to the cingulate gyrus. As the insular cortex doesn't project to the limbic system - the affective component of pain doesn't come into effect.[3] The primary characteristic of this phenomenon is that people afflicted can feel the sensory-discriminative part of pain, but are completely indifferent to it (they lack the affective-emotional aspect).

By using present knowledge of both philosophical sources and hard science, we will try to compliment our findings to analyze the nature of pain and the effect on the theories of consciousnesses. We will try to find out if this knowledge supports one or the other point of view or if it creates new paths of connecting the subjective (sensation or qualia view of pain) and the objective (perceptual, representational) theories.

Apart from the philosophical/psychological aspect, our work might be used to help us understand how the experience of pain could be transposed onto AI or machine understanding of pain (i.e. robotic caregivers).

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Validating the EEG Dementia Index (EDI): A Novel Biomarker of Alzheimer's Type Dementia

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Dementia is one of the most prevalent chronic neurological diseases among the elderly. With population aging, the number of AD patients will continue to rise, and they are fast becoming an increasing socioeconomic challenge. Currently used diagnostic methods are either invasive, expensive or unable to diagnose dementia in its early stages. The aim of our research, conducted at the UMC Ljubljana, Department of Neurology, is to determine whether EEG, as a cost-effective and non-invasive method, is suitable as an aid in clinical AD diagnosis in its early symptomatic stage.

The research is based on a pilot study [1] in which 3 quantitative EEG biomarkers of the phenomenon of "EEG slowing" were calculated from EEG data. The biomarkers (peak alpha frequency, average alpha band frequency, and alpha/theta spectral power ratio) were aggregated into the EEG dementia index (EDI), using a generalized linear model [1]. Our wider research will focus on validating these biomarkers. Between the control group and the AD patients, we expect to find differences in wave frequencies and power ratios for all three biomarkers.

64-channel EEG recordings will be obtained from 150 subjects, aged between 70 and 85, belonging to two groups, AD patients and control group, the former consisting of people diagnosed with "probable Alzheimer's disease", according to the 2011 NINCDS-ADRDA criteria [2]. The experimental procedure consists of two rest- and one active-EEG condition. For rest conditions, participants will have to keep their eyes alternately open and closed. The active-EEG condition is the memory image sequence where the participants will try to determine whether the image on the monitor was repeated or not. Participants will be presented with 80 different images from the NAPS database [3] (40 images shown once, 40 three times). The task, designed at our lab, is derived from a non-verbal memory test. It is currently being tested for P300. A new contribution to the ongoing research will be conducting the active EEG task. Our main focus in this part will be the P300 wave, i.e. a late positive deflection in post-stimulation ERPs in humans.

We expect to see a greater amplitude of the P300 when the subject is presented with a repeated image compared to first presentations, but expect smaller differences between these two amplitudes in the patient group, as compared to the controls.

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Applicability of Role Detection Algorithms on Functional Brain Networks

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With increased attention in Social Network Research, role discovery in functional brain networks is emerging as a promising topic of research. While communities depict groups of highly connected nodes within the brain network, roles are groups of nodes that display similar topological structure in the graph, thus can be assigned to a common function in the network. We evaluate two different role detection algorithms on functional brain data in order to gain first insights about feasibility and applicability of role discovery in brain networks.

Background
Analyses of communities and roles of users within social networks have been conducted for many decades, but the advent of the Web 2.0 has clearly benefitted Social Network Analysis (SNA). Algorithms deriving from SNA have been and are still being succesfully applied in a multitude of practical applications such as countering money laundering and terrorism. While community detection has fully arrived in functional neuroimaging, the amount of research specifically paying attention to role discovery is still limited. A multitude of studies analyzed activation patterns in fMRI as well as PET scans and community structures were repeatedly found to be relevant to cognitive function. Regarding node roles these studies report that certain roles could be observed, but mainly rely on context-independent explanations, such as ones that connect between or within communities. As a result we suggest to investigate well-known role discovery algorithms in the context of functional brain networks networks.

Methodology
We use data from the Human Connectome Project and the preprocessing pipeline is based on Langs et al [1]. We plan to compare two different role detection algorithms. The first one relies on pre-determined communities and network metrics [2], while the latter is a supervised learning approach [3] enabling experts to constrain role discovery.

The results will be evaluated with variability signal-to-noise ratio (vSNR), as demonstrated in Langs et al [3], and repeatability of role-node associations in repeated scans of the same individual.

Expected Results
We will assign groups of nodes in functional networks to roles. We will evaluate the repeatability of this assignment in the same individual across repeated scans, and the specificity of the assignment across individuals.

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Discovering Biomarkers of Alzheimer Disease

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It is estimated that there were 46.8 million cases of dementia in the world in 2015 [1]. The most frequent cause of dementia is Alzheimer disease (AD), which is associated with extracellular amyloid plaques and intracellular neurofibrillary tangles [2]. 95% of cases with AD can be classified as late onset AD (LOAD), of which the biggest genetic risk factor is Apolipoprotein E (ApoE) E4 allele. The carrier of this allele does not necessarily get LOAD, but E4/- heterozygotes have two to three-fold increased risk of LOAD, while E4/E4 homozygotes have five-fold increased risk of LOAD. Carrying this allele is also associated with earlier onset of the disease [2], [3]. The frequency of ApoE E4 allele varies by region and its estimate is the highest in Northern Europe and the lowest in Asia and Southern Europe [3]. The aims of our research are (i) to assess the frequency of ApoE alleles in Slovene AD and non-AD population, as such estimate was not done yet, and (ii) to enable more accurate assessment of risk of AD in Slovenia with incorporation of genetic biomarkers into diagnosis protocol. Test subjects will be recruited in clinic of Centre for neurodegenerative diseases at Neurological clinic from patients with diagnosed AD by established clinical criteria. Controls will be recruited from patients relatives and companions without diagnosed AD and with comparable demographics (sex and age), as the test group. We estimate to have at least 200 subjects in each group. The peripheral blood will be taken from subjects and from it the DNA will be isolated and used for ApoE genotyping. Our project started with application for ethical approval from the Commission of the Republic of Slovenia for medical ethics. At the same time we assembled a database which could be used routinely in diagnostic laboratories for verification of genetic biomarkers. By doing this we expect to achieve traceability of the patients' tissue samples and their anonymity. After verifying and improving both the database and the protocol, the ApoE genotyping will be performed.

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Integrating Gesture into Automated Reference Resolution

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One of the major issues in cognitive science is the complexity of human language and its relation to other cognitive abilities. It is possible to study aspects of linguistic behavior by reconstructing parts of it in artificial systems, for example, in one line of research aspects of situated language use are reconstructed as interactions of artificial agents, so-called language games [1]. Work in computational modeling such as this, as well as empirical and theoretical work, always inform each other, and developments in each line of work can be used to benefit the others.

With that in mind, the present project contributes to this research by performing a literature review concerned with the place of gesture in communication. The importance of gesture for situated language use has been appreciated for a long time, but it remains difficult to study for a number of reasons. The main issue with gestures lies in the fact that their use is not always fully conventionalized, which makes it difficult to describe them formally. Empirically, it is difficult to create corpora concerned with the use of gesture, since it is difficult to record data on all relevant aspects of interaction in an environment. For these reasons, it is currently only possible to provide partial solutions applying to specific uses of gesture.

Reference resolution is the activity of determining what an expression used by another speaker refers to. This ability is of interest since it can occur in the absence of gesture, but also with support of gesture at different level of conventionalization, such as by commonly used hand gestures, or less conventionalized head and body movements.

The result of this project is a set or proposals for integrating these different lines of research. Previous designs of language games, which already include verbal references to objects [1] or locations [2] can be extended to incorporate gesture, for example, by introducing a multi-modal reference resolution algorithm as proposed in [3]. However, the implementation of these designs goes beyond the scope of this project and is left to future work.

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I Know You Think of Me – Experimenting with Telepathy

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Telepathy is considered to be a paranormal phenomenon that has been discussed for decades. Less people know that this phenomenon has been also studied for decades. Many experiments were conducted in the last 40 years and some scientists claim they prove telepathy [1]. Other scientists are more deliberate in their statements; however, they still admit that there is something interesting going on. At least, no one was able to explain abnormally positive results in certain replicated experiments. Although effects have been rather small, researchers who support the existence of telepathy say that they are still important and should not be neglected [2].

On the other hand, there is the implacable voice of critics and skeptics towards experiments on telepathy. Experimental designs and statistical analyses of results have been doubted. Skeptics also complain that results from replicated experiments are inconsistent and many flaws in processes have been detected [3]. However, Storm, Tressoldi, and Di Risio [2] argue that these arguments are obsolete because conditions under which telepathic experiments were conducted have improved significantly. Moreover, they also claim that results from the recent studies are consistent indeed.

Our experiment replicates mainly the "telephone experiment" conducted by Rupert Sheldrake. We plan to perform at least 10 sessions. In one session, we use 5 participants out of which one will be a receiver and the other four participants will be potential callers. One session also includes 10 trials during which callers will call in a random order to the receiver, who sits in a different room. When the phone starts to ring, the receiver has to guess who of the four callers is calling. Though, a chance to guess the right person is 25 per cent. Sheldrake mentions the hit rate of 42 per cent ($p = 1x10^{-26}$) in his experiment [4]. We expect that successful replication of the "telephone experiment" should be in accordance with the results of Sheldrake and show positive results above the 25 per cent statistical chance.

Acknowledgment
I would like to thank to Michal Teplan, Barbora Cimrova, my great classmates and teachers for passionate and inspirational debates about this controversial topic. I also appreciate endeavor of our participants to help and participate in this kind of experiment.

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Challenges for Embodiment: The Case of Language Change

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The last thirty years of cognitive science have been marked by the discussion about embodiment, the influence of the bodily and environmental properties on cognition. Proponents of embodiment assert that body shape and function constrain aspects of cognition [1], and in its more extreme form, embodiment denies the existence of representations and of mental computation and proposes that cognition can be best described as a direct coupling of the organism and its environment [2].

While embodied approaches to cognition have been effective in explaining on-line phenomena, such as visually guided motion, it is disputed whether a comprehensive account of off-line cognition is achievable through embodied accounts. In contrast, symbolic models seem to be more effective in this area, having provided many adequate descriptions of the phenomena studied [1]. Some attempts at embodied models of off-line cognition include the work of off-line cognition as a simulation that uses the sensory-motor circuitry in the brain [3].

Some particularly challenging phenomena for embodied accounts are linguistic phenomena, since they are typically used to represent things not immediately present in the environment. Indeed, the majority of linguistic models, among them those of mainstream Generative Linguistics, continue working with the historically older assumption of symbolic computation as the basis for cognition. The present work aims to make a contribution to embodied accounts of language by suggesting the kind of explanations embodied cognitive scientists might employ to describe some of the more abstract aspects of language. This work will focus on the phenomenon of language change, and specifically one type of language change: grammaticalisation. Grammaticalisation is the process through which lexical words develop into grammatical markers and it is one of the processes that lead to the emergence of pidgins. Its results can be seen in the Tok Pisin (English Pidgin; Papua New Guinea) sentence of “Mama bilong mi I karim pinis fopela pikinini”, (My mother has given birth to four children) in which the grammatical morphemes ‘bilong’,’pinis’ and ‘-pela’ originate in the English ‘belong’, ‘finish’ and ‘fella’ respectively.

In the present work it is suggested that grammaticalisation could be best described by a dynamical system, a tool used by many adherents of embodiment, since this phenomenon depends on the feedback from other parties, such as social feedback, who at the same time experience the same process.

Acknowledgment
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The Impact of Attention Focus on the Activity of Primary Visual Cortex

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Introduction

Attention is one of the variables in most neurological and subjective measurements that experimenter cannot really control. Subjects can be told where and how to focus their attention, but from there onward, experimenter has to trust them that they are following instructions during measurements. In order to find out if and how much attention focus really influences measurements, we conducted an experimental study (extension of study [1]) about attention distractions and their influence on measurements of multifocal visual evoked potential (mfVEP), which is used to measure activation of the visual cortex during visual stimuli. This technique is used to detect any alteration in transmission of a visual signal from eyes to the visual processing system in occipital lobe [2]. As it is an often used in clinical practice, its validity can benefit a lot from our study.

Aim

Our experimental hypothesis states that distractions of attention will provide statistically significant differences on the results of mfVEP measurements.

Methods

Different kinds of distractions were added to mfVEP measurements: visual distraction (counting blimps in visual field), auditorial distraction (listening to a story) and thinking distraction (solving mathematical equations); and were compared to base measurement without distractions. All of those distractions were carefully controlled and subjects were constantly questioned in order to ensure that their attention had been focused on them, while eye focus remained unaffected as required by mfVEP technique. All measurements were made in four 8-minute cycles (one for each distraction and one for base) on students, aged 20 – 25, in Eye Hospital in University Medical Centre Ljubljana.

Results

Our preliminary findings on 7 subjects suggest that distractions of attention do not cause significant alteration of mfVEP results. However, mild variations of mfVEP waveforms were observed in some individuals and further experiments will be needed to make a relevant conclusion. Additionally, it would be a good idea to extend the study and include other types of attention distractions.

Conclusion

In case that our hypothesis is rejected, we can conclude that mfVEP measurements are not significantly affected by studied changes in attention focus, which strengthen the validity of the method. In the other case, that our hypothesis is statistically confirmed, deficits of the methods are revealed and before further use, a way must be found to ensure attention focus in future mfVEP measurements.

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Sequential Pattern Learning in Budgerigars, Pigeons, and Humans

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The ability to develop and use language is commonly regarded to be one of the core phenomena that distinguishes our species from others [1]. One cognitive subset of this phenomenon might be the ability to recognise and categorise certain sequences of items (patterns) based on a set of rules which can be termed grammar. The mechanism underlying rule abstraction in pattern-learning has - although presumably constitutive for language capacity – been found across modalities in several species [2]. Thus, we assume it to be domain-general, but developed differently across species dependent on their respective phylogeny.

It has been shown that animal vocalisations of all non-human species tested so far do not exceed a complexity level of finite-state grammars [2], while human language requires higher-order grammars [3]. However, using certain finite-state grammars can be sufficient to detect strings of greater complexity (long-distance dependencies).
Comparing species that are, as humans, vocal learners with non-vocal learners from the same taxon helps to clarify the influence of selective pressures that shaped this ability and thus enable inferring conclusions about human language evolution. Artificial grammar learning is a promising method to this end [3].

In the current study we aim at comparing budgerigars (Melopsittacus undulatus), who are vocal learners, pigeons (Columbia livia), who are not vocal learners, and humans, in their ability to distinguish and generalise visual XYX (long-distance dependency) from XXY (immediate dependency) finite-state sequences based on shape and colour cues. Subjects first learn to discriminate both types of sequences in a forced-choice task. Subsequently, generalisation of the grammars is assessed in five tests, varying stimuli in shape, colour and novelty of elements.

If the ability of rule-abstraction is domain-general but consititutive for vocal production, we expect budgerigars - having had the need to evolve a flexible vocal communication system – to be equipped with parsing abilities between those of humans (higher) and pigeons (lower). This would result in fewer training sessions and more ready generalisation of the underlying grammars in budgerigars compared to pigeons.

Preliminary results will be shown.

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The Impact of Cognitive Conflict on Processing of Negative Emotions

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Emotional regulation is the top-down management of emotional response. Due to the brain's negativity bias, studies are focusing mainly on negative, i.e. disruptive or undesirable emotions, so do we. Emotional regulation is very important as it is associated with people's socio-economic success and general well-being. Two broad groups of processes are investigated by researchers in this domain, those are the explicit (i.e. effortful) forms of emotion regulation and the implicit (i.e. automatic) forms. The second is reflected in the event-related Late Positive Potential (LPP) in the brain[1].

Cognitive control refers to the ability to guide one's actions accordingly to one's internal intentions. It requires implementation of top-down control processes and enables choosing the proper response while two options are simultaneously competing. Conflicts' detection displays itself in the ERP-component N2 [2].

In this study, we focus on the mutual impact of those two mechanisms. There is a rich body of evidence for the influence of emotional processing on cognitive processes, including cognitive control. However, few studies have investigated the opposite relationship.

In the Flanker Task participants are asked to react to the direction of an arrow located between other arrows. If its direction is incongruent with the others, cognitive conflict is induced. In our research we investigate how the cognitive control mechanism influences the automatic emotional control, which will be reflected in modulated neural sensitivity to emotionally relevant pictures. We present results from EEG recordings, in which we analyze the N2, P300 and LPP components [3].

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Assessing the Relevance of Using Serious Games as an Extension to On-going Therapy of Children Diagnosed with Autism Spectrum Disorder

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In the past decade, there has been growing interest from researchers and practitioners to develop evidence-based therapies and technologies for children diagnosed with Autism Spectrum Disorder (ASD). Due to the heterogeneity of symptoms and the burgeoning prevalence of diagnosis of ASD over the past years, the main concern of stakeholders involved is to provide effective, versatile, and low-cost services.

Serious games are considered effective new methods to support skills improvement for children with ASD [1]. An issue serious games face is the limitation in providing evidence of the ability of ASD children to generalize learning: Both near and far transfer to other tasks/elements within the therapy and to the social environment can be attained if motivation to play is enhanced through an increased use of elements of serious game design [2] .

We address the known theory-to-research-to-practice gap [3] in the area of ASD by starting to develop a basic framework for the design of a serious game aimed at the generalization of learned social skills, founded on Theory of Mind (ToM) and reconciled knowledge from practitioners of ASD interventions. The main goal of this project is to obtain knowledge in the field of ASD therapy adjuncts that should support and orient further research towards the implementation and evaluation of a targeted serious game.

A survey desktop research is carried out in the fields of psychology, neuroscience, and human-computer interaction to clarify the nature of the disorder as well as established rehabilitation procedures. This is complemented by interviews with influential representatives in the fields of ASD interventions and serious games. We attempt to reconcile the acquired knowledge through early prototyping of a serious game.

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Entropy-based Approaches to Mastermind

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We consider a variation of the well-known game of Mastermind to explore entropy-based approaches to the design of effective playing strategies. In the original game, the code maker composes a code of fixed length using a combination of different-colored pegs (or marbles). The code breaker takes a guess at the code, interprets the feedback provided by the code maker, and uses this information to devise her next guess. The code breaker's goal is to guess the code in as few rounds as possible. A generic playing strategy consists of procedures for (i) identifying the set of feasible combinations, where prior feedback is used to determine which combinations are still viable and which not; and (ii) picking the combination that best serves the goal of reducing the number of feasible solutions as much as possible.

In our proposed modification, the code maker generates the code by sampling (with replacement) from a code jar that contains an arbitrary number of pegs of different colors. Each color is chosen with probability proportional to the number of pegs of that color in the code jar. This entails that the probabilities of different candidate solutions in the feasible set might differ. Whereas in the regular version each combination is equally likely, in the modified version, a non-uniform distribution over colors in the code jar will lead to some combinations being more probable than others. To illustrate how this might impact the design of effective strategies, consider how an algorithm might choose between two alternative guesses, each resulting in a set of five feasible combinations, but where the probabilities of codes in set one and set two are [0.6, 0.1, 0.1, 0.1, 0.1] and [0.47, 0.47, 0.02, 0.02, 0.02], respectively. Which set would you rather play with going forward?

In order to quantify each set's uncertainty with respect to the hidden code, we use the notion of entropy. Previous approaches to the problem used the well-known Shannon entropy measure [1]. Building on this work, we conducted computer simulations with our probabilistic version of the game to explore a range of different entropy measures from a unified mathematical formalism called Sharma-Mittal generalized entropy framework. Ultimately, our goal is to translate potential theoretical findings to the domain of human psychology in order to investigate human intuitions about which queries are informative when playing Mastermind.

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Prosodic Cues in a Reference Resolution Algorithm

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The present work aims to propose an adaptation to a previous reference resolution algorithm [1]. The proposal integrates prosodic cues with other linguistic and non-linguistic cues, such as gestures and eye-gaze, used in the original algorithm.

When humans speak, they refer to, objects, actions, and other entities. Their human interlocutors are very good at determining what a particular expression refers to – an ability known as reference resolution - even when they have never heard that expression before and the words alone don't provide enough information to determine its meaning. Among other things, this ability makes us able to understand language in new situations, for example when a new task is explained to us.
This ability can be useful when it can be emulated by natural language processing systems. For example, if a household-aid robot needs to be hard-coded to perform certain tasks, its use is limited. However, if it can be equipped with that same ability to understand new task descriptions, it can be employed in many different situations. To this end, [1] have collected a corpus of situated task descriptions and developed an algorithm that resolves references in this context, on the basis of lexical information as well as information from other modalities that accompanies language use in natural situations.

While the algorithm currently uses a number of linguistic and non-linguistic cues to resolve the referent of object references, it does not yet consider prosody. This project proposes an adaption to the algorithm by [1] that expands it to consider prosodic cues, such as prominence and intonation. Previous linguistic research shows that prosodic cues can signal information structure [2]: it can guide a listener's attention to particular expressions, as well as signal whether an expression is considered familiar, new or contrasted to the speaker. Therefore, we expect that prosody can provide an additional to determine which object is the most likely referent for a particular referring expression.

The corpus used to develop the algorithm by [1] is a German language video-corpus of task descriptions. This project performs an exploratory analysis of that same corpus to find regularities in the co-occurrence of prosodic cues with other cues to the identity of referents. The corpus is annotated for prosodic features using the Praat and ELAN annotation tools. By integrating the results from this analysis with conclusions from previous research about the connection between prosody and referentiality, we suggest an adaptation to the existing reference resolution algorithm.

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Expression of Motion in Visual and Sign Languages: Modal Realisation and Function in Intersubjective Engagement

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Visual languages (VLs) are defined as sequences of images that follow rules of representation, as in the medium of comic books. Motion is expressed in comics in a number of ways, which vary between genre, country of origin, authors and individual works [1]. Sign languages (SLs), on the other hand, are natural languages, composed of morphemes (signs) constructed from the shape and movement of the signer's hands. Motion in SLs is often expressed iconically, with articulators being moved through the sign space demonstrably.

VLs and SLs, although both operating in the visual modality, differ from each other in a number of ways. Firstly, in (a) the temporospatial relationships between interlocuting users – SLs are used purely dialogically (except in instances of translation) whereas VLs constitute static, material artefacts. Thus, signers exchange information instantaneously whereas there is a gap of space and time between the author and the reader of visual languages. Secondly, they differ in (b) the diversity of morphemes extant in the public realm – for VLs, formalised, public vocabularies do not exist in the traditional sense, for example in the form of dictionaries, (although expressive norms certainly do), whereas they do exist for SLs.

These differences are currently being explored in this study with respect to human interpersonal communication. Following a literature investigation into the methods used to express motion in VLs and SLs and into the biology of motion perception, a theoretical analysis is being undertaken in accordance with an enactive theory of language as in [2] [3]. Preliminary results have shown that certain methods of expressing motion in VLs appear similar to successful methods used in pointlight studies of motion perception, suggesting perhaps that VLs are cognitively linked to active bodily routines. With further analysis, I hope to ascertain whether there are differences between the intersubjective interaction and socio-cultural coordination that occurs during usage of VLs and SLs, and whether these differences ultimately have effects on the collective minds or socially extended cognition that are/is established between interlocutors [3].

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EEG Oscillatory Signatures of Auditory Gating

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Sensory gating refers to the ability to filter out unnecessary stimuli and prevent the brain from being overloaded by irrelevant information. Research has shown that extroversion-introversion, a basic personality trait, determines how an individual processes sensory stimuli and the motor responses in reaction to these. Extroversion-introversion might, therefore, conceivably, have an effect on sensory gating. However, whilst the latter has been studied in relation to certain mental disorders, such as schizophrenia, and even in relation to schizotypal personality, the effect of personality on sensory gating remains largely understudied. Building upon previous work by Siegl, the goal of the present study is to assess and compare the effect of extraversion and introversion on auditory gating [1].

Gating can be operationalized through the mechanism of suppression of mid-latency auditory evoked potentials. It is reflected by the percentage reduction in response to a repeated presentation of auditory click pairs separated by an interval of approx. 500ms. We hypothesize that introverts, due to increased sensory reactivity, will show less efficient sensory gating (ERP), while extroverts will show less efficient sensorimotor gating (blink component of the startle reflex).

Out of the 88 volunteers that participated in the experiment, 45 were classified as introverts and 43 as extroverts, using the NEO Five Factor Inventory (NEO-FFI). Two different paradigms were used to assess the gating function based on resting-state EEG data collected from both groups. For each subject, P50, N100, and P200 suppression were measured at two different EEG electrode sites. Similarly, PPI was measured with three different pre-pulse lead intervals at two different EMG electrode sites. Following the screening, further questionnaires-the Revised NEO Personality Inventory (NEO-PI-R), the Schizotypal Personality Questionnaire (SPQ-G), and the General Health Questionnaire (GHQ-12) - were administered to the subjects in order to gain a better understanding of their personalities and mental health status.

Whilst Siegl had examined the inhibition of P50 and concluded that extraverts do not differ considerably in terms of sensory or sensorimotor gating function, the present study goes a step further by employing time-frequency analysis on the same set of data to reveal potential differences that could not have been revealed by the previous method [1]. However, no significant difference was revealed. We thus conclude that extroverts and introverts, indeed, do not seem to differ in terms of sensory gating.

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Recognition of Emotional Valence Using EEG

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Introduction

Studies made in the field of affective neuroscience of emotions are changing the neoclassical view on Homo Economicus who is making decisions in accordance with rational maximization of expected values. Along with the advancement of EEG technology, new opportunities on studies of emotions are emerging, mostly in the field of modern marketing.

The assumptions on which our study was conducted are based on the cerebral asymmetry, specifically on the frontal EEG asymmetry [1], [2]. The approach-withdrawal model proposes the asymmetry of the left and right anterior hemispheres, where the activation of the left hemisphere is linked to the approached or positive affective perception of stimulus and the right side is linked to the withdrawn or negative perception of stimulus.
Davidson [2] acknowledges the fact that the main weakness or deficiency of his approach-withdrawal interpretation is that it is not necessarily true that all positive affective states contain the approach component, thus he saw the main reason that he did not successfully detect the activation of the left anterior hemisphere. The main goal of fundamental research is to find out if the approach-withdrawal model could be the method of the potential analysis of emotional valence using the audio-visual stimulus.

Methods

Our research involved 30 participants, 15 men and 15 women. Age varied from 15 to 65. The EEG was recorded with a 64-channel amplifier ANT Neuro EEGO RT and dry electrodes mounted in a cap using 10/20 montage. The subjects were exposed to various audio-visual stimuli. As the positive stimuli we used the clip which contained ski jumping. We expected the stimuli to have a strong approach component as the clip was showing a Slovenian jumper winning a competition. We believe if stimulus exhibits feelings like nationalistic proud, excitement, satisfaction etc. it can have a strong approached perception. At the beginning the subjects were exposed to the calibration section in which the various combinations of pictures were used. Pictures contained extremely positive and negative aspects, which had approach or withdrawal response. Along with EEG, Eye Tracking method was also used. EEG signal processing was made using BrainVision Analyzer 2.02 (Brain Products GmbH) and MATLAB 13b (Mathworks, Inc.).

Results

The research results can only be displayed in the audio-video format (see Appendix A). Video in Appendix 1 without graphs is also the main audio-visual stimulus. Lower graphic line in the appendix video contains the results from this study.

Discussion

From the video (see Appendix A) it is possible to discern that the parameters of emotional valence coincide with positive reactions to the stimuli, thus we can assume that the usage of approach-withdrawal model can be used as a help to analysis of approach or withdrawal of various stimuli. The potential of the presented method is in various fields. Currently it is the most visible in the field of marketing.

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Investigating Functional and Effective Brain Connectivity During Mindfulness Meditation

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The practice of mindfulness meditation consists of non-judgmentally monitoring the content of one's experience in the present moment. This practice is related to changes in the structure and activity of the brain. FMRI studies have shown that meditators exhibit both immediate and long term differences in their functional connectivity [1]. Two important networks affected by meditation are the frontoparietal network (related to monitoring and attention control) and the default mode network (related to resting state and mind wandering). The frontoparietal network has been shown to be consistently active during meditation. Conversely, the default mode network decreases its activity significantly [2]. Activation of the frontoparietal network during meditation decreases with advanced levels of expertise, suggesting a decrease in the effort necessary to hold a meditative state [1].

Using TMS/EEG, a combined technique that consists of stimulating a brain area while recording the electrical activity of the brain, it is possible to evaluate effective connectivity (i.e., how brain areas directly influence each other) by observing the time resolved reaction to the stimulus in areas participating in the network. This technique can reveal whether areas that activate at the same time are in fact causally connected to each other, or whether they operate in a more independent fashion [3].

We will target the dorsolateral prefrontal cortex, part of the frontoparietal network, with a TMS pulse below the motor threshold. In this way, we can map the spreading of the activation signal in other nodes of the networks of interest. Two groups of subjects will participate in our experiment: one composed of experienced meditators, and one composed of beginners instructed to perform the same meditation exercise. We intend to compare resting state to mindfulness meditation both within and between subjects. First, we will study connectivity changes in experienced compared to inexperienced meditators during resting state and meditation. Second, we will compare connectivity during meditation against resting state in the two groups. The importance of testing the effective connectivity of these networks is to reinforce previous research findings, test their conclusions, and shed light on the mechanisms of mindfulness meditation.

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Do Scientific Convictions Serve as Bulwark Against Death Anxiety?

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The idea that science and scientific results are not what people like to call "objective facts", but rather are depended on a variation of cultural, social and subjective factors has been gaining more and more support. However, constructivist notions have yet to make their way into scientific practice: not enough studies have tried to quantify such confounding dynamics in science. One of these confounding factors may be the scientist's degree of investment into an academic framework, as an over the top identification with a certain framework may blind them for its flaws and limitations.
Our goal with the present study is to shed light on to what extend the identity of members of scientific communities hinges on their academic convictions. There are different ways for a community to qualify as scientific: our first choice, Linguists following a Universal Grammar approach, is a group of professionals working under one theoretical framework. Our second choice is a group of loosely affiliated advocates of rational decision-making ("rationality movement"). This second group was selected, on the one hand, because of their adherence to scientific standards and their investment in this specific world view, but on the other hand, unlike for the Universal Grammarians, their professional future is not dependent on this world view.

In an attempt to quantify the abstract notion of identity, the study was situated within the framework of Terror Management Theory. TMT poses that, when humans are reminded of their mortality and death in general, they seek to alleviate this death anxiety by indulging in world views that are central to their identity. Religious people, for example, tend to be more firm in their faith after a death prime. [1]

To validate whether these effects also generalize to scientific communities, we are administering a survey to Generative Linguists and members of the Rationality movement (2x2 design). The A-groups' survey will consist of first a death prime (participants are asked to reflect upon their death), then a distractor task (world view reinforcing effects of death anxiety occur when it is present only subconsciously) followed by items to measure adherence to the respective paradigm. The B-groups receive the same questionnaire as their matched A-group with a negative, but not death-related reflection task instead of the death prime.

We expect the death prime groups to show higher adherence scores than the control groups. Such results would indicate that a scientific commitment can, like religion or political world views, serve as buffer for death anxiety. This in turn would show that an even greater awareness of such bias inducing identity effects is needed in scientific practice. [1]

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Identifying Overlapping Shared Networks in Resting State Brain Connectivity

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Resting state brain connectivity measured via fMRI is a useful way to explore the brain not only for cognitive science but also for neuroscience research and clinical intervention. As the connectivity architecture across individuals vary, it is necessary to take functional variability into account, in addition to the anatomical variability when comparing subjects to each another. This project tries to improve state-of-the-art functional parcelation by introducing an algorithm previously unused for this problem.

In previous work, Langs et al.[1] successfully managed to identify functional variability at individual level by projecting all subjects' brain networks into shared embedding space and they determined the networks that are shared across individuals by carving up the embedding space into clusters of similar functionality. After transforming the data back to unique anatomical space of the individual subjects they were able to reproduce the functional system within subjects and to explore the differences in location of these shared networks in the population.

This work tries to expand this previously used method for decoupling the anatomical and functional variability by implementing a novel community detection algorithm developed by Yang et Leskovec [2] that proved itself effective for analyzing social networks. This algorithm will be used to determine overlapping communities (= functional centers) that are shared across subjects in resting state connectivity. The main difference from previously used clustering methods is that this community detection algorithm does not classify each node to only one cluster but instead assigns each node to several clusters with varying degree of affiliation. This allows to take into account brain regions with multiple functions. The measure of successful functional parcelation is to achieve low intrasubject variation and high signal-to-noise ratio in intersubject variability of functional measures. The goal of this project is to improve the results of previous studies on the same topic.

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Symbol Grounding Through Action and Language in Cognitive Robotics

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The problem of symbol grounding (assigning meanings to symbols) presents a vast impasse in cognitive science. Yet many contemporary theories are based on empirical evidence that argues that grounding happens through an agent's active interaction with the environment via sensorimotor behaviour. To explain how low-level cognitive phenomena lead to high-level cognition, Vygotsky argues that language leads to abstraction and reasoning [1]. This process can be simulated using robotic models. I review three relevant models and present some of the findings here.

The models' basic goal is to learn and name specific actions. Cangelosi et al.'s [2] robot learns and grounds the actions of moving limbs, Farkaš et al.'s [3] "point", "touch" and "push", and Lallee et al.'s [1] "give", "take" and so on. Cangelosi's approach, employing two robots, is based on a teacher-learner relationship, similar to how a child mimics people. It produces grounding transfer, as the robot acquires higher level actions through learning and naming basic actions. However, it has biologically questionable multilayer perceptron and it forces the learner to unnaturally imitate the teacher. Farkaš's model learns, using a biologically viable reward-based system, names an action and comments on it, the latter proving stronger grounded meaning. The shortcomings are in the location-determining visual module and that it can only name an action after executing it, bringing forth the limitations of its understanding. Lallee et al. expand the understanding of an action with a model that sees action as goal-based with a starting and ending state, similar to humans' perception. The authors argue that an action represents a wider context (e.g. causality, possession). The model learns to divide its actions into subparts which denote the object and the causal relations (if-then, because), resulting in a fuller understanding of actions. However, the model has an innate vocabulary, which hinders its validity.

Each model approaches the same fundamental paradigm from its own direction and presents a different, but limited representation of human symbol grounding. Nevertheless, they show promise in creating autonomous, biologically and ecologically viable models that ground meanings through interaction with the environment via low-level cognition, using language to acquire higher cognition.

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The Simulation of Affective Retrieval using the Self-Organising Map with Temporal Context

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Introduction

Current work aims to implement additional component to existing connectionist model of semantic working memory [1]. The main assumption of this model is that the events are experienced through structured sensorimotor routines, which allows to propose them as events with their participant composed of agent, patient and action. However, such settings may lack some properties of current episode like affective component. Therefore we decided to implement additional architecture to capture such component.

Presented model of semantic working memory has in the Current situation component recurrent architecture: it takes as an input the current episode and its own internal representation of past episodes [2]. It is implemented as Merge Self-Organising Map (MSOM) [3]. Its properties offer to reconstruct the situation by top-down propagation from the weights back to the WM episode medium.

Experiment

Our main goal of this project was to create and test architecture of current episode enriched by affective component in a manner: agent / patient / action / + affect. This affective component is represented as two dimensional vector: <positive valence, negative valence>. The positive and negative affect is represented as randomly assigned number from uniform distribution from interval <0,1>. Therefore larger value can express more positive or more negative affect of current situation (i.e. similar values represent ambivalent emotion). The initialization of the input episodes should be biased with some sort of affect. E.g. some actions may be threatened as more positive or more negative, i.e. I|eat|cream is probably more emotionally positive than Dog|bites|me. Furthermore, when we train our network in such conditions the future presentation of similar episodes will evolve similar emotion like in the past. In addition, when we present to the trained MSOM architecture episode with hidden affective component, the network can abstract affective component from the learned connections with past episodes.

Results and Conclusions

We trained MSOM network successfully. Furthermore, we are able to approximate affective component of the testing episodes without explicit presentation of emotional part. Such property can be used in retrieval from long term storage, i.e. episodes with higher emotional valence can be retrieved easier. We are currently aiming to perform more experiments before we try to add up into the presented model [1], [2].

Acknowledgement

My special thanks belong to Martin Takac for valuable guidance and discussion.

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Sweating the Future: A Precognition Study

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Precognition is a form of extrasensory perception, described as conscious cognitive awareness of a future event that could not otherwise be anticipated through any known inferential process [1]. In order to study this parapsychological phenomenon, we are conducting a study following the example of Bem's [1] original series of experiments which point out that we are likely to anticipate pleasant stimulus and avoid negative stimulus. For this purpose we are measuring the electrodermal activity of participants in reaction to neutral and arousing photographs. There are indices that the skin conductance response occurs sooner when the participant is about to see an arousing image as opposed to the normal reaction time when observing a neutral image, thus showing that participants have anticipated the image before it appeared on the screen. Our assumption is that the method of measuring the skin conductance response will be responsive enough to observe a notable difference between reaction times.

In the study, the skin conductance responses of 50 students from the University of Ljubljana of both genders are being measured. Each subject first answers 7 questions related to extrasensory perception which follow the example of Bem's original study [1] and then they are exposed to a slideshow of randomly selected neutral and arousing photographs presented on a computer screen while having their skin conductivity, skin temperature and cardiac activity measured with a Biopac Student Lab system. The photographs are chosen randomly just before they appear on the screen to avoid any possibility of knowing the next picture. The study's design consists of two rounds. In the first round subjects are exposed to 100 images, roughly 30% arousing and 70% neutral, appearing in 14 second intervals (7 seconds for picture and 7 seconds for blank screen).The electrodermal responses from the first round are analyzed and most arousing pictures for each individual are selected to ensure enough contrast between neutral and arousing responses. The second round consists of a series of 50 pictures (20 arousing and 30 neutral). The pictures are chosen from a collection of 100 erotic images (provided by the artists Erica Lust and Pierre Woodman) and 100 neutral images (100 images from IAPS database ranked as least arousing for the female population).

Since precognition is such a controversial and elusive phenomenon, it is ambitious to expect concrete results. However, if our results are significant we will have more evidence on our hands that there is something about our conscious perception of the flow of time that is beyond our understanding. With future research done in this field, it may well be discovered that our intuitions of causality may be at least in some respect wrong.

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The Role of Eye-movements in Perceptual Switching in Ambiguous 2D and 3D Figures

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Multistability refers to the brain's ability to switch between several alternative interpretations (percepts) of perceived ambiguous objects (e.g., seeing a duck or a rabbit in the rabbit-duck illusion). Previous eye-tracking studies investigating this phenomenon are inconsistent. While studies on the perception of ambiguous 3D objects (mainly using the Necker cube illusion) seem to confirm a correlation between eye movements and perceptual switching [1], research on 2D objects, such as the rabbit-duck illusion, are not as conclusive. Researchers have, for instance, both argued that eye movements are not critical for perceptual switching [2], and that they constitute an indispensable visual mechanism preceding a perceptual switch [3].

In this study, we use eye-tracking to address the gaps in the inconsistent literature. We explore the need of eye-movements preceding a change of interpretation of a multistable figure, with respect to dimension (2D or 3D). The presented stimuli are seven (three 3D and four 2D) well-known ambiguous figures. Two conditions are introduced: free viewing, in which subjects can freely change their eye fixations, and fixed gaze, in which participants are asked to maintain their gaze on a fixation point located at the centre of the figure. We investigate following hypotheses: (a) figure dimensionality (2D or 3D) impacts whether one changes her eye position to switch between percepts, and: (b) there is a correlation between particular fixation locations and perceived interpretations of a multistable object.

We expect our results to provide additional evidence for the role of eye-movements in reversing interpretations of ambiguous 3D figures. However, we predict this effect to diminish in 2D figures. These results would contribute significantly to the existing literature by addressing the inconsistencies in a controlled and extended way, which will be ensured by combining two types of stimuli (2D and 3D) and two conditions (free viewing and fixed gaze).

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Trust Development in Repeated Interactions: The Relationship Between Implicit and Explicit Measures of Trust and Personality Variables

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The main focus of the project is studying the evolution of trust in the context of repeated interactions and analysing how different personality factors influence this process. This approach contributes to the development of the theoretical construct of trust while offering practical information for domains such as online commerce. Trust is assessed using explicit measures: investment behaviour in a repeated trust game and evaluations of trustworthiness beliefs, as well as implicit ones: the affect misattribution procedure and the comfortable interpersonal distance task.

The design of the trust game, similar to that proposed by Fett et al. [1], includes repeated interactions with two players which, unbeknown to the participants, are operated through computer scripts. Participants distinguish between the two players using names (i.e. Player A, Player B) and associated avatars . In the first five rounds, both players return the whole sum invested by the participant in order to avoid biases and suspend disbelief that they are preprogramed. We hypothesise that there will be no difference between what the participants invest in each player and how trustworthy they consider them to be, at the end of the five rounds. Afterwards, one player starts to return less money than what the participant has given him, while the other returns more money. Questions assessing the trustworthiness of each player are presented every five rounds. The task is composed of 25 interactions with each player. We predict a direct positive correlation between the number of interactions and investment behaviour in the generous player and an inverse correlation between these variables in the case of the selfish player. Furthermore, we expect these results to be consistent with those obtained by using implicit measures.

Regarding personality-related variables, the analysis will test for differences in investment behaviour and trustworthiness induced by the general tendency to trust people, measured through questions from the Social-economical panel, inclinations towards altruistic, prosocial or selfish behaviour, indicated by the Social value orientation skill, and motivational aspects that underlie behaviour, reflected by the BIS-BAS scale.
A number of 120 participants will be recruited, half of which will be informed that they are interacting with computer agents (offering a non-social context) while the others will be told that they are playing against other people.

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P300 Component Across Different Attention Modality

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Introduction

There is a vast number of sensory stimuli surrounding us all the time and competing for our attention. Our brains filter non important information out in a process we call selective attention. In electroencephalographic studies we try to find out in what way and how fast the brain reacts to a certain stimulus. The P300 component reflects fundamental cognitive attentional processes, and can be produced using the so-called `oddball' paradigm. Our pilot study investigated the electrophysiological correlates of attentional processes in three different modalities: auditory, somatosensory and visual. Our main question was whether different sensory modalities of selective attention have an influence on the P300 component.

Method

Healthy young adults (N=4), with an average age of 25 years (SD=4,5), had to focus their attention on an auditory, somatosensory and visual three-stimuli oddball task paradigm. Each modality was presented in a block of 25 minutes. All oddball tasks included three types of stimuli: frequent, target and distractor, which occurred 70, 15 and 15 per cent of the time, respectively. The participants were presented with all three different stimuli in a randomized fashion and had to count the occurrences of target stimuli. Simultaneously, brain activity was recorded with a 32-channel EEG system, and transcranial magnetic stimulation (TMS) was applied to the primary motor cortex, in order to measure cortical excitability. In offline analysis, visual, auditory and somatosensory oddball tasks will be compared to a control condition where no specific attention was required.

Results

There were 4 subjects included in this pilot study. No significant differences were observed in cortical excitability measures when comparing the different modalities. EEG data early preprocessing was tailored to deal with TMS induced artifacts according to Herring et al [1] and followed the PREP pipeline procedure [2]. We expect our results to show the mean P300 latencies for auditory stimuli to be shorter than for visual stimuli [3] but we don't know how the P300 latencies for somatosensory stimuli will be elicited since there is almost no research done for all three modalities with three-stimuli oddball task in one study. We can't give any predictions for the P300 amplitudes differences yet.

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A Practical Approach to Automated Segmentation of Brain Tumors in MRI

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Expert brain tumor identification on multi-modal Magnetic Resonance (MR) images is a very time-consuming process for medical experts. Therefore, throughout the last decade, significant effort has been invested in the development of novel approaches applying computer-aided techniques for brain tumor segmentation. Automated brain tumor segmentation aims to separate and label different tumor tissues, including: (1) active tumor cells, (2) necrotic core, and (3) edema from normal brain tissues of Gray Matter (GM), White Matter (WM), and Cerebrospinal fluid (CSF). Even though experts from the brain tumor research area can accurately characterize and identify brain tissue abnormalities, the automated process of tumor segmentation is not straightforward. Many accurate approaches are only evaluated on a single data type coming from a particular brain tumor type, and thus, being far away from a practical clinical application [1].

The aim of this work is to implement a software framework to apply and evaluate a recent technique of automated brain tumor segmentation in realistic clinical settings. We will use the algorithms on a coherent study data set and evaluate how they perform based on a small annotated data set.

The algorithm choice will be based on quantitative evaluations from [2], [3]. Additionally, internal requirements for the selection will be defined (i.e. degree of user supervision, robustness on the various data, etc.). The dataset consists of multi-contrast MR clinical images from [2], [3], as well as, images from the repository of Medical University of Vienna. The robustness of the selected approach will be evaluated using test data from [2], [3]. The performance measure includes segmentation accuracy of each tumor sub-region defined in 1-3, brain tumor type and the severity of the pathological case.

The expected outcome of this project is a toolbox for brain tumor segmentation using existing algorithms. The robustness of the state-of-the-art approaches will be evaluated providing a rough estimation of how far selected techniques are from a practical usage in clinical practice.

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SPM for EEG Source Localisation

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Introduction

Electroencephalography (EEG) is a popular technique used to record electrical activity of the brain along the scalp known to provide excellent temporal but poor spatial resolution. It is a direct measure of activity as opposed to indirect indicators such as changes in blood flow (fMRI) or metabolic activity (PET), which are also considerably more expensive.

Source localisation is an umbrella term for a number of methods developed to address the poor spatial resolution by utilising mathematical models to project data from sensor space into three-dimensional brain space. The result is an approximation whose quality depends on a number of factors.

Multiple sparse priors (MSP) [1], the specific approach used in this work, is based on the assumption of multiple dipolar sources spread over the cortex, each with fixed position and orientation, and the objective to estimate the source amplitudes (also called the inverse problem).

Statistical Parametric Mapping (SPM) [2] is a free open source software package featuring tools for the analysis of brain imaging data sequences including source reconstruction, allowing for fairly efficient workflow and additional inferences from EEG data.

Methodology and Results

The data from the 0° and 180° rotation tasks originated from a rotation-related negativity study provided by the author's supervisor [3] were imported and prepared using SPM. Source localisation was performed using the canonical template head model co-registered with the electrodes, normal cortical mesh, and MSP for inverse reconstruction. The process was documented for the purposes of this work and the resulting images were analysed qualitatively. Statistical analysis is still being performed at the time of submission of this abstract.

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The author assumes full responsibility for the outcomes.

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Automatic Acoustic Siren Detection in Noisy Environment with Deep Neural Nets

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Motivation

Rapid and reliable detection of emergency sounds in traffic is an important skill required for human drivers. Next to the need for assisting the hearing impaired, recent developments in autonomous driving have increased the demand for the automatic detection of these sounds in real time. Simultaneously, the amount of available computing resources in cars has increased vastly and enables the use of state-of-the-art machine learning techniques such as deep artificial neural networks.

Multiple previous studies have tackled this task, mostly by employing techniques of low computational cost, such as Mechanical Resonant Filters, or classifiers like Hidden Markov Models. In more recent years, approaches using small-scale artificial neural networks have proved to be successful at detecting siren sounds, achieving up to 99% accuracy [1]. However, these studies usually focus on very restricted databases of siren sounds, often times of emergency vehicles from a single country or department. This results in restricted models, sometimes relying only on a fixed set of frequencies or signal durations. Additionally, most of the studies ignore the large diversity of real world scenarios, such as closed windows or the Doppler effect caused by moving vehicles.

Method

This study will employ a deep convolutional neural net to detect siren sounds, inspired by an approach for musical onset and voice detection [2]. In a first step, the network is trained on a dataset of several hours of urban noise recordings which include a variety of different siren sounds [3]. In a second step, the available data for training will be augmented by including audio from publicly available videos with siren sounds. As operational systems have to work in real time while simultaneously avoiding false alarms, special attention is paid to finding the optimal response time.

Expected Results

The network's prediction accuracy is expected to match the level of previous approaches using neural nets while being able to recognize a larger variety of different sirens. Previous results indicate that reliable predictions can be expected within one second or less and thereby facilitating real world applications.

Acknowledgments

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Two in One or One in Two? A Closer Look at the Default-interventionist Model

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Differences in thinking across cultures and individuals have been a mystery since early human history. Nowadays, it is quite popular to explain that mystery by dual process theories. On the one hand, there are scientists who presume that such theories have a solid foundation. On the other hand, there are scientists who have opposite opinions.

The default-interventionist model is mostly supported by empirical evidence [1]. Basically, it could be described as a model of the interactions between system 1 and system 2. Authors emphasize the role of individual differences. However, Kruglanski [2] considers this evidence to be a proof for single process theory instead of the dual one. He claims that individual differences matters very much. The result of such thinking is that at the end of the analysis, there is no distinction between intuitive and deliberative process.

The aim of this paper is to test the aforementioned model. We would like to find out whether people use dual processing when reasoning or there are two types of reasoners. In our experiment, participants (N = 250) performed a cognitive reflection task and no-go task. There were two conditions in the reflection task – with and without time pressure. Furthermore, we investigate a knowing cognitive style, level and quality of education, and the level of confidence about answers in cognitive reflection task. The core hypothesis is formulated as follows: there are no significant differences in cognitive reflexive task under time pressure across several professional backgrounds. We use various statistical methods to interpret the data.

Our findings maintain the previous supportive evidence for the default-interventionist model. Nevertheless, a closer look suggests that Kruglanski has a point. Results show that respondents working or studying in technical fields are equally successful in solving reflection task in both conditions. We can say that this default reaction is connected with the availability of the particular type of reasoning and probably depends on training. In conclusion, we consider the empirical evidence as the manifestation of two different types of reasoners instead of dual processing.

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Immunohistochemical Staining of Trpv4 Channels in Rat Parkinson Disease Model

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Introduction
TRPV4 is a nonselective cationic channel and is involved in the development of sensory, motor and sympathetic peripheral nerves. TRPV4 promotes neuritogenesis in the process of differentiation of pheochromocytoma (PC12) cells. Furthermore, TRPV4 gene mutations that cause gain of function are linked to some congenital neuropathies of motor and sensory neurons [1], indicating that TRPV4 could play an important role in the degeneration and regeneration of peripheral nervous system. However, its potential role in degenerative and regenerative processes within the central nervous system is not well explored. For example, it is known that in the rat TRPV4 channels are expressed in the dopaminergic (DA) neurons of the substantia nigra pars compacta (SNc) [2] that degenerate in Parkinson disease (PD).

Aims
We aimed to determine the potential role of TRPV4 in pathophysiological mechanisms of PD. We therefore further explored the localization of TRPV4 within DA neurons of human SNc and their localization within the rat nigrostriatal system. By mimicking striatal dopamine depletion that occurs in PD in a rat model of PD we also examined if the expression of TRPV4 in the postsynaptic striatal neurons may be dependent on the tonus of striatal DA.

Methods
TRPV4 immunohistochemical staining was performed on human brain slices of SNc and brain sections of the SNc and striatum of hemi-parkinsonian rats that were obtained by unilateral stereotaxic injection of specific DA neurotoxin 6-OHDA in the SNc. The specificity of anti-TRPV4 antibody was analysed by knockout validation, with TRPV4 immunohistochemistry performed on wild type and TRPV4 knockout mice retinas.

Results
Immunostaining indicated that TRPV4 may be expressed in the DA neurons of human SNc, in rat DA neurons of SNc and in postsynaptic striatal neurons. We also found a downregulation of TRPV4 immunostaining in postsynaptic striatal neurons within the DA denervated striatum. However, the specificity of anti-TRPV4 antibodies in TRPV4 knockout mice showed some degree of nonspecific binding.

Discussion
TRPV4 expression in DA nigrostriatal neurons and the postsynaptic neurons of the striatum and DA regulation of TRPV4 expression within postsynaptic striatal neurons indicate that TRPV4 could be implicated in pathophysiological processes of Parkinson disease. Additional optimization of TRPV4 immunohistochemistry is needed to determine the specificity of anti-TRPV4 antibodies used in the present study.

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Are Heterogeneous Expectations a Viable Alternative to Rational Expectations in Economics?

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Expectations play a crucial role in economic theories. Different ways of modelling and parameterising expectations change outcomes massively in (macro-)economic models. On a meta-theoretical level, some authors even go as far as to claim that: "Individual expectations about future aggregate outcomes are the key feature that distinguishes social sciences and economics from the natural sciences" [1].

The prevailing expectation hypothesis used in economics is that of "rational expectations" (RE) [2]. Here, it is assumed that expectations are nothing more than the predictions of the relevant theory, i.e., they are defined to be model-consistent. Furthermore, it is assumed that people make no systematic mistakes. Finally, modellers typically introduce "representative agents" (e.g., “the average household”) equipped with RE to bridge the gap between micro- and macro-levels; all interacting units of the economy are therefore alike. Over time, it became more and more evident that certain real-world phenomena, like the global financial crisis, are very hard to fit in a uniform RE framework.

Expectations modelling in economic theory thus is in need of theoretical innovation. New proposals ought to have a strong interdisciplinary foundation, reconciling valuable insights from several other disciplines, including sociology, psychology and anthropology. In particular, we take interdisciplinary thinking to be an effective remedy against the harmful tendency of a large part of economics to isolate specific aspects of human behaviour and then to treat these and only these as "purely" economic subject matter, as in the case of RE.

The concept of "heterogeneous expectations" has been suggested as an alternative to RE, instantiated in so-called "agent-based models" [3]. Here, heterogeneous agents use different methods of expectation formation. The "wilderness" of this approach is fenced in e.g. by the use of genetic algorithms that describe agents' switching between heuristics according to a fitness criterion, e.g. accuracy of prediction.

The goal of our project is to give a critical assessment of rewarding ends and eventual dead ends in the theoretical development of agent-based economic modelling with heterogeneous expectations. The outcome of this work should be a stepping stone towards a more outward-looking theory of dynamics in (financial) markets.

Acknowledgments
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Innovating Interpreting: User Profiles for Programmers

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An innovation needs to be (radically) new, but at the same time fitting into the market, thus leading to sustainable and thriving dynamics in its interaction with e.g. the user [1]. In a three-semester-project, Carina Trapl and I are employing an innovation process based on emergent innovation [1], with one goal being the development of an app for note-taking. The app should serve as an aid for consecutive interpreters and thus I see this project as relevant for cognitive science, because it is dealing with the question of how to develop technology to best aid people in cognitively demanding tasks.

In the current semester, I am doing research on usability because I consider it as a good way to ensure staying as close as possible to users and their needs in order to ensure that the app can connect to the market and though that help the people that might need it.

My research question is: What challenges do interpreters face during the process of consecutive interpreting?

My goal is to represent these challenges via user stories. These are fictional stories from a user's point of view, created typically by a person who is not involved in the programming process itself. These stories can be used all along the programming process to not lose touch with possible future users and check if one is still on the right track. As far as I know there are no user stories for consecutive interpreters so far.

For creating such user stories, literature research and semi-structured qualitative interviews with professional interpreters and students were conducted. The analysis of these suggests, that many different expectations, fears, strategies and personal styles of note taking need to be taken into account during programming. Additionally, research has shown that there are cultural differences in perception and thinking which can have a great impact on evaluating usability [2]. This leads me to the conclusion that these cultural differences might not only play a role in evaluation but also in user experience itself and thus need to be already taken into account while designing and programming the app in order that users all over the world can use it, which could be done by providing different layouts of the same app for different cultural target groups.

For creating user stories I conform to the 14 quality criteria by Lucassen et al [3].

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Moral Enhancement – What is Moral, How Can Morality be Enhanced, and What are the Bioethical Issues Involved?

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Moral enhancement can be viewed as a type of cognitive enhancement, which refers to the aim of improving the state of specific cognitive abilities of an organism beyond its normal healthy state [1]. More precisely, it can also be viewed as enhancement of specific sentiments such as altruism and empathy, or as a more complicated holistic approach to moral character with an empirically grounded model of different components or virtues which need to be balanced [2]. Such moral enhancements could be achieved through the use of electronic, psychopharmaceutical and genetic interventions. Similarly to cognitive enhancement, it has sparked controversy and debate regarding the ethical implications of such an enhancement. However, some argue that unlike other biomedical enhancements, which would benefit some and harm others, moral enhancement would be beneficial to all [3]. The aim here will be to better understand how morality could be enhanced based on an expanded definition of what is moral, and present some of the ethical issues involved in this type of enhancement.

Through a broad interdisciplinary review starting with a theoretical overview of (bio)ethics and philosophy (implications of new technologies) of cognitive enhancement, focus was put on studies specifically discussing moral enhancement. Although there is still much to learn about brain mechanisms surrounding moral motives, certain traits and their biochemical processes relating to morality can be identified and enhanced using pharmaceuticals and techniques such as transcranial direct-current stimulation (tCDS) and transcranial magnetic stimulation (TMS). Nonetheless, with the enhancement of each of these traits there is the possibility of inhibiting other desirable traits (e.g. self-control can inhibit desirable risk-taking). A suggested solution to this is modulating the influence of other virtues (controlling all traits to create an overall balance).

Based on a review of the literature and existing models, an expanded definition (constructed from traits and virtues) of what is moral will be given, from which further exploration of the most viable techniques for enhancement of traits will be suggested. In terms of the ethical issues, arguments for and against moral enhancement will be examined, advocating this type of enhancement to be considered on an individual level and not imposed on society as a whole.

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Sex and Inanimate Objects: Does Grammatical Gender Influence How We Think about Inanimate Objects?

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Linguistic relativity is still a debated topic within cognitive sciences. There are thousands of languages which differ one from another in many aspects. B.Whorf [1] advocated an idea that a language determines the way of how we think. Moreover, recent empirical evidence suggest that language could shape a particular parts of thinking such as perception of time, spatial relations, or even grammatical gender (GG)[2].

Some people doubt GG's advisability because assigning of GG to objects seems to be semantically arbitrary. Moreover, GG of inanimate objects differs across languages [2]. On the other hand, there are many studies which confirm the linguistic notion that GG and meaning are narrowly related. This empirical evidence, however, is still weak and open to different interpretations [3].

We aim to replicate Boroditsky's study on GG [2] with slight modifications and compare both results. Unlike Boroditsky, we examine GG's influence in Slovak and Czech native speakers instead of German native speakers. We have also decreased the number of nouns (from 24 to 20) and used different nouns.

The entire experiment is conducted through the internet in English (no GG for inanimate objects). Hence, all participants must have a good level of English but it cannot be their native language. Participants are university students divided into three groups: Slovak-English, Spanish-English, and Czech-English speakers. Czech and Slovak are chosen due to its closeness (not only linguistic but also cultural). Each group of participants has the same list of nouns in English that represent (abstract) inanimate objects, e.g. 'a bicycle', 'a book', 'a week', 'a life' etc. The list consists of 20 English nouns which are chosen according to GG in native language of participants in this manner: if a presented noun is feminine in Spanish, a noun in Slovak and Czech has to be masculine and vice-versa. The task is to write 3 adjectives in English that come first to their mind to describe each noun. Participants do not know the purpose of the study.

Our assumption is that if a word is masculine (feminine) in participants' native language, written adjectives will be rather masculine (feminine) than feminine (masculine). We expect no significant difference between Slovak and Czech native speakers.

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The Slovene Lexicon Project

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Written words are probably the most studied stimuli in experimental psychology. The most commonly collected data are measurements of word-recognition response time, influenced by a myriad of factors. The Slovene Lexicon is a project aimed at providing standardized behavioral and descriptive data for 2250 words and 2250 nonwords. Data from 90 participants are being collected in a lexical decision task (participant decides whether a string of characters is a word or not) and speeded naming task (participant is recorded reading a string of characters out loud).

Following The English Lexicon Project [1], we attempt to construct a database of naming and lexical decision latencies for slovene mono- and multisyllabic words for use in further research.

The studied variables are word length, word frequency based on the FidaPLUS corpus of Slovene language, orthographic neighborhood (various measures), word structure, mean latency, mean latency according to word properties.

Our participants are native Slovene speakers, who participate in both the naming and decision task. We measure response latencies for the tasks. Accuracy of word recognition in the decision task and self-evaluated pronunciation accuracy in the naming task are noted. Our stimuli are a set of words (content words in their basic forms) and pronounceable nonwords.

We expect our results to conform to the partial analysis by Mencinger and Repovš [2]. This includes: A significantly longer response time to nonwords than words. A shorter naming than decision response time.

The logarithm of individual word frequency being a predictor of response time for both tasks.

OLD20 orthographic neighborhood measure being a better predictor of response time than Coltheart's N [3]. Word length being a significant predictor of response time, even when controlling for other variables.

The data collected in our project will be used to create an important instrument for various studies of word recognition, selection of specific word stimuli, and psychological models based on word effects. Researchers from other disciplines, outside of word processing, that use words as a primary stimulus, will be able to use our database.

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Salsa Meets Science: A Case Study on the Improvisational Skills of Dancers

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Dance and Improvisation have been marginalized topics in scholarly discourse for a long time. Fortunately, this is changing due to the realization that these domains provide essential insights about creativity and intersubjectivity [1], [2]. In their current research project "Embodied Creativity in Dyadic Interaction" Kimmel and Hristova take this stance and have investigated the improvisational skills in Tango Argentino. Based on their interdisciplinary methodology and theoretical framework which is informed by Cultural and Social Anthropology and Cognitive Science (Affordance Theory, Dynamic Systems Theory and Enactivism), I will explore these in the field of Salsa with the aim of bridging science and (dance) practice. The question at hand is concerned with translating a "cognitive theory of joint improvisation" [3] back into practice. In concrete this will result in defining a teaching strategy that focuses on these highly demanding skills.

My research project is subdivided into three phases. In the explorative phase I will make use of interview techniques that combine aspects of Cognitive Task Analysis (CTA) and the video-stimulated recall method [2] to delve into the mindset and the expertise of Salsa dancers. Also, I target at discussing the current state of Salsa didactics on improvisation. Subsequently, I will draw on these second-person data and use the theory of Kimmel [3] to map the discipline-specific demands of Salsa (analytic phase). This framework takes into account the multimodality and complexity of cognitive skills found in dancers, and I expect the defined model on improvisation to function as a basis for defining a teaching strategy. Finally, in the test phase this teaching strategy will be applied and evaluated in a workshop. These results may form a point of departure to reconceptualise didactics in Salsa that take into account the inherent creative character of improvisation. Furthermore, they might have implications for social cognition research contributing aspects to its subfields such as interaction and intersubjectivity.

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Using Foreign Language Reduces Bias in Decision-Making

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We deal with simple and more difficult decisions in our everyday life. These are mostly based on incomplete information or bounded in certain time intervals. The prospect theory, developed by Daniel Kahneman and Amon Tversky [1], describes the way people choose between alternatives that involve risk, where the probabilities of events or outcomes are known. The theory consists of the framing effect which shows that people tend to avoid risk when a positive frame is presented but seek risks when a negative frame is presented. There is evidence [2] that decision-making in contexts which elicit heuristic biases grounded in emotional reactions would be sensitive to the language in which the problems are presented. The another study of the effect of foreign language on the choices [3] has demonstrated that the use of a foreign language dramatically reduces the gain-loss asymmetry in risk preferences, resulting in a frame-independent choice, which is more in line with standard economic theory.

In our experiment, it is shown whether the framing effect and choices in risky situations disappear when tasks are presented in a foreign language. We divided participants into three groups. In the first two groups, participants answer the tasks in both English and Slovak language. The order of languages is presented differently for these groups. Conditions in tasks are balancing in positive or negative frames in both languages. One additional condition shows whether effect disappears because of language or consequences of cognitive endurance, random choices, etc. The control group consists of Slovak native speakers who answer these tasks in the Slovak language. We assume that these effects would arise because our cognitive and emotional reaction interval in a foreign language is greater than in a native language.

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Diagnosing of Narcolepsy in Slovenia

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Introduction

Narcolepsy is a neurologic disease characterized by excessive daytime sleepiness, cataplexy, nighttime hallucinations, sleep paralysis and sleep fragmentation [1]. It is an autoimmune disorder, as there is a strong association with specific genotypes, especially HLA-DQB1*06:02 found in around 95% of narcolepsy type 1 patients [2].

Methods

Our research project, based on the study "Patients with narcolepsy in Slovenia" [1], dealt with newly diagnosed narcolepsy patients in Slovenia. Our aim was to investigate whether narcolepsy diagnosis has improved in the recent years. We compared data of 8 new patients to data of patients diagnosed from 1994 to 2013 in the mentioned study. Patients were compared on the basis of the following attributes: age of diagnosis, lapse from onset to diagnosis, presence of excessive daytime sleepiness (EDS), cataplexy, hallucinations, sleep paralysis, characteristic changes on polysomnography (PSG) and the mean sleep latency test (MSLT), presence of typical HLA typing and prescribed medication. For patients, thought to have narcolepsy but not diagnosed, the discharge diagnosis was checked.

Results

The average age diagnosis was 41 and the average lapse from onset to diagnosis was 2 years. All patients exhibited EDS and cataplexy. 57% had nighttime hallucinations, 43% had sleep paralysis and 83% of the tested patients showed characteristic changes on PSG and MSLT; 1 patient has yet to be tested. All of the tested patients had typical HLA results; 2 patients were not tested. All patients who were prescribed medication were given Sodium Oxybat, 67% Modafinil and 17% Antidepressants; 1 patient has yet to be prescribed any medication. 1 patient was diagnosed with symptomatic narcolepsy due to thyroid gland problems, he received Medrol and Euthyrox. The discharge diagnoses of 19 patients, not diagnosed with narcolepsy, were (by frequency): obstructive sleep apnoea, restless leg syndrome, normal EEG, undefined symptoms, hypersomnia, circadian rhythm disorder, PTSD and night terrors.

Conclusion

Our research showed that the lapse from onset to diagnosis has been largely reduced – from 17 to 2 years. The prevalence of narcolepsy is 2.2/100,000, pointing to underdiagnosis, as the average is 25/100,000 in Caucasian population [1]. The average of patients diagnosed per year rose from 2 to 2.7, showing an improvement. The results of other attributes were similar to those of the 2014 paper. Our results show that narcolepsy is becoming more widely recognised, but the low prevalence shows that additional effort is needed to inform doctors and the general public.

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Data Analysis for BCI Robot-assisted Training for Rehabilitation

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Over 750,000 people suffer a stroke every year, of which about 80% suffer some degree of hemiparesis. It has been shown that the (so-called) mirror box therapy can improve the performance of the paretic limb [1].

Furthermore Pichiorri and collective [2] have shown that the use of brain-computer interface (BCI) improves paretic limb performance. Immediate changes the in functional network organization while performing imagined movement in a BCI was also shown [3].

Inspired by these results we designed training paradigm using BCI, EEG and mirror box for hemiparetic patients trying to perform real or imaged movement. We have two patients (male, 40 and 57 years old) with right arm paresis that were first trained using only mirror box and later using BCI with EEG in conjunction with mirror box.

This training yields an enormous amount of data. My work is a part of this ongoing research conducted at Slovak Academy of Sciences and I develop and implement data analysis tools in Matlab. So far we have shown improvement in the mu rhythm after training as well as both subjective and objective improvement in patients arm movement. In future we plan to analyze changes in multiple frequency bands during training with BCI and mirror box and possible improvements in paretic limb performance.

Even though the use of BCI and neurorehabilitation is widely used with paretic patients, we plan to use multiple frequency bands during training and observe possible correlation between these bands and mu rhythm which has not been done before.

Acknowledgments
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Experiencing the Enactment of Beliefs

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The main goal of our study is to research the experiential aspect of the enactment of belief. Our main assumption is that belief is not a fixed structure (representation) but is enacted every time we examine (probe) it in a more or less unique way. We consider the process of enactment of belief as a constitutive part of belief itself. The term enaction, coined by Varela, Thompson and Rosch (1991) is used, to denote the middle way between the emergence of a fixed memory, and the construction of entirely new experience.

We model the enactment of belief as influenced by individual's conceptual framework and his or her perception of the particular communication situation. The influence of the latter is the principal research interest of our study.

In order to research first-person experience, the study is conducted in a form of in-depth comparative phenomenological case study. Elicitation interviews (Petitmengin, 2006) are combined with are search journals of experiences of belief enactments. In the first phase of the study, the participants are asked common known pre-defined questions in order to form beliefs (i.e. what is Oedipus complex), after answering, they are asked to describe their experience of the enactment of these beliefs. In second phase, the participants become co-researchers, as they are asked to – aided by their research journals - observe their experiences in different communication situations. Journal entries are post festum examined in elicitation interview.

This type of study gives insight into understanding personal epistemological view points, which are essential for the understanding of constructing individual realities. Preliminary results show considerable individual differences in the process of enactment of belief.

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Wearable EEG-Based Brain-Computer Game Controlling Interface

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EEG-based Brain Computer Interface (BCI) employing motor imagery enables direct communication between the user's brain and a computer or other smart device [1]. The user imagines moving his body, causing short moments of mu (8 – 12 Hz) and senzorimotor (12 – 15 Hz) rhythm desynchronizations in the sensorimotor cortex [2]. These are acquired by an EEG device and can be detected in the output signal by a computer program — this task is termed online classification. To be able to classify, the classifier first needs to be trained, which is usually done offline on pre-acquired training data.

We are building an end-to-end BCI solution utilising a wearable headset. We record the signals with NeuroSky MindWave, an economical EEG headset equipped with on-board bluetooth connectivity. This device is reasonably priced, compact and gives user higher freedom of movement and is therefore more suitable for broad use than conventional EEGs. However it also bears only one electrode, which poses a challenge as we are unable to easily topographically distinguish the source of detected neural activity. We acquire the signal using OpenVIBE server, which sends it to OpenVIBE Designer [3]. These do not need to be run on the same computer. We are developing an online classifier in OpenVIBE to classify received signals based on hand motor imagery. Considering having only one EEG channel at our disposal we expect to be able to detect two brain states, effectively creating a brain switch. This switch produces one dimensional control output signal, which we forward to a custom game application via VRPN connection (network protocol).

After a calibration of the classifier the user should be able to control the game using his thoughts alone.

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I would like to express my thanks to my supervisor Barbora Cimrová.

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Can We Trust Our Ears? Perception and Transcription of Naturalistic Speech Errors in Slovak Language

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The aim of this study was to examine our ability of naturalistic speech errors detection. We took a closer look at its sensitivity, potential influential factors and interpersonal differences within Slovak language. We were inspired by the work of R. Ferber [1] who investigated the accuracy and reliability of observational data on spontaneous speech errors. In majority of cases, speech errors are noted down immediately after being heard without any possibility of reexaming the correctness or completness of transcription. Nevertheless, collection of spontaneous speech errors formed the basis for language production processing models. Results of the study [1] showed that only half or less of speech errors were recorded in the condition of immediate transcription relative to repeated listening condition. In this study, we compared results within Slovak language with the results of [1], plus we focused on potential influential factors which might had an impact on immediate speech errors perception. We presumed that emotions, attitudes and socio-demographic characteristics might be the potential influential factors.

Methods

The design of experiment was, unless little differences, comparable to the base study. Participants were listening 20 minute record of post-election debate, which satisfied the condition of naturalistic speech listening. As participants do not have any experience with transcription of speech errors, trial version was passed and then the experiment started. Participants were told to stop the record immediately after hearing any kind of speech error and to note down the time and the perceived expression to prepared answer sheet. After the transcription, listening continued. On the contrary, in the base study [1] participants were not allowed to stop listening during transcription. In both studies participants were not allowed to repeated listening. The choice of theme of the record – post-election debate – was intentional because of its emotional charge and potentiality for revelation of presumed influential factors of speech errors perception. After experiment, participants filled the questionnaire about socio-demographic characteristics, their attitudes towards politics and selected politicians and their feelings and experience related to process of experiment and its content.

We presumed that participants would not be able to perceive all of the speech errors presented in the record and that emotions and attitudes provoqued by political debate would have the impact on the perception of speech errors.

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Brainwaves Analysis for BCI with Robot-Assisted Training for Rehabilitation

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Stroke is caused by loss of blood supply and lack of oxygenation of the brain tissue, which may result in hemiparesis, inability to move the limbs on one side of the body. Common rehabilitation does not offer good results, thus the idea of robot-assisted rehabilitation has been created. Training by motor imagination is used as auxiliary rehabilitative technique, in which body starts to develop the image of movement in the working memory without the real movement itself [1]. Action observation, motor imagery, and imitation are represented in the same basic motor circuit as action execution—the mirror neuron system—and thus provide an additional or alternative source of information to motor training that may be useful to promote recovery from stroke [2].

Our research aims to improve patient's condition by brain-computer interface (BCI). It detects changes of mental activity measured with EEG and transforms it into control signals. Therefore patient receives immediate feedback by seeing the outcome of his effort (movement of a robotic arm) and it allows him to modulate the state of activation of his brain more effectively. Futhermore, after a long-term exposure, it can induce neuroplastic changes in brain [2].

In this case, a measured raw EEG signal was decomposed using the power spectrum analysis into 6 frequency bands – Mu, SMR 1, SMR 2, Beta 1, Beta 2 and Alpha. To that moment, we used only mu rhythm in BCI system, which is specific type of alpha rhythm localized in senzory-motor area with typical event-related desynchronisation (ERD) occuring during movement or motor imagery [3]. However we try to discover specific patterns and correlations among all rhythms. We found strongest correlation between SMR 1 and SMR 2 rhythm as well as between Beta 1 and Beta 2. Our future aim is to look at changes occuring during the „move“ condition and, on its basis, develop more complex model which will combine more rhythms together.

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Learning the Instructions How to Reach with a Simulated Robotic Arm

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Reinforcement learning (RL) is a branch of machine learning concerned with agents learning to take actions that maximize the overall received reward [1]. CACLA (continuous actor-critic learning automaton) is a RL algorithm used in continuous state spaces [2]. It is an actor-critic method in which both the actor and the critic are implemented as neural networks that serve as function approximators. The critic approximates the utility function for the whole state space and the actor learns the policy by choosing an optimal action in each state. Our study is relevant also for human-robot interaction which is a vivid line of research proposing numerous ways how to enhance learning in robots under human guidance [3].

We are using the CACLA algorithm in a context of simulated robotic arm with 6 degrees of freedom learning to reach a given point in space. The agent receives smaller reward (only to speed up the learning) when it makes an action that moves the tip of the arm closer to the given point and bigger reward when the tip of the arm gets near enough to the given point (as if touching a small sphere placed in that point). We extended the CACLA algorithm by adding a teaching signal into the actor's input. The teaching input (in a localist code) serves as a cue in which direction (up, down, left, right, forward, backward) the arm should move in order to reach the given point. The given point is static and after reaching it, the arm is set into a new random position. In this way the actor is progressively going to experience all the possible cues.

In this framework the agent at first has to learn to interpret the teaching signal and move according to the cues. We study how well the agent learns to interpret these cues and utilize them in the reaching task. We propose that once the agent learns to use the teaching signal, it will be able to reach the original (used in the learning process at first) and also any new point faster. The agent should be constantly improving in interpreting the teaching signal, further speeding up the reaching. We suppose that this kind of an algorithm can also be used in more complex problems facilitating the learning speed in various tasks.

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Effects of Mortality Salience on Schadenfreude Induction

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According to the Terror Management Theory (TMT), people defend themselves from the awareness of inevitable death through the values offered by cultural world views, promising literal or symbolic immortality [1]. In this theory, self-esteem is defined as a sense of personal value obtained by believing that one fulfills the cultural world view standards one finds to be valid. Studies have shown that, when reminded of death, people are more likely to strive for self-esteem, i.e. be increasingly motivated to meet valid cultural standards [2].

Pleasure from others' misfortune, or schadenfreude, has been shown to appear in reaction to both self-evaluation threat and perceived deservingness of outcome of anothers' action [3]. A series of studies done by Feather and his associates showed that people tend to feel increased pleasure about deserved failures of high achievers. Furthermore, van Dijk and his associates showed that schadenfreude could be a co-product of downward social comparison based on dimensions relevant for self-evaluation.

The aim of this study is to show the effect of mortality salience (MS), on experiencing pleasure from others' misfortune. In the pilot phase, dimensions relevant for self-esteem are obtained from the sample. In the main study, the MS group is presented with a death reminder, and then subjected to four stories. These stories represent 2x2 combination of factors: high achiever vs. average achiever on relevant dimensions and deserved failure vs. undeserved failure, also having consequences in regard to relevant dimensions. After each story, subjects fill in a short affect scale used for measuring schadenfreude in previous studies. The control group is reminded of pain instead of death, but otherwise has the same treatment.

Taking previous TMT and schadenfreude studies into account, schadenfreude can be expected to satisfy the MS-induced self-esteem striving. Higher average score on schadenfreude scale is expected in the MS group compared to the control group. Also, the factors that were previously shown to induce schadenfreude are expected to be more effective in the MS group, compared to the control group, meaning that high opposed to average achievement and deserved opposed to undeserved failure would result in a relatively larger increase of schadenfreude for MS group.

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Innovation Holograph – From Blind Spots to Innovation Potentials

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Innovation has been identified as the key driver of economic stability and sustainable growth [1]. Hence, there has been a drastic increase in innovation management tools, most of them reflecting the idea that innovation can be produced in a mechanistic manner. Results are therefore mainly incremental, i.e. rather superficial adaptations of already existing products and services. On the other side of the spectrum is the concept of emergent innovation [2], aiming at bringing forth fundamentally new - yet organically fitting - knowledge and products that will have a disruptive impact on the environment. I argue that, in order to be successful, organizations will need to create innovations of the latter kind. This requires a phase shift in organizational mindset and practices: from managing to enabling innovation. How can that be achieved?

Following Fleck [3], products, organizational culture and practices are determined by thought styles. Innovation Holograph refers to them as "mental models", i.e. individual or collective interpretations of an (innovation) object or phenomenon. And while mental models are the glue holding an organization together, they are also creating “blind spots”, thus obscuring "sweet spots" for innovation.

Innovation Holograph has been adapted from the FFG funded, COIN research project “Innovation Lens” (project no. 845942, developed by the University of Vienna and Salzburg Research). It aims at (1) identifying collective mental models, (2) twisting them through perturbations from "the outside world", and (3) - out of this interaction - revealing innovation potentials.

The process has been designed for small to large sized organizations in various industries, evolving around a core team of around 10 members and extending over a period of two to three months. Various methods are used: Generative interviews, semantic mapping, circular questioning etc. Innovation Holograph is currently being tested within the project "Innovating Interpreting" at the Centre for Translation Studies at the University of Vienna. Phases 1 to 3 will be finished by End of June, results on process stability and qualitative outcomes are expected by mid July.

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Evaluation of the Allen Brain Atlas with Respect to Current Questions in Molecular and Cognitive Neuroscience

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Unveiling the complex organization of the brain is the challenge of the 21st century. Different imaging and molecular investigation techniques as well as Big Data analyzation tools have contributed strongly towards this goal. The Allen Brain Atlas, an online open access Big Data tool developed by the Allen Institute of Brain Sciences, integrates the above mentioned techniques and provides a new powerful research device [1]. The following project aims to assess the value and limitations of this tool with respect to current questions in cognitive and molecular neuroscience, using as an example the GABAergic system and its role in memory functions and psychiatric diseases. The project is divided into three subprojects each dealing with a different atlas (i) Using the Allen Developing Mouse Brain Atlas, we examine the developmental expression of mRNA coding for the α5 subunit of the GABA-A receptor in the hippocampal formation and compare the findings to currently existing literature. Our focus is as much on the findings themselves as on the methods used to acquire the data. (ii) The Schizophrenia Study in the Allen Human Brain Atlas will serve as basis to confirm the involvement of genes related to the GABAergic system, like GAD67 in the PFC of patients with schizophrenia [2], and will be compared to data of the normal adult human brain. (iii) Evidence also suggests a role of the cerebellum in schizophrenia patients and expression of certain GABA-A receptor subunits seems to be altered at mRNA and protein levels in the cerebellum. Assessing the Allen Mouse Connectivity Atlas, we therefore examine the connections between the cerebellum and the PFC revealing its central role in cognitive functions other than motor functions. The Allen Connectivity Atlas might help to highlight the finding that a large fraction of cerebellar output maps to associative brain regions [3].

The assessment criteria, e.g. applied to evaluate the different atlases will be selected corresponding to the specifications of each research question, e.g. if the data resolution is apt to asses molecular processes. The expected outcome is a detailed evaluation of the functionality, the advantages as well as the limits of the Allen Brain Atlas.

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Mechanisms of Functional Brain Integration Underlying Flexible Cognitive Control

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Everyday we are constantly faced with countless tasks, simple and complex. Some of these are familiar, and the relevant responses have, to a large extent, become automatized. Others require purposeful, explicit control over the coordinated use of the available cognitive resources, flexibly bringing some online while inhibiting distracting effects of others. The concept of cognitive control is defined by its flexibility, the ability to efficiently adjust to changes in the environment, deal with novel situations and challenges, and stability, the ability to maintain focus on the task at hand [1]. Previous research has shown that a core set of brain regions is centrally involved in implementing a wide variety of distinct task demands [2]. The main goal of this study is to elucidate the brain mechanisms enabling flexible cognitive control through the study of dynamic functional connectivity during task performance. Specifically, we are evaluating the hypothesis that flexible cognitive control is enabled by adjustment of functional connectivity between brain areas relevant for the performance of the ongoing task. This allows formation of virtual workspaces in which processes needed to complete the task at hand can exchange information effectively.

To test our hypothesis we are making use of a new flexible cognitive control task developed to require the use of and switching between different cognitive abilities (selective attention, working memory, reasoning, inhibition of behavior, switching operations, decision-making) and domain knowledge (mathematics, language, semantic knowledge, etc.). Subjects will perform the task inside the fMRI in order to identify the regions of the brain that are involved in cognitive control. Specifically, we plan to identify regions involved in supporting various cognitive tasks, as well as regions enabling switching between and binding them.

This project will offer important information about the role of flexible cognitive control in general cognitive abilities and its mediating function in psychopathology by contributing towards an understanding of cognitive control from the perspective of brain network dynamics and providing insights into mechanisms of brain function integration.

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Effect of Power Posing on Pain Threshold

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With the many challenging issues of experimental pain research in mind, we embarked on a study, based on a published report by Bohns and Wiltermuth [1], who tested dominant and submissive posture effects on pain threshold. Their results show that briefly adopting a dominant pose acutely increases pain threshold, while adopting a submissive pose decreases pain threshold.

The main goal of this research is to determine if a simple act such as adopting a specific pose can be used as an aid in managing pain. This information can potentially be used in a variety of fields such as medicine and sport. According to previous research we hypothesised that adopting an expansive or dominant pose would increase pain threshold and adopting a constrictive or submissive pose would decrease it. Similarly to some studies, including Bohns and Wiltermuth [1], participants would not be told that we are testing their pain threshold, in order to avoid some subjective noise in our data.
To select the most effective dominant and submissive poses for our main study, we conducted a web-based survey in which participants were asked to sequentially adopt and briefly hold six poses and rate their perceived dominance or submissiveness. The six poses were taken from earlier studies [1, 2] and presented to participants in random order. We obtained 100 valid survey responses leading to selection of the most effective dominant and submissive pose.

To measure the thermal pain threshold we will be using an IR light source at a fixed distance directed at approximately 3 cm wide circle on participants' forearm. The participants will be instructed to say when they first detect the thermal stimulus as hot and to say "stop" when the stimulus first reaches the painful intensity. A contact thermometer will be used to measure the irradiated skin temperature with 0,1°C accuracy. We will be measuring pain threshold before and after adopting the randomly assigned pose. To avoid a lowering of pain threshold due to heat-sensitised skin nociceptors, we will switch hands between both measurements. The first hand to be measured and the pose to be adopted will be determined randomly by a program. We will also be measuring blood pressure and heart rate before each pain measurement to cover our primary aim of measuring pain threshold.

We are expecting to confirm our hypothesis and correlate dominant posing with a higher pain threshold and submissive posing with a lower threshold. These results could prove useful for better understanding of pain and the mind-body connection.

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Visualizing the Nigrostriatal Pathway: Comparison Between Sagittal and Angled Brain Sections

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Introduction

Nigrostriatal pathway, also called nigrostriatal bundle (NSB), is one of the major dopaminergic pathways. NSB neurons begin in the midbrain in the substantia nigra and then project to the striatum, a subcortical structure with a role in motor planning and reward-based learning. Dopaminergic neurons play an important role in motor actions and their degeneration is one of the main pathological features of Parkinson's disease [1].

The aim of our research project is to compare the sagittal and angled rat brain sections in NSB and to demonstrate the usefulness of the angled cut. Because of the specific shape of NSB projections, the angled cut stands a better chance to capture more of the NSB neurons and therefore provides opportunity for their use in further research. Our hypothesis is that the sagittal cut will not conserve whole neurons in the NSB, suggesting that the proposed cut under 45 degree angle might prove itself as the better option.

Method

Brains from two rats were used, where thick slices were made using a sagittal and a 45° cut from the midline. The slices were then embedded in paraffin and sectioned into thinner (3 μm) slices to prepare them for staining. For the immunostaining a three layer technique was used. The first layer was Tyrosine Hydroxylase (TH) antibody, the second layer was biotinylated antibody and the third one was a complex of avidin-biotin peroxidase. The peroxidase was developed by 3,3-diaminobenzidine (DAB) so that a brown precipitate was produced marking the distribution of TH. The stained slices were imaged with a light microscope and the images were then analysed using ImageJ software.

Results

According to the initial results, the 45° angled cuts seem to have a more conserved nigrostriatal pathway, compared to the sagittal cut. On the angled slices, we were able to see the substantia nigra, striatum and the neuron projection.

Discussion and Conclusion

The preliminary results show that, compared to the sagittal cut, the angled cut preserves more of the neurons in the nigrostriatal pathway. These results will be further checked and hopefully confirmed by using CLARITY technique which enables us to visualize the sections in 3D, in order to see (trace) preserved whole dopaminergic neurons. In future research it would be interesting to compare current results with thicker brain slices, obtained with the same method. Furthermore, this cut will be used as the basis for organotypic nigrostriatal neuron cultivation, which could be an exciting new model to study the dopaminergic pathway.

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List of Participants