MEi:CogSci

Middle European
Interdisciplinary Master Programme
in Cognitive Science

Proceedings of the MEi:CogSci Conference 2013

Budapest, Hungary

Editors:

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Proceedings of the MEi:CogSci Conference 2013

The conference took place at Eötvös Loránd University in Budapest, on 20-22 June, 2013.

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Welcome!

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

This is the seventh MEi:CogSci Conference, the first one in beautiful Budapest, hopefully with dry feet. We want to express our gratitude to Eötvös Loránd University, particularly to László Ropolyi, for the local organisation of this event, which was supported by the OTKA (Hungarian Scientific Research Fund under the K84145 project number). We further thank the Budapest Semester in Cognitive Science for sponsoring the Best Poster and Best Talk Awards.

We want to welcome our invited speakers and presenters of workshops, Ildikó Király (Budapest), who will open the conference with her keynote, László Gulyás (Budapest), Lilia Gurova (Sofia), Bipin Indurkhya (Krakow), Olga Markič & Toma Strle (Ljubljana) and Hans Bernhard Schmid (Vienna) . Thank you for joining us this year.

The organizing team of Comenius University in Bratislava and the printing of this proceedings were supported by the grant 076UK-4/2013 from Cultural and Educational Grant Agency (KEGA), of the Ministry of Education of the Slovak Republic. Thank you, Igor Farkaš, for organising this as well as the first publication of these proceedings under an ISBN number.

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

And last but not least it is you, Coxies, who make it happen. Your posters, talks, and initiatives will make the MEi:CogSci Conference 2013 an exciting and joyful event!

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

Soheil Khosravipour

Brigitte Römmer-Nossek

Elisabeth Zimmermann

Seventh Middle European Interdisciplinary Conference in Cognitive Science
Eötvös Loránd University in Budapest, Hungary
20-22 June, 2013

Thursday, June 20, 2013

14:00 – 14:30	**Registration**
14:30 – 17:30	**WORKSHOPS (registration required)** 1) *Lilia Gurova*: Categorization: Theories and Empirical Effects 2) *Bipin Indurkhya*: On Creativity 3) *Olga Markič & Toma Strle*: Neuroethics 4) SACS:workshop (Student Association for Cognitive Science)
17:30 – 18:00	**COFFEE BREAK**
18:00 – 19:00	**Welcome!** **Keynote**: Rational Imitation or Relevance Guided Imitation: The Development of the Head-Touch Task *Ildikó Király*
19:00 – 19:15	SACS (Student Association for Cognitive Science) Activities
19:15	**Interaction groups** **RECEPTION!**

Friday, June 21, 2013

9:00 – 10:00	**Invited Talk**: Thinking Like A Child: The Role of Surface Similarities in Stimulating Creativity *Bipin Indurkhya*		
10:00 – 11:10	Track A: User Experience	Track B: Attention	Track C: Language 1
	Interacting with tutoring systems – the role of power and related affect *Katharina Rötzer*	Bottom-up vs. top-down influence on attention capture by subliminal stimuli *Tobias Schöberl*	Language comprehension and situation models *Paula Stachová*
	Cognitive Aspects Of Video Games *Roman Koči*	Priming of Visual Attention in Dynamic Visual Scenes – an Experimental Study Using Eye Tracking *Blerim Zequiri*	Prosody of Slovak Motherese *Michala Hrnková*
	Approaching User Experience: Moving between Modelling and In-Depth *Michael Glanznig*	P3 Topography from Different Sensory Modalities in Oddball Tasks: Testing the Common Pathway Hypothesis of P3 Generation *Daniel Attia*	A computational morphology approach to Croatian noun inflection with focus on gender prediction *Milena Mihajlović*
11:10 – 11:40	**COFFEE BREAK**		
11:40 – 12:10	OPEN.SPACE:mobility.networking		
12:10 – 13:00	Track A: Neuroimaging	Track B: Movement with EEG	Track C: Cognition in Therapy
	Serotonin Transporter Quantification in the Living Human Brain Using Positron Emission Tomography and the Multilinear Reference Tissue Model (MRTM2) Implemented in Matlab *Gregory Miles James*	Effects of Intention on Motor Performance: A Combined TMS-EEG Study with Focal Dystonia Patients *Ruben Perellón Alfonso*	Enabling Psychotherapeutic Spaces *Klemen Trupej*

	Preprocessing of resting-state functional connectivity MRI *André Hoffmann*	Cortical Inhibitory Processes in Focal Dystonia: A combined TMS-EEG study *Stephan Lechner*	Contact Points Between Psychoanalysis and Neuroscience *Matija Pajer*
13:00 – 14:30	**LUNCH BREAK**		
14:30 – 15:15	**Invited Talk**: The Role of Principles in the Explanatory Practice of Cognitive Science *Lilia Gurova*		
15:15 – 16:25	Track A: Motivation	Track B: Social Agents	Track C: Deciding
	A Computational Model of Intrinsic and Extrinsic Motivation for Decision Making and Action Selection *Indre Pileckyte*	A Coherent Model of Mentalizing, Empathy and Self-awareness *Soheil Khosravipour*	The Impact of Free Will Beliefs on Psychological Functions *Marcel Žerdin*
	Modelling of a Motivated Agent *Michal Gurník*	Can emotional experience (emotional judgment) be the same as moral judgment? *Lan Rok Vošnjak*	Quandaries of Life – Phenomenology of Decision Making. A First Person Inquiry in the Field of Decision Making *Ioana Laura Popa*
	Near Miss Effect in Flow Theory *Ján Cimra*	How Cues of Being Watched Affect Moral Judgements *Aleš Golja*	Choice-Predictive Neural Activity Associated with Movement and its Temporal Relation to the Subjective Awareness of Perceptual Decisions *Romylos Pantzakis*
16:25 – 18:00	**POSTER SESSION**		

Saturday, June 22, 2013

10:00 – 10:45	**Invited Talk**: Shared Intentions and Normative Expectations *Hans Bernhard Schmid*		
11:00 – 12:10	Track A: Experiencing Thinking	Track B: Animal Cognition	Track C: Language 2
	Making Sense From Phenomenological Experimental Data *Nejc Trnjanin*	Picture Object Recognition In Kea Mountain Parrots *Amelia Wein*	An Interdisciplinary Framework for Understanding Narrative: A Cognitive Scientific Literary Analysis *Krištof Anetta*
	Delicate Thoughts. A Phenomenology Of Food Cravings *Fransisca Hok-Eng Tan*	Modeling of social learning in ravens *Nace Mikuš*	Performative Acts: "Let There Be Reality!" *Miha Sajko*
	Introspection in Problem Solving *Cornell Schreiber*	CATOS (Computer Aided Training/Observing System) *Jinook Oh*	Comprehension of Indirect Replies *Marek Meňhart*
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12:40 – 14:15	**LUNCH BREAK**		
14:15 – 15:00	Track A: Mirror Neurons	Track B: Abstract Thinking	Track C: What do we need?
	Mirror neuron system and the perception of movement *Samuel Sitáš*	Relationship Between Natural and Cultural Evolution of Humanity and the Development of Human Mind - Mathematics and Abstract Thinking *Zarja Muršič*	Creating Knowledge of Need: A Methodological Framework for its Abductive Inference *Florian Kragulj*
	Self-organization of Sensorimotor Representations and Their Usage in Object Grasping *Matej Pecháč*	Eye tracking on art paintings - differences between abstract and realistic paintings *Mateja Lesar*	Effects of Sleep Deprivation and Exercise on Cognition *Marija Kozin*

15:00 – 16:30	**POSTER SESSION** **&** **COFFEE**
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17:15 – 18:00	**Best Poster & Best Talk Awards** **Closing of Conference**

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Workshop 1

Categorization: Theories and Empirical Effects

Lilia Gurova
Department of Cognitive Science and Psychology,
New Bulgarian University,
Sofia, Bulgaria

It is broadly accepted that categorization (or grouping together entities which are otherwise seen as non-identical) is a basic cognitive ability. In the same time, none of the proposed theories of categorization has gained unanimity so far. The pros and cons of four major views on categorization (the so-called „classical" view, the prototype view, the exemplar view, and the theory view) will be discussed against the background of a large set of empirical phenomena. The students will be involved in practical exercises of planning, being participants in, and discussing the results of experimental studies of the most famous categorization effects.

Workshop 2

On Creativity

Bipin Indurkhya
Cognitive Science Department,
Jagiellonian University in Krakow, Poland

We will conduct two hands-on workshops on creativity. Each workshop is based on a different approach to stimulating creativity. The workshops will be participatory, but do not require any special background or previous preparation. However, you need to register so that we know how many participants are there and can plan accordingly.

Workshop 3
Neuroethics

Olga Markič, Toma Strle
Department of Philosophy,
University of Ljubljana, Slovenia

We will explore the new interdisciplinary field of neuroethics. The workshop will consist of two parts, corresponding to how Adina Roskies [1] distinguishes two branches of neuroethics: the ethics of neuroscience and the neuroscience of ethics. In the first part, the ethics of neuroscience, we will examine questions that require ethical reflection on neuroscience: its practice, the technologies used and ethical implications of neuroscience. For example, the questions of neurocognitive enhancement, the question of authenticity, the question of brain imaging and privacy, etc. In the second part, the neuroscience of ethics, we will explore what the sciences of the mind, and in particular neuroscience, can tell us about the nature of morality and morally relevant topics in philosophy. Traditionally, ethical theories have been centered on philosophical notions such as free-will, self-control, personal identity, and intention. Some scientists think that understanding how brains cause behavior will radically change our understanding of the mind and moral responsibility and thus challenge the "humanistic image" [2]. We will look at some studies that have potential impact on our understanding of moral responsibility and on moral judgment.

References

[1] A. Roskies, "Neuroethics for the new millenium". Neuron, 2002, 35: 21–23.
[2] O. Flanagan, "The Problem of the Soul: Two Visions of the Mind and How to Reconcile Them." New York: Basic Books, 2002.

Invited Talk

The Role of Principles in the Explanatory Practice of Cognitive Science

Lilia Gurova
Department of Cognitive Science and Psychology,
New Bulgarian University,
Sofia, Bulgaria

There is a tendency in recent philosophy of cognitive science, best seen in the writings of Bechtel et al., to overstate the significance of mechanistic explanations and to neglect the role of explanatory principles in this area of science. This tendency, it will be shown, creates a distorted picture of what is going on in the field. A careful look into the efforts to find a satisfactory explanation of peculiar cognitive phenomena reveals that appeals to explanatory principles are neither rare nor is their role insignificant. Several examples from the history of categorization research will be discussed in support of the latter claim. It is suggested that those who tend to overlook the explanatory role of principles have been misled by two wrong assumptions: that the deductive-nomological explanations are the only species of principle-based explanations and that mechanisms could be fully analyzed in terms of the 'entities' and 'activities' which they comprise.

Invited Talk

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

Bipin Indurkhya
Cognitive Science Department,
Jagiellonian University in 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.

Invited Talk

Rational Imitation or Relevance Guided Imitation: The Development of the Head-Touch Task

Ildikó Király
Department of Cognitive Psychology, Eötvös Lorand University in Budapest, Hungary

Research has confirmed that early imitative learning is a selective, non-automatic, and inference-guided process (Gergely et al., 2002). According to the Natural Pedagogy theory (Gergely & Csibra, 2006) infants' selection as to what to learn from novel actions they observe is a) sensitive to their evaluation of the rationality of the action in relation to its outcome within the situational constraints, and b) sensitive to the presence of an ostensive communicative cueing context that serves to guide their relevance-reading process. This view, and the results of the head-touch task has been challenged by Paulus et al. (2011, 2013) who argue that imitative learning is non-inferential and mediated by motor resonance through automatic matching by the mirror neuron- system.
They reported some modified versions of the head touch study to demonstrate that the selective imitation effect could be accounted for in terms of whether the action could be mapped onto an already existing motor scheme that the infant could perform.
The aim of the talk is to defend the natural pedagogy view of selective imitation against this challenge on empirical grounds. Three novel, modified versions of the head touch task (that are close to two of the Paulus et al.'s procedure) generates contrary predictions from the perspective of the motor resonance account and the natural pedagogy account. In Study 1, the model presented the head touch with her hands free and held upwards either in a communicative context or in a non-communicative setting for 14-month-old infants. We found that the proportion of imitators differed significantly in the two conditions, despite the identity of motor presentation. In Study 2, the model kept balls in her hands while she put her hands next to the table, but either she demonstrated that she needed to hold the balls or she demonstrated that she could leave the balls in the plates next to the lamp. Here again, the proportion of imitators differed almost significantly in the two conditions. Finally, in study 3 we tested whether infants perform the very same head touch behavior in the presence of a novel object. We found significant imitation with the novel object, speaking for the generalizability of knowledge learnt through imitation, and posing questions for the low level accounts.
These results provide support for the inferential relevance and rationality-sensitive account of selective imitation.

Invited Talk

Shared Intentions and Normative Expectations

Hans Bernhard Schmid
Department of Philosophy, University of Vienna, Vienna, Austria

It has sometimes been argued in the literature that the decisive difference between humans and other animals is in the human capacity for shared intention. However, there is no consensus as to what shared intention really is. In this talk, it is argued that a distinctive feature of shared intention is that it involves a particular kind of expectations between the participants.

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Talks

An Interdisciplinary Framework for Understanding Narrative: A Cognitive Scientific Literary Analysis

Krištof Anetta
Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava, Slovakia

Assuming the exhaustive viewpoint of cognitive science with its suitability for biocultural inquiry - striking a balance between the natural sciences and the humanities - how can we explain the instance of a particular literary narrative: motivations for its creation and perception, different functions and effects with respect to human agents involved?

Theory

This thesis attempts to construct a theoretical framework for understanding narrative, stressing the co-existence of a multiplicity of non-communicating perspectives. Countless scientists from different research fields take part in or describe the “narrative turn” in social sciences. There is a range of established notions: Humans interpret and re-interpret their identity as a narrative, and therefore might be helped by modifying it (narrative psychology). Human brain is specifically suited to process and generate narratives. In some circles, even the entire human “reality” is believed to consist of narratives. Civilizations hold and follow shared schemas of meaning called metanarratives. There have been attempts to find the grounds for these phenomena, including evolutionary explanations of narrative being a useful medium of social information, an efficient device of social grooming, or a pattern exploitable for cognitive play. However, the research fields are insufficiently interconnected. Examples: The evolution of narrative use from the interchange of social information and different fitness benefits as stated by Dautenhahn [1] and Sugiyama [2], and the evolution of literature as outlined by Boyd [3], where art is described as cognitive play with pattern, are rarely treated together. Narrative construction of the self, of knowledge in general, and whole civilizations’ construction of all-encompassing metanarratives – the perspectives stand separate.

Analysis

This strongly interdisciplinary theoretical basis is applied in analyzing a literary work, specifically Kurt Vonnegut’s 1997 semi-autobiographical novel "Timequake". Why was it written, why is it bought, how does reading specific sentences affect cognitive phenomena such as perception, attention, or mental imagery? The analysis builds on a rough sociobiological/ evolutionary structure and it attempts to establish links to psychological, linguistic, and philosophical concepts often thought to be unexplainable by biology. The aspiration is to produce a readable text which, scrutinizing both large-scale and small-scale textual and contextual devices in "Timequake", can rapidly switch theoretical viewpoints and thus enable for the synergy of interdisciplinarity. Since a significant portion of human cognition is related to narrative structure, knowledge produced in this direction of research has a wide range of application - to say the least, every instance of human-targeted design needs to take narrative into account.

References

[1] K. Dautenhahn, “Stories of Lemurs and Robots: The Social Origin of Story-telling,” in Narrative Intelligence. Amsterdam: John Benjamins, 2003, pp. 63-90.
[2] M. S. Sugiyama, “On the Origins of Narrative: Storyteller Bias as a Fitness-Enhancing Strategy,” Human Nature, vol. 7, no. 4, 1996, pp. 403-425.
[3] B. Boyd, On the Origin of Stories. Cambridge, MA: Harvard UP, 2009.

P3 Topography from Different Sensory Modalities in Oddball Tasks: Testing the Common Pathway Hypothesis of P3 Generation

Daniel Attia
University of Ljubljana,
Ljubljana, Slovenia

The P3 (also termed as P300) wave is an event-related potential (ERP) component with a latency of 250-500ms, which was recorded first in 1964. It is considered to be an endogenous potential, as its generation doesn't seem to rely on the physical attributes of a stimulus itself but to a person's reaction to it. It plays a crucial role in attention and memory processes, stimulus evaluation and categorization. A probable explanation is the context updating theory, suggesting that the working memory compares the momentary neural presentation of the environment with the actual one. If a significant change in the environment gets detected, the P3 generates [1].

In experimental settings, the common way to elicit the P3 wave is through different Oddball tasks. Even though the P3 wave is one of the better-studied ERPs, its generation and distribution over the scalp is still a matter of debate. Katayama and Polich [2] showed that the P3 generation for different sensory modalities is likely to have a common pathway with a maximum distribution over the frontal-central and temporal-parietal area. Most of the known studies that have been done in this field used either only a little array of electrodes [2] or tested rarely for the correlations of different sensory modalities when using a dense array of electrodes. Also contradicting results have been found [1]. Therefore we will use a 128-channel EEG testing 20 participants with different sensory modalities in oddball tasks (i.e. auditory, visual and somatosensory). The aim of the project will be to analyse the scalp distribution of the P3 wave and to look for topographical correlations elicited by the different sensory modalities to find out:

a) If the P3 generation shares a common neural pathway
b) If the physical attributes of the stimuli are indeed irrelevant
c) How it is distributed over the scalp and how the topographical correlations between the different modality tasks are

As the task difficulty seems to have an effect on the P3 amplitude and latency [1] we will also use two different difficulty levels for each sensory modality.

This study could provide a better understanding of the basics of the neural P3 generation and therefore could have valuable impact on future study designs and clinical research, e.g. Parkinson and Schizophrenia.

Acknowledgements
I want to thank Prof. Dr. Zvezdan Pirtosek, Dr. Grega Repovs, Jurij Dreo and the IKN of the University Clinical Center for offering this great possibility to conduct this research.

References
[1] J. Polich, "Overview of P3a and P3b", in: Detection of change: event-related potential and fMRI findings, J. Polich, Ed. Boston:MA, 2003, pp.83-98.
[2] J. Katayama, J. Polich: Stimulus context determines P3a and P3b. Psychophysiology, 35:32, 23–33, 1998.

Near Miss Effect in Flow Theory

Ján Cimra
Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava, Slovakia

Flow is the mental state of operation in which a person performing an activity is fully immersed in a feeling of energized focus, full involvement, and enjoyment in the process of the activity. In essence, flow is characterized by complete absorption in what one does. Proposed by Mihály Csíkszentmihályi, this positive psychology concept has been widely referenced across a variety of fields.[1]

Near misses are widely believed to encourage future play, even in games of chance where the probability of winning remains constant from trial to trial. Some commercial gambling systems, particularly instant lotteries and slot machines, are contrived to ensure a higher frequency of near misses than would be expected by chance alone. [2]

Aim of this thesis is to incorporate situations known as Near miss to Csíkszentmihályi's Flow theory. Proposal of our solution is followed by presentation of performed experiment. Results of this experiment indicate positive effect of Near miss situation to one's Flow.

In order to show positive influence of Near miss situation to one's Flow in gaming, following experiment has been designed: Participants was asked to play several games of computer game Mashed against skilled player. After each trial (each game consist of several trials, each winning trial give player one point) participants had to write self-evaluation of their performance on scale 0-10. This was more or less just distraction task, time spend on this task has been measured. Based on the assumption that motivated player will do the distraction task quicker in order to keep playing game, we compared reaction times after winning, loosing or near-miss trials. After winning or near-miss trials players react significantly quicker than after loosing trials.

References

[1] Csikszentmihalyi, Mihaly. Finding flow: The psychology of engagement with everyday life. Basic Books, 1997.
[2] Reid, R. L. "The psychology of the near miss." Journal of Gambling Behavior2.1 (1986): 32-39.

Approaching User Experience: Moving between Modelling and In-Depth

Michael Glanznig
Faculty of Education, University of Ljubljana, Ljubljana, Slovenia

Introduction

User experience (UX) research in the field of Human-Computer Interaction tries to understand how humans experience the interaction with technological artefacts (e.g. mobile phones). This field of research is quite young and there is significant debate about what the concept is and how to research it. Two movements are competing against each other: Hassenzahl's model of UX [1] and McCarthy & Wright's framework of experience centred design [2]. Hassenzahl stays grounded in cognitive psychology and focuses on uncovering the objective in the subjective, on the precise and the formal. McCarthy & Wright take a humanist approach, stress the ambiguous and suggest to live with the subjectivity that is inherent in the concept of UX. Only few studies try to integrate both views. This situation in UX is not unique. A discussion between first person and third person approaches also happens in other disciplines (e.g. cognitive science) and there are efforts to integrate both perspectives with each other.

Method

I am trying to compare both approaches by using them in the user evaluation of a website with two user groups, one for each method. Despite comparing results (type of data, what has been discovered and missed out & why) I also reflect on conducting both approaches. This includes looking at required knowledge & skill, training, preparations, difficulty of recruiting participants and time exposure of conduction & analysis. A focus group with the clients of the evaluation also tries to incorporate their view and answer the question what type of data & which results are most helpful for them.

Results

Results suggest that Hassenzahl's model is easy to employ, gives a broad overview and results are easy to visualise. But its results have to be classified into practical relevant categories and detailed explanations are missing. On the other hand, the method based on McCarthy & Wright's framework provides detailed and informative insights, but its results do not generalise easily. It is at least twice as costly to employ than the model and requires a skilled researcher.

Conclusion

Regarding methods, Hassenzahl's model misses context information and the here used Descriptive Experience Sampling should be easier to employ. Generally, a methodological stance should not be emphasised too much and an integrated view from different perspectives seems to be more valuable than a unified view. In UX research there should be a more pragmatic use of methodologies. They should be viewed as tools with strengths and weaknesses that are able to advance knowledge when used appropriately.

References

[1] M. Hassenzahl, "Experience design: technology for all the right reasons" in Synthesis Lectures on Human-Centered Informatics, vol. 3, pp. 1-95, 2010.
[2] P. Wright and J. McCarthy, "Experience-Centered Design: Designers, Users, and Communities in Dialogue" in Synthesis Lectures on Human-Centered Informatics, vol. 3, pp. 1-123, 2010.

How Cues of Being Watched Affect Moral Judgements

Aleš Golja
University of Ljubljana,
Ljubljana, Slovenia

People often consider how their public behaviour is perceived by others and due to reputational consequences of their action, tend to proceed in more cooperatively manner. Laboratory and real-world setting studies have shown that subtle cues of being watched cause people to behave more cooperatively [1], [2]. Expressing our opinions about morality of certain acts is a key means of advertisings our cooperative dispositions.

In this seminar work, we conducted a replication study [3], where we sought how subtle cues of being watched would affect moral judgements.

Participants read two short stories (”Kitten” and ”Plane Crash” stories) describing a moral situation and rated moral acceptability of each situation. We hypothesised that images of a pair of eyes would elicit greater disapproval of moral transgressions than in the control condition, where images of flowers were presented.

In contrast to our predictions and the results of most previous studies, analysis showed no significant difference between two conditions (Mann-Whitney $U = 963.5$, $p = 0.281$, one-tailed) in Kitten story and significant difference (Mann-Whitney $U = 764$, $p = 0.014$, one-tailed) in the Plane Crash story, where participants showed greater disapproval in the flowers condition, which is in contrast to our hypothesis. We suggest that people may ignore subtle cues of being watched when they know their behaviour is truly anonymous. We conclude that participants in the flowers condition rated greater disapproval of moral transgressions due to the induced positive emotional state of our participants that resulted in stronger endorsements of moral norms.

References

[1] D. Nettle et al., “The watching eyes effect in the Dictator Game: it’s not how much you give, it’s being seen to give something.” Evolution and Human Behavior, vol. 34, pp. 35-40, Jan. 2013.
[2] M. Bateson et al., “Cues of being watched enhance cooperation in a real-world setting.” Biology Letters, vol. 2, pp. 412-414, Sep. 2006.
[3] P. Bourrat et al., “Surveilance Cues Enhance Moral Condemnation.” Evolutionary Psychology, vol. 9, pp. 193-199, May 2011.

Modelling of a Motivated Agent

Michal Gurník
Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava, Slovakia

Introduction

Our research aims to model and implement an autonomous agent that represents an infant exploring the environment and performing actions to satisfy its needs and to keep itself in the best condition possible. It is embodied in the environment, the agent is changing the environment and the environment has impact on agent's state. We have based our model on work of D. Kadlecek [1].

Methods

Our implementation is divided into 3 modules – world, body and agent itself. World represents the space in which agent operates, the objects which the agent interacts with and it handles the movements of the agent. Body is responsible for carrying out the effects of actions on agent's needs. We have also implemented a virtual "mother" as a fall-back option if the agent is helpless and needs to be taken care of; i.e. it is hurt and needs to be treated or it is hungry and needs to be fed. The mother is activated by crying, which is energetically inefficient, thus not rewarding.

The first part of the agent is a physiological needs space. It is a 6-dimensional space which stands for 6 basic needs of the agent – 3 extrinsic (nutritional energy, physical energy and physical integrity) and 3 intrinsic (curiosity, competence and playfulness). The second part of the agent is a reward function which returns a positive value if the movement in the needs space is towards 0. Third part of the agent is a reinforcement learning module which stores the mappings between actions in certain states (internal and external) and rewards obtained from them. The last module is the action-selection block which uses learning module to evaluate the actions and to select the best fitting one.

The agent utilises exploitation to select the best learned reward but the curiosity introduces the exploration into decision. If the level of curiosity is higher the agent is more likely to select a random action or the best action with different parameters.

Expected Results

Our agent as it is currently implemented is only able to learn how to satisfy the needs separately (when only one of them is active). Our next step is to implement a version of the agent that will be possible to learn to explore and satisfy its needs in a balanced way.

References

[1] D. Kadlecek and P. Nahodil, "Adopting animal concepts in hierarchical reinforcement learning and control of intelligent agents," in 2nd IEEE RAS & EMBS International Conference on Biomedical Robotics and Biomechatronics, 2008. BioRob 2008, Scottsdale, AZ, USA, 2008.

Preprocessing of resting-state functional connectivity MRI

André Hoffmann
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Resting-state fMRI is a very recent method that analyzes regional neural interactions in the absence of an explicit task. It allows to study the functional organization of the brain in general, as well as the differences thereof between distinct subject populations.

When acquiring a resting-state scan, the only instruction given to the subjects is to keep their eyes opened. The subjects will not receive a stimulus of any kind during the recording. The resulting data is then preprocessed using slice-timing correction, motion correction, spatial normalization and spatial smoothing [1]. Furthermore, any signal that is not originating from grey matter will be removed.

As only slow changes (< 0.08Hz) in the neural activation are considered to be related to functional connectivity, anything above this threshold will be filtered out before analyzing the data. Another way to think of this is that only neural oscillations for which it takes more than 1/0.08Hz = 12.5s to go from a more activated state 'A' to a less activated state 'B' and back to 'A' are of interest for this analysis. Thus, anything with a higher frequency — such as spontaneously fluctuating neural activity — will be discarded.

Finally, the signal will be decomposed into independent components that should correspond to highly correlated functional networks. The resulting networks include well-known anatomical structures such as the visual and sensory/motor networks as well as others about which there is not much known. It should also be noted that the resulting networks are not required to be structurally(anatomically) connected to be considered functionally connected. Many of these networks have been found to be very stable across large numbers of healthy subjects. In addition to the exploration of functional networks, this technique can also be applied to study diseases such as Parkinson, where a reduced connectivity has been found in the visual and executive-attention networks [2]. Another application is to study the effects on resting-state networks after the stimulation of a certain brain region using TMS.

This work will address the efficient processing of resting-state data and critically evaluate fundamental standards of this very new method, such as the frequency threshold of 0.08 Hz that dates back to the first paper describing the method in 1995 [3] and was used ever since. To our knowledge, the consequences of changing the threshold on the resulting functional connectivity have not been studied so far. Furthermore, resting-state data obtained from much longer runs(1h) than usual (3-10min) are analyzed to (a) check for very slow oscillations which — due to their slowness — require an even longer scan time to be revealed and (b)evaluate the influence of the scan length on the quality of the outcome. The goal of this work is the better understanding of the frequency band and time parameters, which are important for the design and analysis of all resting state MRI applications.

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Prosody of Slovak Motherese

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When talking to children or infants, we tend to alter our speech in various ways. Research of this phenomenon, which has many names including baby talk, motherese, parentese or more generally infant-directed speech (IDS), has been conducted in many languages. The comparative research of this kind was able to generate some universalities among linguistic and acoustic features of IDS such as decreased linguistic complexity, repetition and redundancy as well as prosodic features such as high pitch, wide range and exaggerated intonation. These findings subsequently led to a hypothesis that motherese exists in our languages and speech universally regardless of our culture and the language we speak.

Functions of this special type of speech towards children have not yet been fully researched and may even differ during the child development. Theories exists about three basic functions that could be a motivation for adults to use this type of language as well as beneficial for the child – linguistic, attentional and social/affective (Fernald, 1985; Grieser & Kuhl 1988; Thiessen, 2005). Although my primary purpose is to acquire acoustic features of IDS in Slovak language which can be used to advocate the notion of universal motherese I recognize the significance of the function of IDS and will therefore discuss it in the theoretical part of my thesis.

I conducted my research with the help of 6 participating mothers recorded during an interaction with their children in prelinguistic phase of their development ranging from 3 months to 12 months of age as well as mother's speech directed to an adult (ADS). All the recordings were done in natural domestic setting to achieve as authentic samples as possible.

First step after I gathered the data is their preparation for comparative analysis. In order to acquired the acoustic features of IDS in Slovak language I intend to identify the differences of my samples IDS and ADS such as differences in fundamental frequency or pitch, frequency range per sample and phrase, duration of pause and phrase, number of syllables and phrases per sample and various others. As the next step I am to compare the acquired features of IDS in Slovak language with available data from other studies and possibly support the universal motherese hypothesis.

The preliminary results of my research show that the mean fundamental frequency is higher and its range is wider in IDS than ADS, which is consistent with the hypothesis.

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Serotonin Transporter Quantification in the Living Human Brain Using Positron Emission Tomography and the Multilinear Reference Tissue Model (MRTM2) Implemented in Matlab

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Positron emission tomography (PET) is a nuclear brain imaging technique, enabling the investigation of cerebral uptake and distribution of molecules in vivo, i.e. proteins (enzymes, receptors and transporters) [1]. Different from other brain imaging systems, such as functional magnetic resonance tomography (fMRI) signaling relies on the injection of a radioactive marked tracer, a so-called radioligand. A radioligand is a radioactive labeled molecule consisting of a biochemical compound with an affinity to a certain target protein [1].

One quantitative measurement is the binding potential (BP) which is defined as the ratio of receptor density Bmax to radioligand equilibrium dissociation constant KD [2] and allows an inference to the protein density. The BP is determined for each radioligand by specific mathematical models according to its characteristic kinetics.

So far, the implementation of these models is limited to commercial software tools (e.g. PMOD) or realized in lab internal solutions. The purchase of such software packages is expensive, whereas it does not include an option for lab internal modification due to inaccessible algorithms and program scripts. Lab depending implementations on the other hand are time consuming and mostly redundant, as the same models underlies in the application of a specific radioligand. Open-source solutions are not widely established in the PET community yet, contrary to disposable fMRI research tools (e.g. preprocessing and analysis tools such as SPM, FSL or Freesurfer).

The aim of the present study will be to implement a Matlab-based tool in the concrete case of the radioligand [11C]DASB. The radioligand [11C]DASB binds reversibly to the serotonin transporter (SERT) [3] and plays a crucial role in the investigation of neuropsychiatric impairments, such as major depression and obsessive-compulsive disorder. The SERT binding potential (BPND) can be estimated with reference to the cerebellum, a brain area consistent of only few SERT binding sites [3], used as a so-called reference region for the investigation of the 5-HT transporter. The underlying model is called the multilinear reference tissue model with two parameters (MRTM2), which generates computationally fast and noise resistant parametric images of BPND.

One of the main advantages of this Matlab-based MRTM2 implementation will be the opportunity to facilitate performance modifications in MRTM2 analysis, such as study-aligned parameter tuning and the determination of lab depending default values. This tool can represent an alternative to present commercial software packages through similar outcome parameters at a comparable computational speed, however available for all potential users as an open-source application. A graphical user interface (GUI) will enable data processing for a various group of users, such as neuroscientists, a batch script mode will simplify routine analysis sequences and will also allow the evaluation across subjects within a study, as so far only single subject analysis is realized in commercial software tools. Furthermore, the extension for additional models of other radioligands would be conceivable.

PET data from the SERT database of both subjects suffering from major depression and healthy control subjects, will be provided by the Functional, Molecular & Translational Neuroimaging Lab, Vienna (http://www.meduniwien.ac.at/neuroimaging). These data will serve as basis for outcome comparisons of the commercial software PMOD and the Matlab-based implementation. Applying the model Ichise Noninvasive MRTM2 in PMOD to quantify the BPND and rate constants of key regions as the thalamus, striatum and the midbrain, similar results will be expected by using the Matlab-based tool.

A Coherent Model of Mentalizing, Empathy and Self-awareness

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Intelligent software agents and robots are taking on increasingly more complex interactive social tasks. Such high-level social agents have to be able to understand, predict, and influence mental states of their peers: humans, other artificial agents, but also themselves. Self-awareness, mentalizing (theory of mind), and empathy refer to cognitive phenomena intimately related to these indispensable abilities of social artificial agents. In this project, we researched the contributions of mentalizing and empathy to self-awareness, with the aim of developing a sound conceptual basis for the design and implementation of social computational agents.

We set out with a broad survey that alongside theoretical literature from philosophy, sociology, psychology, and the neurosciences also covered empirical methods for the assessment of self-awareness and relevant achievements in the field of artificial intelligence. We next focused on the development of the Sauté model (Self-Awareness and User-awareness through Theory of mind and Empathy), a coherent Computational Theory of self-awareness, mentalizing, and empathy. Sauté integrates Simulation Theory [1] as important philosophical category of mentalizing, the psychological Objective Self-awareness Theory [2], and the ideomotor model of Mirror Neurons from the neurosciences with concepts of interactive storytelling from the field of artificial intelligence. In Sauté, empathy and theory of mind are realised through the simulation of imaginary models of the targeted agents (and targeted users) in the "minds" of real virtual agents. This approach may also lend itself to simulating an imaginary ideal self-model that develops self-awareness; we identified different variants how such imaginary models can be managed.

We then identified main requirements for a cognitive architecture suited as baseline for the implementation of a practically viable computational model: OFAI's ActAffAct cognitive architecture [3] was demonstrated to meet these requirements and in addition provide a suitable scenario domain for a prototype implementation. In first efforts towards realising a prototype implementation on top of ActAffAct, we could determine main characteristics of architectural design candidates. Overall, the realised prototype shows both, the desirable property of locality of specific processing tasks and uses of representations, as well as global effects of information processing, in the sense of a modulation and structuring of the global system behaviour. These very promising results are reflected in the list of directions for further research and development.

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Cognitive Aspects Of Video Games

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This project consists of two parts. Firstly the theoretical part where we study the general motivation to play video games across all genres. We also look on specific motivation in certain types of games such as action, adventure, role-playing, simulation, strategy, arcade, and trivia. Secondly the practical experimental part is devoted to increase the user retention and motivation to finish and update the game in trivia mobile game Quiz House.

The player needs incentives in form of reward such as expansion of abilities, weapons and defenses to learn new skills and get better and better. At the beginning the player easily achieves quick successes, but as he progresses further the reward comes less frequently. Usually there is a thin border between good and bad frustration or good and too hard challenge to achieve.

Practicing a needed skill may result In too repetitive game play which can end up in bore down because the game mechanics get stereotyped. [2, page 381]

The games which fail to exercise our brain get quickly boring E.G. Tetris. It is very limited exercise and challenge. When the player learns and masters all the patterns more innovation is required to keep the player motivated to immerse deeper. The more formally constructed your game is that more it is going to be restricted. If the game should be long lasting then more unpredictable variables needs to be included such as physics, human psychology and behavior... [1, page 37] [2, page 19]

We developed trivia casual mobile game Quiz House. The game contains famous people, car models, places and monuments in the world. Player goes through levels and has to guess unless 5 out of 9 pictures to unlock next level. User has virtual coins which he gets after correct guess or he can buy them in the store. Various hints are offered for the player.

The goal is to find the most important motivational and engagement elements and increase the user's motivation and engagement in the Quiz House which would lead to bigger user retention .

The hypothesized reasons of dropping the game are:

* Don't understand the language or GUI, what to press in what situation. = links to mechanics
* When they get stuck they don't understand how to use hints. = links to mechanics and customization
* Not having coins. = links to mechanics, advancement and customization
* The pictures are too easy or too hard to guess and they have no suitable challenge = links to game advancement, progress, escapism

We track and capture the user's action in the game background such as button press, successful and incorrect guesses. What hints in which situation are used. All collected data are stored in the database on the server and we can determine and improve weak parts of the game. The player doesn't know about it and acts naturally.

We found out that our user retention is in average 20% who finish the game to the end and updates the game after new content and features release.

From the 80% players who download the game and don't progress till the end is 30% who drop it within the first and second level. 50% left of the users leave the game when they get stuck such they are not able to guess correctly other pictures and they don't have more coins to use hints. And they are not willing to spend real money to buy the virtual coins. The goal is to find out why 80% of users don't finish the game and improve the weak parts of Quiz House. We want to maximize the user retention so any thing more than 20% will be considered as success.

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Effects of Sleep Deprivation and Exercise on Cognition

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Endurance sport, adventure racing, ultra marathons, alpines, etc. are extreme sports. Most of the time the events take place in outdoors and last one or several days to weeks without a set cool-down period.

Despite the extremes (length of the event, unpredictability, ingenuity), extreme sports are not about taking risks, but rather psychophysical preparation and development growth of the person taking part in them.

During multi-days (over 48 hours) events persons are experiencing effects of sleep deprivation. As much of scientific research have been done in field of sports training and implementing it, the question how to prepare, how to train and deal with sleep deprivation remain unanswered.

The goal of my talk is to present few studies about effect of endurance sports and sleep deprivation on cognition. Studies have shown that sleep deprivation of up to at least 24h has not been shown to influence physical as psychological performance, while sleep deprivation of up to 64 h can influence someone performance significant. Can we improve our performance while being sleep deprived?

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Creating Knowledge of Need: A Methodological Framework for its Abductive Inference

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Introduction

The fulfilment of humans needs is a physiological prerequisite for the individual's survival and prosperity [1]. Hence, the knowledge about needs is valuable assuming that knowing one's need, rather than a certain satisfier to that need, enables us to find new/different ways of need satisfaction. Surprisingly, first empirical data suggest that people hardly talk about their needs and desires but rather about certain satisfiers meaning concrete objects or conditions when asked about what they need for their personal well-being. Furthermore, some philosophers claim that we cannot be aware of our needs directly but only of their satisfiers [2].

Research Question and Methods

The question at hand is how researchers can look "behind" an observable satisfier (e.g. objects, state of affairs etc.) and identify the underlying need. So, the main concern is to make explicit what might be implicitly defining our acting. The aim of this empirical master thesis which is based on a project with the Austrian Federal Economic Chamber with about 150 untrained participants is to propose a replicable and consistent methodological framework for creating need knowledge which can be understood as explicit knowledge about one's needs and desires. The project aims at finding a method for non-instantaneous settings meaning that data acquisition and analysis are sequential rather than iterative (no possibility for researchers to check back directly what the underlying need is).

I am going to employ qualitative research methods in general and an abductive approach [3] in particular. Finding hypothetical explanations (needs) for the satisfiers observed (questionees report about their imagined future of a fulfilled professional life) should be supported by heterogeneous paradigmatic views on the data. Those views are based on different theories and approaches (e.g. theory of causality, generative listening [2]) and should be crystallized into sets of questions promoting the abductive process. Finally, to transform the bunch of hypothesis generated by researchers into verified knowledge about needs, a concluding feedback loop integrating the questionees in the knowledge creation process once again (communicative validation [3]) will be implemented.

Structure

After dealing with the theoretical backgrounds including the concept of need (and its relation to satisfier and desire), the epistemological foundations of need knowledge, theories on abductive reasoning, hermeneutics and communicative validation, I will evaluate approaches being potentially valuable for the abductive reasoning process and finally tailoring them to be usable for the research project (views on data). Additionally, I will discuss the role of researchers in and their effects on the knowledge creating process.

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Cortical Inhibitory Processes in Focal Dystonia: A combined TMS-EEG study

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Recent research by Bonnard et al. [1] has found that inhibitory processes can be altered by the simple task of mentally resisting or assisting an externally triggered movement. They showed this by delivering a transcranial magnetic stimulation (TMS) pulse to the contralateral motor cortex and recording elicited wrist twitch movements by electromyography, after people were instructed to resist or assist the pulse. Motor evoked potentials (MEPs) were significantly smaller when subjects were instructed to resist the movement, compared to when they were asked to assist it. The "silent period" (SP) - a measure of cortical inhibition - was found to be shorter in the trials where people were asked to resist. Additionally Bonnard et al. measured several EEG potentials in response to the TMS evoked movement. Combined TMS-EEG gives the possibility to investigate how sensorimotor cortical networks are involved during the preparatory period and in the brain response to TMS. For evaluating the brain response, the N100 potential was used, which is commonly associated with inhibitory processes. Amplitude of N100 was significantly larger in the resist condition in several electrodes. Additionally the EEG data was analyzed for the contingent negative variation (CNV), which is known to reflect an anticipatory increase in cortical excitability. CNV amplitude was significantly decreased in the resist condition in three electrodes.

Dystonia is a disease that affects the motor system on the level of the cortex, basal ganglia and brainstem. It is typically characterized by involuntary movements and muscle cramps that result in abnormal postures. This clinical presentation of the disease is due to loss of inhibitory processes in all levels of the motor system [2].

A particularity of Dystonia is the "sensory trick". When people are touched in specific points (e.g. the chin) the spasms seize for a while before returning. There are also reports that the sensory trick can be triggered by mentally simulating the touch.
In our study we want to use the paradigm of Bonnard [1] and apply it to 15 patients with focal Dystonias and 15 age matched control subjects, to see whether the mental preparation task has a different influence on cortical excitability in the respective groups. Generally we hypothesis, that people with focal Dystonia will have a decreased ability to resist a subsequent TMS pulse as compared to controls. Also we think that we will observe a shorter SP in the patient group. N100 and CNV might also be reduced for patients.

Since it has been reported that the sensory trick can also be performed by mentally, we will also see whether patients with sensory trick perform better, than those who do not have it.

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Eye tracking on art paintings - differences between abstract and realistic paintings

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Theoretical concepts

Eye tracker is a device for measuring positions and movement of the eye. It is widely used in research of the visual system, which includes visual perception [3]. Differences in human gaze behaviour can be studied by analyzing fixations and saccades. Fixations are the periods when the eyes are relatively stable and visual information is gathered, while saccades are fast eye-movements which bring the fovea from one fixation point to another [1]. In paintings, the viewer's eye is easily caught by figures presented in a picture. Although gaze behaviour during picture viewing is affected by visual features, cognitive factors are also important, for example person's knowledge about the picture [2]. Eyetracking could be used when we would like to observe gaze patterns of two types of art - abstract and representational. Representational art consists of pictures that depict some recognizable thing or scene. It includes portraits, still-lifes, and landscapes. Precisely, it includes realist art, which attempts to reproduce the actual appearance of the things depicted. Abstract art uses a visual language of form, colour and line to create a composition which may exist with a degree of independence from visual references in the world .

Aim of the study

The aim of the study is to test hypothesis that there are differences in perception of abstract versus representational, more realistic paintings.

Hence, I want to compare whether people look diversely at different styles of art pictures, that is why I choose abstract cubist paintings and more realistic paintings.

Methods

Gaze patterns were measured on iView eyetracking device where pictures were presented on a 19-inch computer screen. 9 point calibration was performed before experiment. 16 volunteers participated in a task, which was 4 minutes long. In that time, 27 pictures were presented, of which there was 8 pairs of pictures with the same theme painted in different style and 11 distractor pictures. Each picture was presented for 10 seconds and there was a fixation cross between each. Participants had the task to look at the pictures freely.

Expected results

I expect to find differences in eye gaze patterns regarding different styles of picture. In abstract-style paintings I expect more fixations with shorter duration, while in representational-style paintings less fixations with longer duration are going to be observed. I expect that because i think that we view these two kinds of pictures differently – in realistic paintings we see what it is clearly painted, while in abstract paintings we somehow composeing picture like a puzzle . I will analyse the data of which picture style, number of fixations and duration of fixations are crucial for analysis. A two sample t-test is going to be performed to test whether there are differences in perception of abstract versus representational pictures.

Interdisciplinarity

The study focuses on human perception which is important topic in cognitive psychology. Not much has been done on that topic until now, although nowadays there is increasing interest in that field.I believe this research is also important for understeanding art perception, in the field of art history,and for a number of artists who are interested in perception of art or "how we look" pictures.

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Comprehension of Indirect Replies

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Search for relevance is the basic feature of human cognition utilized in communication [1]. This allows us to convey more than our words alone seem to express.

Example:
A: "What did you think of my presentation?"
B: "It's hard to give a good presentation."

Although the answer in the example is somehow indirect, the listener can still be pretty sure that the intended message is: "I did not like your presentation." The process of indirect replies' comprehension hinges on the listener's realisation that the speaker is avoiding to answer directly. Therefore, he might assume that there is more than just literal meaning present and that the intended message is most likely a negative one [2].

We studied the speed with which listeners arrive at the intended indirect meaning. Holtgraves [3] has shown that the comprehension of an indirect reply takes longer (compared to a direct one) and it involves realisation and rejection of the literal meaning and consequent activation of the indirect one [3]. What is not clear is whether the inferential process takes place during the reading of a reply or only after it is completed.

In order to examine the inferential process underlying the comprehension of indirect replies we conducted two experiments: an eyetracking and a self-paced reading (SPR) study. We used eyetracking to examine the physiological indicators that would suggest increased cognitive effort during the processing of an indirect reply. With SPR, we aimed to see when, during the reading of a reply, readers realise that there is an alternative meaning present.

Method
19 native Croatian speaking (eyetracking) and 32 native Slovak speaking (SPR) participants were presented with short stories describing relationship and interaction between two main protagonists followed by a question-answer pair and a sentence-verification task at the end of each trial. For the eyetracking, we used a reply as a target to the sentence-verification task, whereas for the SPR we used additional probes [3]. In the SPR study, question and answer (the reply) were presented in a word-by-word fashion, where the participants read the individual words of a sentence with the next word presented after pressing a button. We used unconventional excuses to refuse to comply with a request, disclose sensitive information or to provide a negative opinion.

Results
In the eyetracking study we found that people fixate longer and more often when reading an indirect reply. Our results suggest that there is an inferential process present during an on-line indirect reply comprehension.
Self-paced reading portion of the data shows gradual decrease in reading pace for the indirect replies. We expect this to be a consequence of the inferential process being present during the reading of a reply, not after the reply is fully read. The variability in individual participants' results did not allow us to determine when during the reading of a reply is the inferential process initialized.

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A computational morphology approach to Croatian noun inflection with focus on gender prediction

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Croatian inflection of nouns is a highly interesting grammatical phenomenon to explore both from the cognitive and linguistic point of view. Croatian exhibits a number of interesting properties with respect to cognition, e.g. animacy, gender in the plural, gender-changing nouns and natural-gender-grammatical-gender discrepancies. With respect to noun inflection, some languages, especially those with rich inflection, are traditionally analyzed as gender-oriented (e.g. Croatian and German), i.e. in order to inflect a noun properly one needs to know that noun's gender. However, unlike in German, gender in Croatian is also closely related to phonology, which allows probability inflectional choices based on the phonological properties of nouns, i.e. gender assignment, and thus also inflection-class assignment, by default, e.g. nouns terminating in a consonant are masculine by default, nouns ending in -a are feminine by default and nouns in -o/-e are neuter by default.

Based on the afore-stated, the aim of the master thesis will be to develop a computational model for the Croatian noun system that would be able to predict gender of a noun when given in the nominative singular form (dictionary form). The gender is thus meant to be induced mainly from the phonological and morphological properties on the one side – the model has to differentiate between a) suffixed (rad-ost "joy"= fem.) and b) unsuffixed words (most "bridge"= masc.), and the agreement with attributive adjectives on the other side e.g. lijep-a rad-ost vs. lijep most "a beautiful bridge" & ljep-i most "the beautiful bridge". Pursuant to this, the Croatian National Corpus is meant to be used in order to gain a better insight into what the native speakers actually prefer more.

My further goal will be to investigate the pertinent cognitive implications of inflection as well, since gender, as an inherent property of nouns in Croatian, is something native speakers "know" all too well, together with the inflection of nouns, however, dealing with this in computational modeling is very hard. In addition to this, the concept of defaults is well-known to language acquisition theories in psycholinguistics (U-shaped learning), as well. Finally, I would like to approach this problem from the view of Natural Morphology, since it deals with what is natural in morphology.

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Modeling of social learning in ravens

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Research in social learning is vital in the forever ongoing debate whether animals could be said to possess culture or not. Are animals able to acquire behavioral traits by learning from each other or are acquired traits more a consequence of ecological and genetic factors? It is therefore crucial to develop ways to first distinguish social from asocial learning, and further on to consider what are psychological mechanisms behind social learning [3]. Why are the individuals learning from each other and what exactly is it that they are learning?

In recent years the methods available for social learning research have expanded considerably. The classical method of comparing diffusion curves has an alternative in quantitative methods. Network based diffusion analysis, first developed by Franz and Nunn [2], analyses the spread of traits by taking social networks into account via fitting models of social and asocial learning to observational data using maximum likelihood estimation. The model was expanded by Hoppitt [1] to include which individual characteristics might influence the rate of social transmission thus making it possible to infer to the psychological mechanisms underlying the social learning process.

Social learning in general refers to learning by observing and interacting with conspecifics. We have focused on the aspect of social learning that results in social transmission: a spread of a behavioral trait through a group of captive subadult ravens (N = 12). By measuring the order and the times of the spread of the behavioral trait we can test various hypotheses regarding the social relations that underline the social transmission taking various individual characteristics (e.g. dominance rank, kinship, sex) into consideration. The main hypothesis is that the spread of social information depends on the dynamics of the group and is influenced by the frequency and duration of time that individuals spend in proximity to each other. By considering various social networks which are made from careful observations of the group considered, we can asses which social traits seem to be more important in the spread of the trait.

The model used on the preliminary results is programmed in R and uses certain features of Hoppitt's NBDA model [1]. The analysis at the current stage focuses on assessing if the spread of the trait follows a certain social network, without taking individual characteristics into consideration. The results indicate a positive social learning rate, meaning that the trait seems to spread socially among the ravens. Detail analysis with individual traits included is due.

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Relationship Between Natural and Cultural Evolution of Humanity and the Development of Human Mind - Mathematics and Abstract Thinking

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The main problem the paper presents is how to explain complex frame of the present-day human mind with data and theories from human evolution. Examples from biological and cultural evolution are used. Since the early hominid evolution both are integral parts of the evolution of the species.

Introduction
There are several hypotheses regarding the incidence of human mind. Researchers who study animal cognition give attention to the importance of mental continuity. The most similar to humans are species with the common ancestor, i.e. the primates. Researchers of comparative animal cognition presented different hypotheses about the incidence of human mind: (1) Vygotskian hypothesis [1], (2) social intelligence hypothesis [2] and (3) cultural intelligence hypothesis [2].

Humanity differs from other animals with its ultrasociality and cumulative culture. The latter provides humans accumulation of knowledge and tools development, i.e. industries and technologies no other species use. Mental representations among humans are changing through time and their complexity rises. Dean et al. [3] made an empirical study where they compared chimpanzees, capuchin monkeys and human infants. Their results showed that human infants solve tougher tasks much better. Human infants used three important socio-cognitive processes: teaching through verbal instruction, imitation, and prosociality.

Aim
The objective of this paper is to present interdisciplinary (evolutionary biological, anthropological, psychological, philosophical and neuroscientific) arguments relationship between natural and cultural evolution with insights of cognitive science. Human species' history and environment will be specifically stressed, i.e., cognition which gives strategic advantage to an individual in his/her struggle for survival. This is indeed a very broad topic, therefore, the presentation will focus on comparative analysis of processes human beings use in mathematics.

The main part of the paper will analyze various empirical and theoretical observations regarding recognition of quantity, counting and complex mathematics in animal species and humans. Studies showed that rhesus macaques (Macaca mulatta) can distinguish between small numbers (< 4), but when numbers are higher, the ability to distinguish precisely between amounts becomes more difficult. The question arises of how to go from distinguishing quantities to mathematics. The goal of the paper is also to propose new empirical approach in which we may test how cultural and natural aspects in human evolution relate to the shaping of human mind and works of activities.

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CATOS: Computer Aided Training/Observing System

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In animal behavioral biology, there are several cases in which an autonomous observing/training system would be useful. 1) Observation of certain species continuously, or for documenting specific events, which happen irregularly; 2) Long-term intensive training of animals in preparation for behavioral experiments; and 3) Training and testing of animals without human interference, to eliminate potential cues and biases induced by humans. The primary goal of this study is to build a system named CATOS (Computer Aided Training/Observing System) that could be used in the above situations. As a proof of concept, the system was built and tested in a pilot experiment, in which cats were trained to press three buttons differently in response to three different sounds (human speech) to receive food rewards. The system was built in use for about 6 months, successfully training two cats. One cat learned to press a particular button, out of three buttons, to obtain the food reward.

Contact Points Between Psychoanalysis and Neuroscience

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What are the contact points between psychoanalysis and neuroscience? Recent research shows that the psychoanalytic approach is not necessarily inconsistent with a biological approach when talking about behaviour. In recent years there are many researches that are reconnecting both disciplines; by investigating how psychotherapy affects brain, by studying psychological processes in patients with brain injuries and trying to explore neural correlates of psychoanalytic concept.

One of the main themes of this comparison, in the light of current knowledge on the mechanisms of neural plasticity, is about the possibility that psychoanalysis and psychotherapies can change the functioning of the brain. The similar findings, for example, were observed by Erik Kandel [1] who has discovered a protein in the nervous system that plays a key role in turning short-term memories into long-term memories, and therefore he believes that the experience produces physical changes in neurons by activating or disabling genes. This plasticity, which involves every kind of experience, implies that the dynamics of the psyche, conscious or unconscious, could be reflected in neural dynamics.

Another comparison regards exploring neural correlates of psychoanalytic concept particularly psychological strategies. My study will observe defense mechanisms and similarities with brain injury symptomatics. The discussion will continue on neuropsychological and imaging findings in neuropsychiatric disorders in relation to neural integration and specific defense mechanisms.

The term defense mechanisms was coined over 100 years ago to describe a construct of psychological mechanisms for coping with intra-psychic conflict. Defense mechanisms are complex emotional-cognitive constellations and require specific functional mechanisms to integrate neuronal activity across several brain regions[3]. The list of defence mechanisms is enormous and there is no theoretical consensus on the number of them. In my study I will present the predominating ones, attempting to relate them with principles of neuronal integration.

In conducting an experimental work an appropriate methodology will be used. This is a methodological strategy developed by Northoff et al. [2] and it is called “first person neuroscience”. It systematically links subjective first-person experience (defense mechanisms are first-person data) to the third-person observation of neural states.

On the other hand there are several neurological disorders with similarities that one can find in manifestations of defense mechanisms. An example is a neurologic disorder of anosognosia where the patients develop lack of awareness of his or hers own sensory and motor deficit. The symptomatics can be correlated to the defense mechanism of denial where patient fails to recognize obvious implications or consequences of a thought, act or situation. However some authors (in [3], p15) state that anosognosia might be the result of a defensive reaction based on motivation, including the strong need for self-respect and the inability to cope with failure and loss.

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Choice-Predictive Neural Activity Associated with Movement and its Temporal Relation to the Subjective Awareness of Perceptual Decisions

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We employ a novel approach for measuring cortical preparation of movement, with respect to the timing of a decision to react in a perceptual decision-making task. We avoid methodological problems of other relevant studies (for example, see [1]) through: (i) using other Electroencephalography (EEG) signal analysis technique to compensate for the non-specificity of the commonly used Readiness-Potential (RP); (ii) employing behavioral measures that differ from the problematic introspective reports of decision-awareness; (iii) performing the experiments on a greater number of participants, thus allowing for more reliable conclusions.

We use Event-Related Desynchronization and Event-Related Synchronization of neural oscillations (ERD/ERS), which represents a change of cortical rhythms to external and internal events. In contrast to the RP, ERD/ERS of β-band oscillations (13-30 Hz) appears to reflect a broader physiological aspect of motor execution and control [2].

A homogenous group of 20 healthy volunteers is recruited for a set of electrophysiological and behavioral experiments.

Firstly, we replicate a pilot EEG study, which showed that signal dissociation in β-band ERD/ERS predicted left/right hand responses linked with binary decisions in a random dot motion (RDM) global direction discrimination task much earlier than did the RP [3]. In this task, participants observe pseudo-randomly moving dots for 2 seconds and are then asked to decide on their global direction, which can be either left or right, by using their left or right hand, accordingly. Our scope is to confirm, including control conditions, that the motor outcome of the task (response with left or right hand) can be predicted significantly earlier by β-band ERD/ERS.

Secondly, by behavioral means, we further address the second scope of the study: to investigate the temporal relationship between the onset of this distinct neural activity, predictive for a future motor act, and the timing of subjective awareness of the dots' global direction that leads to decision to perform a left or right hand response. We ask participants to respond in the RDM task openly, i.e. as soon as they know the global dot direction. We will then infer the timing of their mental decision (awareness of global motion direction), which presumably preceded their overt response. If this time comes after neural prediction, we will also perform an additional experiment where we interrupt the task at a time between neural prediction and subjective awareness, and see if participants respond as to the global dot direction at chance levels.

We expect to find that movement-related ERD/ERS signal dissociation: (i) predicts the specific motor outcome of a decision in the task approximately 500 ms after dots start moving; (ii) precedes subjective awareness of the dots' global direction that leads to a decision for left or right hand response.

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Self-organization of Sensorimotor Representations and Their Usage in Object Grasping

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In our project we are focusing on exploration of neurological researches dedicated to functioning of sensomotoric circuits and formation of sensory and motor representations in premotor cortex and superior temporal sulcus brain area. We have analyzed several models of mirror neuron system and isolated problematic places and inspired by recent researches of D.Perrett et.al [1] and V. Caggiano et.al [2] we have designed our own modular model of mirror neuron system for robotics incorporating model of premotor cortex (PMC), posterior and anterior superior temporal sulcus (pSTS, aSTS), parieto frontal cortex and model of motor execution. We have focused on adding model of STS where are processed visual data on high level and model of motor execution (Controller for Reaching and Graspin - CRG). The aim of our project is to prepare all building blocks and perform series of tests with them.

All modules of our mirror neuron system are based on sub-symbolic paradigm built up from neural networks. We have prepared two training datasets, one for PMC module, where are proprioceptive information of arm states, where arm was performing three types of grasps. The second dataset was for pSTS modul, where according to D.Perrett et.al [1] are populations of neurons discriminating object or action and perspective from which are observed. The dataset for pSTS was artificially created from original dataset for PMC applying geometrical processing we have obtained four instances of the same grasp observed from different viewpoints. Data for model CRG were generated from images taken by Microsoft Kinect camera and processed by specialized libraries Point Cloud Library and Vision For Robotics library.

For implementation of pSTS and PMC modules were used recurrent self-organizing maps and for implementation of aSTS was used classical self-organizing map. The model CRG was implemented using architecture of actor-critic and trained by recent reinforcement learning training algorithm for continuous environment CACLA [3].

In the first experiment we focused on exploration of performance and suitable parameters of used self-organizing maps for our main task. Our main goal was to reproduce results of researches of D.Perrett et.al [1]. We suspected that after training the main organization of pSTS module will discriminate data by the perspective of observer and beneath will be sub-organization into three clusters referring to three types of grasps. PMC module should be organized into three compact clusters, each representing type of grasp. Module aSTS where we wanted to reach creation of perspective invariant neurons was taking input from activation of pSTS and PMC modules and that resulted in reversed organization as have pSTS, so that main clusters were representing types of grasps and each main cluster contained sub-clusters representing perspectives. But this is only the first step of our goal to emerge perspectively invariant neurons.

CRG model was tested in task of reaching and grasping of objects different sizes and orientation. Then we performed tests with added noise to object positions which revealed ability of generalization and good performance in slightly changed environment. In the completed model of mirror neurons this model will generate input for PMC and pSTS modules.

The future task remains integrating all mentioned modules together, solving problem of emerging of invariant neurons. There also appeared catastrophic interference in tests of CRG model with more than one objects simultaneously.

In the end we can conclude that our designs fulfill our expectations and proposed model have very good chance to expand our frontiers of cognitive robotics and action understanding.

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Effects of Intention on Motor Performance: A Combined TMS-EEG Study with Focal Dystonia Patients

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The aim of this project is to explore the effects of intention (assist vs resist) in a central perturbation of the primary motor cortex (M1) elicited by Transcranial Magnetic Stimulation (TMS) in Focal Dystonia (FD) patients. In fact, recent research has shown that in healthy subjects, prior intention to a TMS delivery to the M1 can modulate cortical excitability [1], [2] and thus modify the motor output of the stimulated cortex (increasing or decreasing the amplitude of the motor evoked potentials at the target muscle, depending on the condition). Dystonic patients are believed to have impaired inhibition at a spinal, brain stem, subcortical and cortical levels [3]. The main aim of the thesis is to test whether modulation of the M1 by intention, is disrupted in the cognitive-motor loop of patients with FD, and whether there are specific differences between patients with and without sensory trick. The intended outcome of the thesis is to deepen our understanding of the effects of intention on motor performance, both in healthy subjects and in a variety of subtypes of FD. A secondary goal of the research thesis is to provide new insights into the neurophysiology of the sensory trick. A methodology combining TMS and Electroencephalography (EEG) will be used to address these questions. This technique offers the valuable possibility of getting into the cognitive-motor loop, and thus, exploring the neurophysiological and behavioral effects of cognitive function (related to intention) on motor function (related to performance).

Methods

15 FD patients and 15 matched healthy controls will be asked to mentally resist or assist a subsequent TMS single pulse to the M1. Changes in the amplitude of the Motor Evoked Potentials (MEPs) will be monitored for the wrist flexor and extensor muscles by using Electromyography (EMG). EEG will be recorded throughout all the experiment in order to determine the extent of modulation of cortical excitability (revealed by Contingent Negative Variation) prior to TMS pulse, and whether this modulation was mediated by inhibitory circuits (revealed by N100 component), this last measure will complement Silent Period. In addition, behavioral data will be recorded using a two degrees of freedom goniometer. Finally, after completion of the experiment, a qualitative questionnaire will be handed to the subjects. This will be used to discriminate further possible reasons for variability or significant differences in the measurements across subjects, if any, and to explore the possibility that different mental strategies for performing the task correlates with different degrees of success in the two experimental conditions.

Expected Results

MEP amplitude will be decreased in the resist condition compared to the assist condition. This effect will be lessened in FD patients, but perhaps not in patients with sensory trick. Simultaneous EEG measures will allow determination of the neurophysiological characteristics of the modulatory effects of intention, in healthy and diseased subjects, and deepen our understanding of the sensory trick. Finally, different mental strategies may correlate with different degrees of modulation and task success

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A Computational Model of Intrinsic and Extrinsic Motivation for Decision Making and Action Selection

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Motivation is a fundamental force which moves an organism into performing certain activities. It is not a unitary phenomenon, as it can differ in both the intensity (level) and the type (orientation). The type of motivation is determined by the different attitudes, goals and reasons that give rise to an action. This leads to the most basic distinction between intrinsic motivation, which refers to doing something because it is inherently interesting or enjoyable, and extrinsic motivation which denotes activities leading to a separable outcome [1]. Motivation is a classic psychological topic, however, its importance has recently been noticed in other disciplines as well, making it a stimulating interdisciplinary research subject.

In our current project we are developing a computational model of extrinsic and intrinsic motivation for action selection and decision making (two of the most basic problems in intelligent systems). It will consist of a few main blocks: Internal Physiological Space, Motivation block, Return Predictor (Learning block), and Action Selection block. The internal physiological space will represent all of the agent's needs and motivations in one multidimensional space. The motivation block will help to link the internal physiological space to the agent's external environment. It will also compute a list of weighted admissible actions for the action selection block. The learning block will be based on the framework of Reinforcement learning (concretely, Temporal Difference Q-learning). This framework allows using the action reward (or reinforcement) as a source of feedback about the performance [2]. Finally, the action selection block will use a few different algorithms to maintain the balance between exploration and exploitation. In our model, motivation will be used for both goal and reward derivation, and will influence decision making, action selection, and the level of exploration.

The model will be implemented in an incremental fashion using computer simulation. We will start with the motivation systems of a single need, increasing the complexity to the multiple needs system. Finally, the subsystem of intrinsic motivation will be incorporated into the extrinsic system.

We believe that this project will allow us to approach questions important for both psychology and computer science. Psychologists could benefit from learning more about the functional nature of intrinsic motivation (especially about different sub-types of intrinsic motivation), from possible mechanisms which connect extrinsic needs and intrinsic motivation into one coherent system, and from a clear formalization of psychological concepts such as “joy”, “curiosity”, “challenge” and similar. For computer scientists this project could provide useful insights into the advantages of designing motivation based learning systems, as well as the benefits or downsides of intrinsic motivation in simulated agents. Last but not least, this project will allow us to explore the philosophical question of whether it makes sense to design computational systems based on biological models.

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Quandaries of Life – Phenomenology of Decision Making. A First Person Inquiry in the Field of Decision Making

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Decision making is one of the topics which has received a great deal of attention from most of the modern cognitive sciences. However, it would appear that the phenomenon has only been studied from a 3rd person perspective, fact which encourages the current paper to investigate the phenomenon within the relatively newly emerged research area: the study of experience (phenomenology). Within the thesis, decision-making will be studied from a 1st person perspective by gathering experiential data through in-depth explicative interviews, with the aim of putting together a map of experiences related to decision making. The acquired data will be coded and examined for potential similarities and patterns and analyzed through specific experiential methodologies. Based on the findings, conclusions will be drawn as to whether significant commonalities have been registered among the experiencers, and such commonalities will then be integrated in a topology of decision making related thoughts and experiences.

The topic arose from the observation of some discrepancies between the described models of decision-making from the literature and the personal systematic observation of the experience and thoughts occurring when taking a decision. This observation later lead to the question whether individuals experience similarly or not the process of decision making. There is an abundance of literature supporting the idea that making a decision is (supposedly) preceded by a sense of anxiety/difficulty which in some cases leads to the avoidance or adjourning of the decision [1]. This is of great interest for the purpose of this topic, for on an experiential level, there is, with no doubt, an entire palette of possibly perceived nuances [2].

From the methodological point of view, the current study will be a qualitative research, namely a comparative case study. The number of participants will be 5-6, and the research plan might change/get adjusted according to the preliminary results.

In the selection of participants, the first phase will comprise of the completion of a questionnaire related to the maximization/optimization theory, as well as a detection of self-reports, in which the participants would be asked to explain how they decide what to wear in the morning and how they decided which university to attend/which life partner they chose. Out of the participants who will fill in the pre-tasks, 5 or 6 will be selected for further inquiry. These subjects would be trained in Descriptive Experience Sampling for 24h, in which they would need to write down on paper, and later be interviewed about what they were experiencing at random points throughout the day, signaled with an App.

The method used will attempt a modification of the experience sampling method and/or the explicative interview technique. The subjects will be asked that in a 3 days period, whenever consciously encountering a decision, that they would write it down in as much detail as possible. They would then be interviewed and the data acquired would be analyzed through qualitative text analysis methods [3].

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Interacting with tutoring systems – the role of power and related affect

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Teaching and learning, including tutoring, are assumed to be highly social activities and social interaction has been stated to be a key mechanism in tutoring situations [2].
During the last 30 years many intelligent tutoring systems (ITS) have been developed. Such computer-based learning environments incorporate computational models from the cognitive sciences, learning sciences, computational linguistics, artificial intelligence, mathematics, and other fields and are supposed to track the learner's psychological states, such as subject matter knowledge, skills, strategies, motivation, emotions or other student attributes [1].
The goal of the present master thesis is to investigate the social interaction between learner and tutor, systems using conversational interface agents which directly interact with the learner, attempting to simulate a human tutor, are of special interest. Here the quite successful AutoTutor [1] or similar systems can serve as an example that seems worthwhile investigating.

The core research interest is the role of power and related affect, as well as their relationship, in the interaction between the human learner and the software agent incorporated in the ITS.
This interaction is understood as a micro-level dyadic social interaction. Hereby student and tutor both are assumed to be (potential) social actors. The focus of the analysis lies on the social dimensions of this interaction, not on the (learning) content.

Existing theories and approaches seem to fail to grasp the social dimensions of this specific kind of interaction. Furthermore, theories originating in the Social Sciences were meant to describe human-human social interaction, but seem to be directly transferred to human-computer interaction. In case of the construct of power, it is not said that assumptions and theories concerning human-human tutoring automatically hold for human-computer tutoring situations, even if the ITS resembles a human tutor.

Following an exploratory, theory-building study design, the present master thesis aims to formulate an adequate theory. Main influences are coming from socio-cognitive theories including interactionist, dramaturgical, micro-structural and social constructionist approaches, which usually operationalise the construct of power along concepts such as hierarchy, (interpersonal) control, role attribution processes, or performance expectations, thereby relating it to affect [2,3]. Sociological research traditions provide various theories about power and affect in micro-level interactions that can be drawn upon, such as power-status theory or affect-control theory [3].

Within the scope of this master thesis, main methods will be of a qualitative kind. Besides theoretical research, users interaction with an ITS will be studied by the method of observation, followed by reflective interviews focussing on learner's subjective experiences, as well as pre- and post-test questionnaires.

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Performative Acts: "Let There Be Reality!"

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The following abstract represents a preliminary exploration of a constructivist framework that will serve as a basis for further investigation of construction and regulation of meaning and problematisation of the notion of agency.

There can be little doubt that constructive processes of some kind underlie the creation of social reality, e.g., institutions such as money or private property. Searle [1] identifies the basic mechanism for the creation of institutional facts in declarative speech acts or, short, declarations. Declarations differ from other speech acts in not having an analogue of pre-linguistic intentionality. The peculiarity resides in their reflexive intentional structure, that is, declarations install ontological facts in reality, by representing them as existing or, in theatrical terms, through performance. "I pronounce you man and wife" is a declarative exemplar par excellence.

Additionally, Searle claims that once there is language, there is already a fully blown social reality. Indeed, the conventional nature of language becomes obvious as soon as one realizes that there is nothing natural about the ascription of meaning to particular signifiers, be it words, symbols, sounds or images.

Crucially, the social conventions underlying the structure of language imply a set of commitments. In the most trivial case, a user of language is committed to tell the truth. However, institutional facts exceed such examples, by involving commitments, which go far beyond the truth. For instance, private property installs a much more complex system of rights, duties, prohibitions, etc. It follows that social reality, at its purest, is about the distribution of (social) power.

Despite advocating a similar stand on the nature of social reality, Butler [2] differs in problematising the notion of agency. Whereas Searle sees agency as a locus of declarations, Butler's famous statement "There is no doer before the deed" establishes agency as the effect of performative acts. In other words, the actor is always already on a stage. The subject, instituted through performance, is therefore an illusion masking its own origin.

The performative acts then create the illusion of essence, as if things expressed their inner nature. For instance, by behaving as if money had inherent value, we get to experience it as such. Indeed, performances are enactments of possibilities in a given historical moment that get reified and sedimented through repetition. However, the enactment is always regulated by punitive processes, thus a subject is a subject under coercion. In a given historical moment, there are limited ways of performing a role, be it the role of a female or a professor.

Social reality can then be conceived of as subjectivized objective social structures (which themselves change through time). It is the way we objectively perceive reality. That is, it is as if we observe the reality through some kind of conceptual filter, which produces a particular meaning, but if we were to take the filter away, we would lose the meaningful reality itself. As Žižek [3] puts it, by destroying appearances, we destroy the thing behind the appearances as well.

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Bottom-up vs. top-down influence on attention capture by subliminal stimuli

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Is attention and consciousness the same? Do they serve the same function or are they different? These are intriguing questions both from a philosophical as well as from an empirical viewpoint. It is now commonly accepted that some part of attention operates independent of awareness. An ongoing debate however addresses the question if unconscious (subliminal) attention capture is in general top-down contingent – that is, if the stimuli have to fit the voluntary control setting – or if it is stimulus driven (bottom-up). Recent empirical evidence from spatial cueing studies has been interpreted in favor of the latter position [1,2]. In these studies, particular locations in the visual scene were cued by subliminal stimuli, and, when subjects had to perform a Go/No-go task, it was shown that the cued locations were attended – that is, reacting to targets at cued locations was facilitated relative to reacting to targets at uncued locations (cueing effect). It was argued that this attention capture was bottom-up because the cues were highly salient and not predictive for the target location. However, the interpretation of the data is problematic. Namely, subsequent experiments already revealed that changing the task by showing distractors in addition to the target disrupts the cueing effect [2]. Although this finding had initially been interpreted in terms of the neurophysiological properties of the neuronal projection from the retina to the Superior Colliculi which is hypothetically underlying bottom-up subliminal attention capture [3], it is not a far-fetched alternative interpretation that the subliminal cue actually was top-down contingent in the original setting, but no longer after changing the task condition.

The objective of the current project is to rule out this alternative. Two experiments are designed in which we systematically change the task and, hence, the top-down setting in the paradigm of Mulckhuyse et al. [1]. By using color distractors in addition to the color target, we rule out if top-down singleton search is a better explanation for the cueing effects that were observed when color targets were used without distractors [2]. Also, we no longer use a Go/No-go task and the luminance of the colors is psychophysically equated to the background. This is to rule out that individual differences in color-luminance perception evoked residual contrast responses and were responsible for some of the results in the previous experiments [2]. If the bottom-up effect is real, we would expect to find cueing effects regardless of the task condition and eventually dependent on whether the color stimuli are psychophysically or objectively luminance-equated to the background.

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Introspection in Problem Solving

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Problem solving research has encountered an impasse. In the early days of cognitive science the seminal work of Newell und Simon [2] paved the way for the investigation of the mechanics of well-defined search problems. But contrary to the high hopes no general problem solving theory emerged and researchers do not seem to have made much theoretical progress ever since [1, 3]. While we can formalize the representations and steps subjects take in a search problem, we do not have an accepted formal theory yet that can describe how representations and strategies are attained and adapted.

In this opinion paper we argue that one factor that is holding back the field is the widespread rejection of introspection among cognitive scientists. We argue that cognitive scientists have good reasons to be skeptical about introspection as a research method but self-imposed experimental rigor can get in the way of exploratory research. A systematic introspective study is a good way to get experience with a new experimental paradigm and explore possible problem solving strategies that subjects might be using in the task. However, we document that cognitive science textbooks dismiss introspection and argue that as a consequence introspective methods are not used in problem solving research, even when it would be appropriate. By discussing examples of successful exploratory research that used questionable introspective methods, we aim to show that systematic introspective studies can help develop new hypotheses and ultimately, perhaps, help overcome the impasse the field is facing.

More importantly, in problem solving research the rejection of introspection is particularly harmful because introspection – as a form of metacognition – is an essential part of problem solving processes. When dealing with new or hard problems that cannot be solved by standard methods, good problem solvers introspect while they engage with their task: they examine their strategies and representations, they evaluate their progress, they realize that they are stuck or that they have had an insight. We review evidence that introspection improves problem solving performance, sometimes dramatically. Several studies suggest that self-observation, self-monitoring, and self-reflection play a key role in developing problem solving strategies. We thus argue that studying these introspective processes will require researchers to systematically ask subjects to introspect

We conclude that research on problem solving could benefit from being more open-minded about introspection, both as a method and as a cognitive phenomenon.

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Mirror neuron system and the perception of movement

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Neurophysiological studies of the last decade have been connecting the suppression of electroencephalographic (EEG) oscillation known as mu-rhythm, during either observation or imagery of a motor act, with so-called mirror neurons. Mirror neurons are a functionally special class of neural cells found in some areas of primate brains that are rendered active by executing, observing or imagining a movement. Being part of a larger mirror neuron system, they are hypothesised to enable a form of neural mapping of perceived movement and thus might be one of the underlying mechanisms of action understanding, imitation or empathy [1].

Unlike in lower primates, where mirror neuron activity has been reported as being specific to object-directed motor acts, human mirror neurons were shown to be capable of responding to a more abstract types of movement [2,3]. To test the boundaries of this human ability, a couple of EEG experiments were conducted, with the event-related desynchronisation (ERD) of the mu-rhythm being considered as the indicator of mirror neuron system activity.

In the first experiment, EEG data was collected from subjects observing a precision grip of an object, or an empty grip performed in the same manner, carried out by both human and robotic hand. The second experiment was focused on using motionless stimuli in form of chronophotographic pictures and action words, to test whether the mere notion or implication of a movement is sufficient to cause an ERD of the mu-rhythm. Fast Fourier Transform was performed on the filtered EEG data that had been cleaned from artifacts and power spectral densities of mu specific bands were compared across conditions. The results suggest embodied properties of the mirror neuron system, facilitating the understanding of innate and abstract actions alike.

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Language comprehension and situation models

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Language comprehension is a complex problem. In order to understand what was heard/seen, humans have to take context into account, make predictions over the course of a sentence, deal with syntax and grammar as well as semantics, paralinguistic content, pragmatics, etc. Also, they have to recognize the information in the speech/text, which may contain events, entities, properties or categories. Language comprehension predicts having own interpretations of what was transferred in the language.

In my thesis I deal with Situation models [1] [4] and their use during comprehension of spoken and/or written language. It has been theorized, that the process of deeper understanding of language sentences involves construction of mental models of the situations depicted in them. Comprehenders keep track on multiple dimensions and number of aspects of the situations, like causality, intentionality, protagonists and their emotional states, soace objects and their visual characteristics like colors, etc. I study these models in the framework of embodied cognition. Theorists in embodied cognition suggest, that language is grounded in corresponding sensory-motor modalities and emotion processing. In this work I provide an overview of these ideas and describe two experiments, based on these ideas.

First one is dealing with effect of monochromatic stimulus habituation on subsequent comprehension of short sentences. This experiment was repeated with adjusted experimental conditions, due to insignificant results in the first run. Results of this experiment provide additional insights on previous work by Rakovsky [3]. Since he used two opposite colors (blue and yellow) in habituation and sentences, from his results it was not clear, whether the habituation on monochromatic stimulus had slowed comprehension of sentences, depicting situations with the same color, or facilitated comprehension of sentences of the opposite color (possibly both). Using a third color (green) type of the sentences, which were neutral to both monochromatic habituation types (blue and green), we were able to prove the first of two explanations, while the second cannot be supported from the results.

Second experiment is dealing with effect of visual emotive stimuli priming on further comprehension of short sentences, depicting situations, which typically evoke similar or different emotion. Result show, that priming on emotion of happiness facilitates comprehension of sentences, depicting situations, which typically make the protagonist happy and priming on emotion of anger facilitates comprehension of sentences, depicting situations, typically evoking the same emotion in the protagonist. This experiment is inspired by study called Gender, emotion and the embodiment of language comprehension [2].

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Delicate Thoughts: A Phenomenology Of Food Cravings

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Food Matters. You will agree that "food is for nourishing, for fuelling the body, for building bones, teeth and muscle" [1], but there is more to it than nutrition. Current research connects concepts such as »food cravings« to issues of obesity, depression, addiction or compulsion [2]. This seems intuitive and as our daily experience with research shows we often work with phenomena and concepts that appear quite clear to us, up to the point where we ask ourselves on how to actually define and operationalize them. Looking at possible assessments of food cravings via arbitrary rating scales, speed of consumption, physiological arousal or saliva secretion should evoke curiosity on how many other concepts in current research work with hypothetical constructs that are hardly directly measurable.

Food cravings provide as a typical example for the manifold of poorly understood phenomena where obtaining reliable data seems to disregard experiential data for the sake of focusing on science-based measurements. This Master thesis will therefore aim at a point of discourse that I claim to be of core relevance for the discussion of Cognitive Science as a discipline, namely the discordance between science-based and experiential forms of knowledge.

Instead of looking through a micronutrient lens of explaining mechanisms, an experiential approach towards understanding food experiences may give rise to novel perspectives towards psychological and social aspects of nurturance.

The thesis consists of three connected main aspects:
1) Experiential data will be obtained using qualitative methods of dialogical phenomenology within in-depth interviews and analyzed according to open coding in grounded theory, aiming at a case-based mapping of food-related thoughts.
2) Potential patterns and commonalities found in the data will then be integrated into the design of a methodological strategy for experiential data input, by identifying relevant categories and modalities of experiences that may allow a more structured protocol for assessing food-related experiences.
3) This strategy will be applied and evaluated to assist in the third dimension, namely the mapping for a topology of food-related thoughts & experiences.
The chosen topic of interest is both integrating the personal interest and the increasing trend of investigating food-related phenomena, identified by current interdisciplinary research on the generation and perception of flavour as well as their influence on behavior and nutrition.

Delimited from prior hypotheses, experiences will be discussed following the approach of problematization according to Freire, as a "process of posing questions in order to deconstruct a particular phenomenon so as to understand its construct"[3] that shall call attention to the crucial role of first person reports and our way of assessing research data mostly in demarcation to a participant's experience.

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Making Sense From Phenomenological Experimental Data

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Introduction

The main goal of this master thesis is to present a new level of understanding of phenomenological experimental data collected through the usage of software application via descriptive experience sampling to provide an in-depth research at an application user.

Method

The collected data will be processed through a computer based environment and represented in a multi dimensional graphical interface that would allow the user itself to interact with the data recorded via customized application software on a daily basis [1]. The data is going to be sampled by the user and automatically sent online to the required server, that will host all the necessary services. When the data transfer is completed from the user, the sampled data are then forwarded to a computerized environment that will be responsible for extracting, transforming and creating presentational aspects that were requested by the user in a specified time interval.

Expected Results

The usage of phenomenological experience sampling will open an opportunity for multi dimensional correlation research of user's experience in a fully customized environment [2]. An extensive data mining sandbox is also considered as a great research area for conducting future pragmatic researches by an optional customer.

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Enabling Psychotherapeutic Spaces

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The relation of a healing potential to design in psychotherapeutic spaces was studied in many researches. It was noted, that patients are responding to different settings in a way, which affected the therapeutic process and its outcome. Beautiful rooms are described as attractive, pretty and comfortable and on the other side in the ugly rooms patients were more likely to complain of monotony, fatigue and headache and showed irritability and hostility [1].

Several studies showed also more specific effects on patients well-being during therapy. On e.g. seeing personal memorabilia of therapists was shown to lead to better self-disclosure in patients, the display of a large number of credentials was concluded as a positive impact factor on judgements of therapists' qualifications [2], specific lightning, decoration and interior design were also studied and concluded as important elements in psychotherapeutic spaces [1].

The problem with the most studies conducted is that although it is known how specific physical properties affect patient and therapist, we are unsure about the outcomes of different features combined. Although they were tested (on e.g. beautiful vs. ugly [1], soft vs. hard [2]) it could be different for every patient and therapist, as there are different preferences. For getting better or completely new results it is important to discover the core processes, which can be later transformed to a physical space as innovative enabler of new knowledge.

In this study, enabling space paradigm is used, which is focused toward identification of core processes and patterns that define specific environments [3]. The identification was done by searching for the basic qualities that are needed in psychotherapy by therapists and patients.

Methods

Qualities were researched using qualitative interviews. 12 interviews with patients, which were on average 21:19 minutes long and 7 interviews with psychotherapists, which were on average 44:50 minutes long were made. In those interviews patients and psychotherapists were asked about the branch of the psychotherapeutic approach they are attending or performing, basic qualities needed, their relation to physical settings and relation to the process of psychotherapy. Interviews were based on previously conducted questionnaires, but were not used rigorously. Thus participants lead conversation and more information, which could lead to innovation was gathered.

Results

Based on 'sense making phase [3]' and quotes from therapists and patients, trust is proposed as a basic quality, that is needed in psychotherapy and which can later be regarded as a fundament of enabling space. It was concluded that patients develop trust if cognitive, emotional and physical spaces provide them safety, privacy, acceptance and understanding. Distractors showed as very affective in the process of developing trust, so in designing the prototype of physical space, I focused on removing as many of them as possible.

In this talk, I will present the results of the interviews and observation in detail and show a designed prototype of the proposed psychotherapeutic space, based on qualities found.

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Can emotional experience (emotional judgment) be the same as moral judgment?

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Emotions are sometimes seen as a threat to the morality and the rationality, even though there is probably closer to us the romantic idea of emotions as the center of human individuality and morality. In both of these approaches there is obvious division of emotions and reason. My work is focused on eliminating this view of exclusion. I would like to present the view, that if we can talk about emotions and reason as two entities, both together must form a system of evaluation that is needed for best possible motor (or mental) responses to any stimuli.

On this system of evaluation also system of moral judgment is based. Moral judgment was often undividedly connected to reason and wisdom. I am researching the relation between moral judgment and emotional experience in search for possible sameness.

I argue, that there is a point of view, from which moral judgment and emotional experience cannot be the same. But there is also another point of view, I will present, from which they can even be the same.

In master thesis, which deals with the reflection on the emotions, judgment as decision-making, reason, morality and similar glib terms, a major part of the work is devoted to the precise definitions of these terms. Terms definitions are under section of various and already confirmed empirical evidences, scientifically defined by various authors and personal feelings, based on phenomenological embodied internal activity. And so, for example, I will search for the meaning of term reason from Kant's Pure Reason to the other side – to reason as a capacity of embodied cognition to decide which reaction to choose in connection with some stimuli. Because of the nature of the language, in different contexts we are many times forced to use the same word for expressing different meanings. In search for definitions I will also include some non-scientific results of internet's forums, social sites and other web sources search on this topic and on the meaning of those terms. Because a big part of my career as a lawyer was devoted to the field of psychiatry and in recent years to human rights I like to examine the junction between morality, embodied cognition as being and law. Although I will expose the interpretation of possible conflicts between emotional judgment and moral judgment as conflicts between two different judgments, which can be result of the same process of evaluation, I try to focus on the process of evaluation itself.

In law, there are many implicit presumptions that moral judgment cannot be the same as emotional judgment. Also in a process of a legal decision making emotions are seen mainly as a disturbance. So, my thesis's findings can also importantly contribute to the field of law and human rights.

My research question is therefore: Can an emotional experience (judgment) and a moral judgment be the same?

The answers to the questions I will be searching through the analysis and synthesis of mainly three works on which the thesis is based (Bortolotti(1), Damasio(2), Nussbaum(3)), as well as analysis and synthesis of all facts, emotions and feelings experienced during cognitive science studies.

My master thesis is theoretical and my main method is philosophical analysis as chimera to lawyer's logical system. Philosophical analysis today in examination of the issues related to emotions, reason and morality can no longer rely solely on the analysis of the language so it should be even more strongly connecting with other findings of science. That's why in my work I also relay on scientific knowledge in the fields of neuroscience and cognitive psychology. I also try to develop some thoughts with the help of the knowledge of the basic mechanisms of genetics, taking into account the findings of the genes which predetermine emotional tendency.

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Picture Object Recognition In Kea Mountain Parrots

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Making the connection between a real-world object and a picture is no minor feat for non-human animals, and can even present difficulty for untrained humans[1]. This has important methodological significance for cognitive and behavioural research with animals, as photographs and videos are often utilized in experiments. It is important that researchers do not assume that animal subjects see the same thing in a picture as their human counterparts. Not only does this run the risk of anthropomorphizing, but due to the different visual systems and cognitive abilities of animals, it is certainly not the case for most animal subjects. A large body of literature over the last half century has been devoted to clarifying how animals react to, discriminate between, and categorize pictures and videos. The vast majority of this research has focused on primate species, and much progress has been made in understanding how they perceive the relationship between pictures and objects[2]. For birds, on the other hand, the picture-object recognition research has focused almost exclusively on pigeons, except for a handful of studies on other species such as chickens and Japanese quail[3]. Nonetheless, cognitive research is being done on numerous bird species unrelated to pigeons or chickens, coming from groups as diverse as corvids(crows, ravens and allies), passerines (songbirds) and psittacines (parrots).

This study shows evidence of picture-object recognition in a parrot species: the kea mountain parrot (Nestor notabilis). Kea were tested on an object-to-picture transfer task. Subjects were trained and tested in a two alternative forced-choice procedure, meaning that for each trial the kea was presented with two objects or images, and had to choose one before continuing. Stimuli were a metal toy duck and a metal toy frog for the object discrimination task, and photographs of those objects presented on a touchscreen for the picture discrimination task. Test subjects learned the object discrimination task during training, and once training was complete they were presented with the touchscreen task. A control group participated in the same touchscreen task but without prior training on the solid objects. The test group also took part in a control touchscreen session, where they were presented with pictures of novel objects.

Test subjects performed significantly better in the test session than in the control session, and better than the control group. The results of this study suggest that kea can correlate a picture on a touchscreen with an object that they have encountered before. Further, this is the first time such an ability has been shown in a parrot species.

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Priming of Visual Attention in Dynamic Visual Scenes- an Experimental Study Using Eye Tracking

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Background

During visual search there is a cognitive effort to detect different stimuli features in visual environment among many distractors in dynamic scenes and find a target. One of the facilitators for this detection is a phenomenon called priming. Priming as a cognitive phenomenon was being studied widely and extensively but its role in visual search was neglected although priming plays a crucial role in visual search.

Primed features associated with target are found more easily and faster than not primed features. One study found that if the target has same feature or same location as the previous trial, search was faster than if one of the features or location changed [1]. Moreover they found that searching time was slower when the target changed one of its features as color change, side change etc.
Another study found that discrimination performance of different visual stimuli was better if the location of the saccade target and discrimination target was shown on the same side after the cuts. Besides side change effect, they found that if discrimination target shared same color with the saccade target it has improved the discrimination performance for the discrimination target to be reliably and faster detected [2].

Research Question

This study aims to find out that attention is captured by features that are repeated from precut scene in dynamic visual scenes.

Materials and Methods

In our Eye Tracking study were recruited 36 participants from internal database. Participants watched manipulated features in different silent sport movies. Manipulated features were:
* Continuity change variable which was Continues, Discontinues and Full Continues.
* Color change variable which was Color to Color, BlackWhite to BlackWhite, BlackWhite to Color and Color to BlackWhite.
* Location change variable in which the target movie was shown randomly either on the right or on the left part of the monitor screen.
Participants were unaware of the experiment purpose. They've been instructed to attend one of the movies (target movie) and ignore the other movie (distractor movie). Movies switched randomly positions in some of the trials, so the participants had to switch their gaze to the new position. Moreover, participants were instructed to press a keyboard button whether the target movie continued on the same or different position, encouraging them to press a button as quickly as possible while maintaining a high accuracy.

Conclusion

The data are in ongoing process of analysis &interpretation, therefore it is still too early to speculate about the final results, but we expect the fastest eye gaze saccades when the movies were observed in the same side, continues and color-color trials and the slowest eye gaze in trials with different side, discontinuous, color to blackwhite trials. Taken together, trials that saved the features and location from a precut scene are easily primed in a post cut scene and otherwise.

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The Impact of Free Will Beliefs on Psychological Functions

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Introduction

Questions related to free will were and still are an important philosophical field of inquiry, but in modern days it is not only philosophy that addresses the problem of free will and its related topics. Psychology too provides new insights to the problem. The question is, is there a correlation between believing in being free, being in control (free will beliefs) and the performance in executive function tasks – the Stroop task and Go/No-Go tasks, for example.

Theoretical groundings

Research conducted by Vohs & Schooler [1] demonstrated that there is a positive correlation between disbelief in free will and antisocial behavior, cheating on a test for example. Other similar studies have shown that there is a connection between job performance and believing or disbelieving in free will [2]. This research paper assumes that one of the main reasons why some people have better job performance is that beliefs in free will facilitate exertion of control over one's actions. But the research does not stop here; research done by Rigoni et al. [3] has demonstrated that free will priming has an impact on the readiness potential. In this study the readiness potential was reduced in individuals primed to disbelief in free will. These findings indicate that there is a correlation between abstract belief systems and basic unconscious brain processes.

The assumption that emerges and that can be tested is: do beliefs about free will have an influence on other basic inhibitory or control functions of our brain? The hypothesis is that beliefs in free will have an impact on the performance in executive function tests or with other words that there is a connection between free will priming and the performance in the Stroop test, Go/No-Go tasks and similar inhibitory or task switching tasks. Ample research is showing that when performing on these tasks, activity in the dorsolateral prefrontal and anterior cingulate cortex is very high. As mentioned before [3], the research by Rigoni et al. demonstrates that beliefs about free will can change very basic brain processes related to motor control.

Empirical approach

Participants will be randomly assigned into three groups: a control group, a "free will exists", group and a "free will does not exist" group. The two non-control groups will be primed with "free will exists" and "free will does not exist" world views depending on the group. The free will beliefs will be evaluated with FAD-Plus questionnaire and the executive function will be tested with a Stroop test and a Go/No-Go task. The performance will show if there is a correlation between free will beliefs and executive functions performance.

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Posters

Experimental Syntactic Microsynchronization: the psychology of relative clauses in natural language dialogue

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From recent dialect syntax projects (dialectsyntax.org) it is known that phonology-based classifications of language varieties (dialects, regiolects, sociolects) may not be congruent with lexical- and syntax-based classifications. Hence, even within phonological dialects there is a steady syntactic "contact"-situation. For Bavarian (Bavaria in Germany, Austria without Vorarlberg, South Tyrol in Italy) the spreading and retreat of some syntactic phenomena was observed by [1] in an apparent time approach on an macrolevel. As language contact is a contact between speakers, this project shows, how speakers from different syntactic varieties behave in dialogue: by either aligning or persisting syntactic patterns. This process of microsynchronization was shown for phonology [2] but not yet for syntax.

The presented phenomenon are "doubled relative pronouns" (RP). Varieties of Bavarian offer two possibilities for relative clause formation: with one or two relative pronouns. There is not only syntactic but also lexical variation involved.

*Das ist die Frau, die / (die) wo / (die) was ich neulich getroffen habe. (That is the woman, that / (that) who / (that) what I recently met.)
For Bavarian Speakers it is far from clear a) where in the Bavarian language area which particular variant is used and b) under which circumstances single vs. doubled instances of RPs occur. Standard German does only show single RPs. To answer a), the results of an online query (350 locations in the Bavarian language area) show the distribution of RP variants.
Concerning question b), no reliable natural language task evoking RPs existed. Hence a new method was developed. The result is a video stimulus showing objects that must be discriminated by their movement. This is implemented into a team setting. By a preliminary questionnaire the composition of teams is controlled.

As there have been studies relating the grade of alignment in dialogue to personality traits [3] this and other parameters are covered by a questionnaire (e.g. attitudes towards language varieties / dialogue partners, RP predisposition) to facilitate a connection between observed language behaviour and psychological factors. An interview, subsequent to the task, reinforces the analysis. Applying this method to a set of 10 Bavarian vs. 10 German Standard speakers shall give rise to the following questions:
*How do speakers behave in natural language dialogue if confronted with deviant syntactic patterns?
*Which factors trigger the use of particular RP variants?
*If alignment / priming for new syntactic patterns is successful, is the general acceptance of these variants / the grammar of speakers affected?

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An Exploratory Case Study of Problem Solving in Mental Imagery

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Problem solving is a cognitive process usually seen as the hallmark of "higher cognition", making use of numerous faculties of our cognitive architecture. Research on expertise has shown that experts in their domain—as opposed to novices who have to employ "weak methods" like means-end analysis—efficiently solve problems by employing a deeply integrated framework of domain-specific knowledge ("strong methods"). When concerned with problems in their domain, this allows experts to rapidly recognise relevant information, to apply adequate sub-procedures and to easier retrieve intermediate stages of the process, cf. [1]. Due to their automatised procedures experts have more working memory capacity at hand, enabling them to explore problems that require a deeper understanding of the domain principles.

While a lot of progress has been made, we still do not know precisely which processes mediate the qualitative change from novice to expert, that is how this deeply integrated framework the expert possesses, is constructed and how this is put to use in problem solving. Considering the development of expertise, there is ample evidence that especially in intermediate periods, reflection and self-explanation are playing a particularly important role. E.g. subjects instructed to explain their reasoning performed significantly better in transfer tasks than subjects instructed to explain on the problem-level and subjects who thought-aloud [2].

Thus, if we want to get protocol data about how problem solving strategies are constructed and integrated with the existing knowledge framework, it seems sensible to acquire process-level data about these learning periods. We present an experimental paradigm that is designed to allow for the collection of comprehensive process-level data from introspection about the development of expert-like problem solving skills. This paradigmatic setup adheres to the properties of a microgenetic study, cf. [3]. It is aimed at facilitating deep-level learning in order to allow small scale studies of "expertise in the making". They are 1) the use of multi-stage tasks of increasing difficulty, 2) instructing subjects to solve tasks in mental imagery and 3) the instruction to introspect.

We will present preliminary results from an exploratory case study, serving as a proof-of-concept by providing high-fidelity descriptions of problem solving processes.

Acknowledgments
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Visualising fMRI Data for Brain Surgery

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Functional magnetic resonance imaging is regularly used in planning brain tumour surgery of motor and language areas. To optimize the results of surgery and keep postoperative loss of function to the minimum, speech dominance is assessed and the locations of primary motor and language areas established prior to surgery. At the moment fMRI analysis and brain mapping are performed with the help of different software programmes, which provide surgeons with imaging maps that help them plan brain surgery. Although scientific visualisations used for presurgical planning visualize data accurately and efficiently, they are not particularly user-friendly. Therefore, we have decided to examine the current trends in fMRI visualisation techniques concentrating on the fMRI data user. While previous studies dealt with accuracy and sensitivity, we will try to offer suggestions for improvement by focusing on intuitive and easily comprehensible visualization of data, though still maintaining accuracy.

Functional magnetic resonance imaging data may be visualized with various purposes and users in mind. First, it can be used to familiarize the user with either spatial or temporal properties of the fMRI signal, or both. For brain mapping in presurgical planning spatial properties are of particular interest because fMRI imaging is used primarily as a functional localization technique. Second, the type of display medium is another important factor for the choice of visualization technique as final results can be presented either on a computer display or in print, the latter having serious limitations in terms of interactivity. Visualizations range from simple 2D images, sliced 2D images, 2D images from multiple views, 3D images, sliced 3D images to interactive visualizations. As neurosurgeons can make use of printed images as well as computer screen displays, each of the above techniques will be evaluated on the basis of intuitiveness and data comprehensibility, i.e. the ease with which a user can understand and utilize data. An additional 3D technique using transparency, Maximum intensity projection, which is typically not used in fMRI data results presentation, will also be assessed. An especially important factor for the evaluation of these techniques will be the visualization of the primary motor and language areas relative to the tumour location as proximity or overlap of those areas influence surgery decisions and procedure.

Features of Innovative School Environments

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Research Question

Within the framework of Enabling Spaces we explored the structural elements of innovative secondary schools. Secondary schools are specially interesting as they prepare students for a vocational and/or academic career. The term "innovative" is seen as a label, which is given to learning environments that break with traditional learning settings. The currently still wide-spread behaviouristic of treating learning as a input-output relation is obsolete, due to findings in cognitive and learning science. An innovative learning environment views learning as a situated and enacted process within a social setting. The goal of this research is to explore the structure of current innovative learning environments as inspiration for teachers and knowledge workers.

Method

The Organisation for Economic Co-operation and Development (OECD) invited universities or public institutions from all over the world to send ethnographically collected data about innovative learning environments. Out of this data set we extracted 19 schools based on the following criteria: runtime at least 1 year, secondary school. Two additional schools were added, compliant with the definition of innovative learning environments by the OECD [2]. These secondary educational institutions have been structured according to the OECD definition and are dissected according to it. These structural elements are space and time organisation, assessment, content and social interaction.

Results

Some schools have a more traditional understanding of space, where learning happens in a classroom, whereas other schools consider the whole school area and additional virtual space as a learning environment. Assessment is mainly done by interviews and different kind of portfolios. On the one hand teachers are seen as guides or coaches who supports students. In these settings students either form one one big learning group or work independently. On the other hand students are organised in classes where one teacher or a teaching team is responsible. In two third of these schools the time table is predetermined, whereas in the other third time organisation is negotiated . Some schools have a specialised or highly differentiated curriculum, whereas other schools stick to the specifications of their ministry of education. Learning is happing all over the school and with different social settings and assessments compared to traditional school settings.

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Effects Of Different Breathing Patterns on the Cognitive Performance

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Introduction
Lately, much research has been done with topics concerning biofeedback and the effects it has on the overall physical and cognitive functions. Many proposed hypotheses state that there is a particularly strong correlation between rhythmic breathing and cognitive abilities. Thus, the focus of our research is to test those claims, in particular how do breathing rhythms affect cognitive abilities. In addition, we are monitoring various physiological parameters and looking for possible correlations between the breathing rhythms and other parameters governed by the autonomous nervous system. We would also look for the correlation between cognitive performance under stress and different breathing patterns.
The broader context of our research is the experimental psychology. More specifically, how do the changes induced on the physiological level affect the cognitive state.
The main goal of the project is to examine the effects of controlled breathing on cognitive abilities measured by a psychological test. By testing different breathing patterns we want to examine proposed claims that state the positive correlation between coherent breathing and cognitive abilities. Additionally, we would like to examine the effects of hyperventilation on cognition. Since it also introduces rhythmic breathing, but in the contrast to coherent breathing it is not synchronized to the heart rate and induces a chemical disbalance in the body as well. In order to expand the examining context of the research, we also decided to include the monitoring of the overall physiological factors during different breathing patterns.
We hope to contribute to the overall understanding of how changes of certain physiological parameters governed by the autonomous nervous system, can affect the entire physical and psychological state.

Methods
Creation of an experiment consisting of two cycles. First cycle consists solely of monitoring the physiological parameters and their changes under different breathing patterns. The second cycle is the same as the first one, but in addition we introduced the testing of cognitive abilities. Each cycle consists of three parts. In the first part of the cycle the subject is breathing normally. In the second part we induce coherent breathing techniques inside the regulated pattern presented on the screen which the subject is following. Finally in the third part of the cycle, the subject is told to follow the breathing rhythms that are inducing during hyperventilation. In the second cycle after each part has been completed, cognitive abilities of the subject are tested. In order to properly measure cognitive abilities and their potential change we chose to use the stroop test. The physiological parameters we are measuring are heart rate, respiration, temperature, skin conductance, and EMG.

Results
Firstly, we expect to find a positive correlation between rhythmic breathing, particularly coherent breathing, and cognitive abilities. Further, we expect to observe synchronization between respiration and heart rate variability. We also assume that the effects of induced stress factors after coherent breathing will minimize the negative effects of the stress on cognitive performance.

Conclusions
During the research we stumbled upon some challenges such as finding the right timeframe for the induction of different breathing patterns as well as finding a cognitive test, which would measure cognitive performance in a representable way. Despite all the difficulties we assume that the collected results will support our hypothesis and provide guidelines for further research. The direction of possible further research would be the use of biofeedback for regulation pf the physical and mental states that are in correlation with physiological parameters.

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In Search for a Middle Way: An Intersection Between Descriptive Experience Sampling and Just Ask Approach

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Our goal is to develop a middle way of qualitative phenomenological (experiential) data gathering, between the Descriptive Experience Sampling method and the Just Ask approach, in order to improve and optimise research process for participants and researchers.

DES (Descriptive Experience Sampling) is a method developed by R. T. Hurlburt, in which a DES investigator gives a beeping device (a beeper) to a chosen subject, who then uses the device in her natural environment. The device beeps on random occasions throughout the day (5-7 times per day), while the subject's task is to write down her ongoing experience from the moment right before the beep. A DES investigator then meets with the subject for an interview on collected beep notes within 24 hours. The investigator's task is to get a thorough and detailed knowledge on the subjects' noted experience. DES offers insights into experiential cognitive processes by enabling high fidelity and methodologically consistent reports of pristine inner experience [1]. Another popular alternative to DES is a so-called Just Ask approach, where the subject is given a series of questions (e.g. How are you feeling?, What were you thinking when...?, etc.) and answers accordingly [2].

There are certain problems of data gathering with both mentioned methods. Descriptive experience sampling can be quite time-consuming giving that the researcher and the subject or subjects have to meet on many occasions and go through the interview process lasting up to a couple of hours [1]. On the other side, the Just Ask approach lacks depth and thus doesn't provide a thorough and realistic report on experience as most people have a weak knowledge of their own experience and lack systematical training in acquiring the appropriate way of observing that experience [3].

The main goal is thus to develop ecologically valid environment that doesn't require researcher on daily basis, is not so time consuming and allows an in-depth insight to one's experiences. For this purpose we developed a new mobile application that enables the user to describe her experiences on many occasions throughout the day, as it combines DES (Descriptive Experience Sampling) with beneficial aspects of the Just Ask approach. The participants may describe their experience in various ways: by taking a photograph of their face at the moment of a beep, by open text and/or by creating new key words. Furthermore, the user with no prior knowledge of qualitative data gathering does not need to give a thorough phenomenological report on his collected beeps and there is no need for a time-consuming interviewer's guidance in a dialogue, for this task is done by the mobile application itself.

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Interaction of Emotion of Disgust and Fear

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Hypothesis

If an object that activates disgust in an agent is detected, fear is activated as well.

Method

In the experiment, series of photos will be shown. Apart from neutral pictures, it will include also photos of disgusting objects and photos of disgusting objects in relation to humans or animals. According to hypothesis, in addition to disgust, also fear activation is expected in the latter, but not in the former case. Physiological changes associated with fear and disgust represent dependent variable of experiment. Manipulated independent variable will be presence/absence of human or animal morphological features.

Visual stimuli consist of photographies from 3 categories: neutral, inducing disgust without picturing humans or their bodyparts, inducing disgust with picturing humans or their bodyparts. Objects inducing disgust include rotten food, bodily fluids, insuffiecient hygiene, bodily deformieties and injuries. Pictures will be presented in random order, with exception of pair pictures from 2nd and 3rd category will not be presented immediately after each other. Presenting order will be different for each participant. During the experiment pulse, skin conductance and facial muscle activity will be recorded by EMG [1][2].

After the experiment, participants will see pictures one more time, with a purpose of finding subjective evaluation. Pictures will be presented in random order. Participants will mark magnitude of fear and disgust, they were experiencing, looking at particular picture.

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Exploring the Chain Model

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There is a lot of empirical evidence showing that motor areas of the brain are activated both during action execution and comprehension of action related verbs, or sentences [3]. Interestingly, behavioral research and TMS research show both faciliation and interference when comprehension of motor action related sentences and execution of motor actions take place shortly after each other. This evidence suggests, that there is some relation between language processing and motor areas in the brain, but the nature of this relation is poorly understood [1].

Neurophysiological measurements show, that motor neurons encoding the same motor act exhibit different activation patterns according to the goal of sequence they are a part of. This gave birth to a theory of motor chains. The core idea of this theory is, that short action sequences are represented in brain as chained activation of pools of neurons, where each pool encodes a specific motor act. Chersi et al. [1] proposed a computational chain model aspiring to bring light to the relation between language processing and activation of motor parts. They tested the model by simulating an experiment inspired by previous experiments on human subjects. My goal is to implement the proposed model, replicate the simulated experiment and simulate my own experiment after the first is replicated successfully.

The model consists of neuronal pools organized in chains, where the behavior of each pool is described by a firing rate model [2] with time dependent synaptic currents. The first experiment examines the facilitation and interference in activation of brain motor areas when an action is executed shortly after an action related sentence is presented to the subject (model in my case). The delay between stimulus (sentence) and execution is the independent variable and the firing rate of particular motor area is the dependent variable. I expect to observe temporal relation of interference and facilitation to delay as in [1], comparable to results obtained from experiments with human subjects.

This exploration is a logical first step for my subsequent research regarding the chain model, which could help entangle the wires connecting language processing and motor areas in the brain and for the use of this kind of models in context of cognitive robotics.

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Refinement of the Learning Centre of BMA1

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Introduction

Cognitive architectures have the goal of modelling human cognition. These models may be implemented to simulate different aspects of cognition like learning or behaviour-generation. To achieve the modelling goal it has been proposed to analyse how children learn to perceive and behave. The so-found principles should to the creation of machines, which may develop cognitive characteristics of adult humans after a course of education and parenting. Last year a new cognitive architecture for this so-called baby machine approach has been proposed: BMA1 [1]. The description lacked details in the most important section, the learning centre. The following presentation is aimed at adding some recent findings to the architecture.

Motivation

A working architecture of the human mind will allow for example simulating learning under different conditions. The so-gained knowledge will influence teaching methods and make new kinds of tutoring systems available [2]. BMA1 is assumed one of the possible candidates for further development, because it's designed to integrate the mechanics of other established architectures and neurological findings. The centre of this presentation, the learning area of BMA1, is important for making sense of the world.

Methods

Since the publishing of [1] the research has been continued purely theoretical, based on literature research & review. Many more (recent) architectures have been taken into consideration through their formal descriptions. Further influences have been drawn from learning theory courses taught at University of Leipzig, focused on Piaget, Vygotsky, and more current theories. For this abstract even a brief description of BMA1 would exceed the word count. But in the presentation the architecutre will be introduced and the novel findings will incorporated into the model.

Results

For the presentation several new aspects of the learning mechanism will be discussed:

* In respect to Kahneman's version of the dual process theory [3], it appears helpful to introduce the two systems into the architecture.
* Recent infant experiments have shed light on the recognizable patterns shortly after birth. Those patterns and the possibilities of their introduction into the architecture are of central interest.
* Recognized patterns stay activated for a certain amount of time to allow persistence of input and the possibility for multiple active realities/contexts.
* There need to be reinforcing and inhibiting signals among patterns to allow expectations and violations of them.

Conclusion

Creating a cognitive architecture is a highly iterative process. These findings hopefully contribute new evaluation and modelling criteria so that a first implementation could be realized in the near future.

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The Intuitive Mode: Being Guided Towards The New

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The emergence of new knowledge is often associated with intuition. Researchers report that they have been guided towards insights and discoveries by hunches that appeared without conscious reasoning. Some artists claim that the act of creation is characterized by intuitive guidance in which they are manifesting knowledge that emerges from a non-conscious source[1]. Within the research project the phenomenon of being in a mode of intuitive guidance in the context of knowledge creation is investigated.

Research was conducted on the basis of literature on intuition in the domains of psychology and philosophy, as well as on accounts of subjects experiencing the intuitive mode. Conceptualizations of intuition were identified and summarized. Holistic intuition, as described by C.G. Jung and Jerome Bruner, is characterized by the integration of multiple cues without conscious awareness or explicit rules. Due to the formation of new knowledge it seems to provide a common ground for examining the intuitive mode.

A definition of the intuitive mode is introduced along with conditions for its arising. It is determined by an episode of hunches -being consciously aware- that guide the subject towards the manifestation of new knowledge; the scientist towards an insight or a discovery, the artist towards the act of creation. It gets active when one is in immediate contact with an object, meaning that no expectations or schemes are applied on whatever is about to emerge. Furthermore, it pursues the quest of one's will; e.g., the artist having the explicit will to come up with a painting or a piece of music.

In the next step, research on related mechanisms was conducted. The Unconscious Thought Theory stands in favour of holistic intuition and is closely related to the intuitive mode; information is processed in the unconsciousness on behalf of one's will whereby the resulting outcomes are conscious hunches [2].

Finally, the intuitive mode was related to similar concepts of cognitive modes. Although sharing several features, the Flow-Effect by Csikszentmihalyi differentiates in its purpose; specific goals and constant feedback are required, thus hindering the emergence of new knowledge.

Presence by Otto Scharmer, and Mindfulness Meditation have an enhancing effect on the intuitive mode; one does not apply any cognitive schemes on structures, but directs attention in a judgeless manner to whatever is about to emerge.

Little research is done on the intuitive mode. Basic investigation of how or when it arises may reveal pioneering results for further research. Furthermore, it is worthwhile to investigate the impact of talent or giftedness on the likelihood of experiencing the mode.

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Language Aptitude: Evidence from Audio-vocal Speech Imitation and Grammar Sensitivity

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Language Aptitude is the ability to learn any language in a given amount of time under given conditions. It is considered to become stable when a person matures and only a minority maintains a high capacity to learn languages in the adulthood.

Recently, a study from Reiterer [1] investigated 138 German speakers during the task of imitating foreign accents. The participants displayed various degree of mimicking capacity in completely unknown languages (Hindi and Tamil). The constant presence of lower fMRI BOLD activation in the subjects showing a higher ability in imitating Hindi raises the question whether language aptitude is due to specific activations of neural architecture and to which point other high-cognitive processes play a role in the resulting performance.
The aim of this project is to throw further light on the language aptitude phenomenon. Specifically, this has been done paying attention to the relations between phonetic imitation and syntactic sensitivity, two features of human language that only recently have been considered to be related (in particular, when it comes to the neuro-linguistic effects of Age of onset of Acquisition)[2].

Methods

The project tried to falsify or validate the hypothesized correlation between phonetic imitation and syntactic sensitivity. Firstly, this has been done correlating the existing data from Reiterer's study. Secondly, a new experiment has been performed.
The experiment required a small sample of multilingual speakers with high proficiency in English and no previous exposure to Italian. To replicate Reiterer's study, the subjects have been administered with Carroll John's MLAT IV, a syntactic-oriented test focused on the retrieval of phrases' functional role. The architecture of Reiterer's audio-vocal speech imitation experiment has been re-proposed with Italian: each participant imitated 3 sentences containing distinctive Italian phonemes. Subsequently, native Italian speakers rated the sentences with an ordinal scale for the quality of native¬like imitation capacity.

Main Results

The analysis of Reiterer's sample suggested a significant positive tendency. This has been confirmed by the trend of the replication experiment, with a positive Spearman's rho correlation (0,393) between aptitude for accent imitation and grammar sensitivity. Multilingual speakers, whose syntactic sensitivity is high for second language, are more likely to be good in mimicking a completely foreign language, suggesting that innate talent for language is not confined to single language features.

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Automatic Processing of Language in Bilinguals

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Introduction

Attention is a cognitive process that helps us interact with our environment. When performing various actions, attention can be needed to different extent – this divides the actions into "automatic" and "controlled" [1]. The processing of language is considered automatic; speech and written text can attract attention very effectively even if you are immersed in a different activity. This behaviour is manifested by Stroop interference [2], where the reading of written text (language processing) is interfering with a secondary task (colour naming, picture naming or picture categorisation). Our previous experiments with Croatian and English (and work of other researchers [3]) have also shown that the interference is absent (or less prominent) in foreign languages, thus Stroop effect is visible primarily in the native language of the participant.

This study aims to find out which language is more dominant in Slovak minority in Vojvodina, Serbia. The participants live in a Serbian-speaking environment but their families are usually Slovak-speaking. They have various educational backgrounds, some studied in Slovak, some in Serbian.

Methods

This study uses a picture-Stroop task with text labels as distractors. Pictures are from two categories, animals or non-living objects. Distractor can contain the name of the object on the picture (congruent condition) or a name from the other category (incongruent condition). The experiment is implemented as a web application because most of the participants live in Serbia. Participant's job is to categorise the objects. Firstly, 5 training stimuli are shown to the participant and the presentation application responds whether the answer was correct or not. Then a set of 50 English stimuli is presented to the participant without feedback. The final stage of the experiment contains 90 stimuli in Serbian and Slovak, with languages mixed.

Expected Results

We are focusing on difference in reaction times between congruent and incongruent condition. Stroop effect is manifested by lower reaction time in congruent condition and higher in incongruent. We expect the Stroop effect to be stronger in Slovak trials. It should be weaker in Serbian trials but getting stronger if the participant had more exposure to Serbian in school or current environment. Performance in English trials is not crucial; it is used as a baseline.

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Balancing of virtual figure while moving arms

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In my project I focused on learning to sustain balance to virtual humanoid robot iCub. It was unbalanced by raising arms upward or stretching arms sideways. Robot cannot do steps for balancing.

For learning experience I used reinforcement learning approach with punishment and also with reward. It is obvious that punishment is received after not sustaining balance and falling on floor. Reward is rising with longer time of successful balancing. The point when balancing is considered as unsuccessful is when misalignment overruns constant variance. This variance is critical boundary of angle in balancing organ towards angle of floor.

I designed monitoring of balance as it is in human. Human balancing organ is in head and balance in managed by motor cognition and body. In case of robot I consider global position of head as his balancing organ.

The longer robot keeps variance inside critical boundary, the higher reward it gets. According to reward value he can reveal moment when his decisions were fine and then manage angles of joins in sequence. Change of previous decisions will spread from latest (as major change) to earliest (as lowest change). Some of the decision may become stable. After successful balancing all decision become stable.

During learning algorithm, arms and one of the balancing joins are changing. In every time unit, angles of arms are changed constantly and angles of other pair joins are changed randomly according to weights.

Which joins are used during balance? One of my hypotheses is: the lower number of active balancing joins is, the shorter time is needed to learn sustain balance. I tested ability to learn sustaining balance with various conditions (various numbers of active joins) and analyzed its fruitfulness, velocity in reaching optimal result and similarity of solution with human balancing. In case of human balancing are most important ankles, knees and hips.

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SleepCog Pilot Study

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Our experimental research has focused on the qualitative and quantitative aspects of sleep and its consequences – particularly the impact of disrupted sleep on cognitive functions (especially attention) during the next day. Some of the previous studies concerning this topic suggested that sleep quality rather than quantity could be the determining factor for cognitive performance [1], but only in specific cognitive functions [2] among older populations. Based on conclusions from these and some other experimental studies found in literature, we have formulated our hypotheses concerning the impairment of cognitive functions caused by decreased quality or quantity of sleep in comparison to cognitive performance after an unaffected sleep. In our pilot study we have performed sleep modification experiments in a sample of college students. Participants were randomly assigned to one of the experimental groups (one for the qualitative and one for the quantitative aspect of sleep). We have modulated the qualitative aspect of sleep by frequent sleep disturbances (a simple task of rejecting phone calls made at a constant time interval - sufficient to wake the participants for a very brief moment) during the whole night (while the total sleep duration remained unchanged) and the quantitative aspect by means of sleep deprivation (without any additional constraints). Cognitive performance of each participant was assessed two times during the day after an ordinary unaffected sleep and two times during the day after sleep quality or quantity manipulation with the use of attention tests from the CogLab software (which measures reaction times to various stimuli in milliseconds). The raw collected data were then statistically analysed with the statistical software SPSS (alternatively PSPP). At present, we are finishing our data analysis. In the future, we would like to repeat measurements with the same experimental setup in an enlarged experimental sample, but focusing only on those parameters and those daytimes where the significant differences have been found in the pilot study. Furthermore, we would like to revise the methods of measuring attention (e.g. a more suitable custom-made application instead of the CogLab software). The potential asset of our research could be aimed at the researchers involved in the SleepCog project for inspirational purposes concerning methodological tips for measuring and quantification of cognitive functions.

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Towards a Test for Self-consciousness in Artificial Agents

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Consciousness and our conscious experience of self and the world are considered the most puzzling aspects of the human mind. In addition to interdisciplinary philosophical and empirical work on consciousness, research in the field of Machine Consciousness focuses on engineering conscious robots or software models of consciousness. Although this approach is able to shed light on many aspects associated with the phenomenon, there is no accepted test that could tell whether or in which sense an artificial agent instantiates or simulates consciousness. Therefore, my aim is to develop a test for consciousness that can be applied to artificial agents.

Starting with the premise that consciousness above all concerns ourselves and is therefore also a problem of self-knowledge, I argue that self-consciousness and self of human beings take primacy in approaching the topic. Moreover, self-consciousness and self-knowledge are directly related. Based on the work of Metzinger's self-model theory of subjectivity which already provides a theoretical foundation for interpreting self-consciousness and self in a functionalist-representationalist way [3], I argue that the use of self-knowledge to guide one's actions in social situations should be the relevant criterion for assessing self-consciousness. Furthermore, consciousness seems to come in degrees. For instance, one generally feels self-conscious to a greater degree in everyday waking consciousness than in dream consciousness. This line of thought can be extended to waking consciousness too, so that this may as well be a matter of degree. If this is true, some people could be self-conscious to a greater degree than others.

Inspired by the work of Floridi [2], I aim at developing a game that is played by two human players and won by the player with the greater degree of self-consciousness. The underlying assumption is that the degree of self-consciousness is reflected in the courses of action of each player. An explanation will be provided in terms of information integration [1]. Requirements for an artificial agent's cognitive architecture resulting from the level of abstraction of the game will be derived using a top-down approach. Finally, I will argue that an artificial agent that meets these requirements should have the means to compete against a human player.

Acknowledgments
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Qualitative study of prolonged sitting's effects on cognitive tasks performance

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Introduction

The following paper explores phenomenological accounts of the effects of prolonged sitting on the performance of cognitive tasks. In the context of this paper the notion of 'sitting' refers to a work- or education-related static bodily position (typically at a desk or in front of a computer). To be discussed, in particular, are the perceived effects of prolonged sitting in relation to two extreme views: a) static sitting as a de-arousing stressor [1] (similar to sleep deprivation) and b) static sitting as a necessary stimulus deprivation that facilitates the focusing of attention. Arousal is regarded as a focal point of this paper, given the fact that it represents a key to linking the related research on stress and task difficulty. An important contribution in this regard is the work of Kamijo et al. concerning the interactive effect of exercise intensity and task difficulty on human cognitive processing [2]. Further physiological mechanisms to be accounted for, in relation to embodied cognition, are proprioception system, muscle metabolites and blood supply to the brain. The assessment of the subjective perception of one's own abilities to tackle mentally-demanding tasks during a prolonged period of passivity (i.e. sitting), is performed by means of qualitative interviews.

Methods

The theoretical foundation of this paper encompasses, among others, such scientific fields as cognitive science, neuroscience, ergonomics and psychophysiology. Information about the subjective perception of the effects of prolonged sitting on the ability to tackle mentally challenging tasks has been acquired through retrospective semi-structured interviews. Research subjects have been asked questions encompassing their sedentary behavior and preferences in connection to cognitive problem solving. Interviews are kept short, but informants are encouraged to share additional opinions or experiences.

Further empirical data is assessed by way of participant observation in a public library - place where prolonged static sitting is a common practice. Behavioral observation accounts are then combined with the phenomenological report of perceived bodily and cognitive effort.

Results

This paper accounts for the general tolerance towards prolonged sitting and individual differences. The analysis of its influence on cognitive performance can, in turn, account for a broad range of results. The expected result is qualitative data that enables creation of the models of body position's influence on cognition. Such models can be used for prototyping practical solutions that enhance cognitive performance.

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Parental Input and Its Influence on Children's Language Development

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Introduction

This project investigates the influence of parental input on the language development of children, specifically, the role of differences in socioeconomic status as well as gender of the subjects. Extensive studies suggest that the quality and quantity of caregivers' input differ according to the socio-economic status (SES) of families – with children from a higher background receiving more and richer input than children from a low SES background – and that this input may predict later language abilities [1].

The present study is set within the framework of the larger INPUT project, which is conducted by the Comparative Psycholinguistics Research group. The INPUT project examines the role of family and kindergarten teachers' input on language acquisition of German and Turkish speaking kindergarten children. This particular project is not concerned with cross-cultural differences, but the focus is rather on differences due to socioeconomic status and gender within German-speaking families. Research has shown that fathers seem to use more imperatives, especially when talking to their sons, and that mothers use tag questions more frequently [2]. Therefore, this project looks at possible gender differences and investigates if those may stand in relation to the socioeconomic status of families.

Methods

The data used in this study comprise four one-hour-long audio and video recordings of spontaneous interaction between the main caretaker and the child set in the homes of four different subjects – two high and two low SES families with one boy and one girl in each SES group. All the children are approximately 3.0 years old in order to attain comparable results. From these one-hour recordings, 30 representative minutes are chosen, which then are transcribed, coded and analysed using CHILDES. Furthermore, qualitative analyses are applied as well as statistical analyses using SPSS.

Results

Preliminary analyses already suggest that, indeed, children from higher SES families receive qualitatively and quantitatively richer input. In the case of the low SES boy, the mother uses mostly simple utterances and rarely even reacts to mistakes the boy makes. In contrast, the high SES mother uses more difficult words and sentence structures and engages much more with the boy, e.g. via the frequent use of tag questions. Regarding the aspect of gender, as all the main caretakers are mothers, analyses are slightly restricted and but it is still possible that there will be notable differences in interactions of mothers with their sons and with their daughters. Yet, as especially the interrelation of gender and SES in parental input and its influence on children's language development is a rather novel and interesting aspect, more extensive research is advisable and may lead to a deeper understanding.

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Effects of Death Priming on Risky Behavior Engagement

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Terror management theory (TMT) states that by creating a culture, humans try to gain a sense of immortality in order to overcome death related thoughts. In TMT, self-esteem is considered to be an anxiety buffer against potential fear of death found in death primed people [1]. Furthermore, the likelihood of performing a risk-taking action rises when the possibility of a negative outcome is perceived to be minimal or the potential gain is perceived to be great [2]. Correspondingly, individuals may tend to engage in risky behavior if it is likely to raise their self-esteem [3]. We investigate this relation by examining the impact of death primes on a simple risk taking task.

The study comprises three distinct phases.

In the first phase, the participants are separated in two groups based on visual death/pain priming by ten simple word recognition tasks. The priming is conducted by a Java applet which instructs subjects to classify words in verbs and nouns.
The second, incubation phase lasts five minutes and consists of thirty simple tasks: unrelated questions with a purpose to distract subjects from conscious death/pain thoughts.

In the third phase, the Balloon Analog Risk Task (BART) method is applied. The participants are presented with ten virtual balloons sequentially, and asked to inflate them by pressing a keyboard key, receiving one virtual dollar for each press/inflation. The exact moment of the balloon burst is unknown and randomized, thus ten balloons will be inflated either to the level determined by the subject, or to the level of burst. Point of burst is set to be different for every of the ten balloons but same for all participants in both groups. The participant receives no virtual dollars for a particular balloon in case of burst and the goal is to collect as many virtual dollars as possible.

In our hypothesis, we expect death primed subjects to engage in risky behaviors more, due to the deprivation of their beliefs and cognitive control. This aspect is observed also as the sum of all inflations regardless of the outcome. Should the death primed group significantly outperform the pain primed group in the total number of inflations, this study will provide another perspective of relation between the TMT and risk-taking behavior, using a unique combination of methods.

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Associative Memory for Multimodal Representations

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Multimodal representations are distributed and dispersed in multiple specific modalities. This representation includes visual, proprioceptive or other modality. According to Barsalou[1] information travels from sensors up to neurons in feature modules, which produce a modality specific representation. Conjunctive neurons in association area then capture representations from multiple modalities and connect them in one. In absence of input from particular modality, conjunctive neurons can partially reactivate representations in feature modules and reenact or simulate earlier sensory inputs. As a means for sensorimotor simulation might be used Common coding theory [2], which suggests that there is a common representational base for perception and action (motor performance). The perception of action automatically activates its motor component (motor resonance) and vice versa.

In this project we implemented artificial neural network (ANN), which simulates the behavior of conjunctive neurons in association area and works as associative memory (AM). Our hypotheses is that such AM could be used to simulate missing sensory inputs, which were presented to it earlier. In our case, the network received information from two modalities at once, visual and proprioceptive (motor) and integrated it. This information was produced by two feature modules. To test our implementation, we presented the trained AM with input from just one modality and expected it to complete the missing part of the representation for other modality. Particularly, we were interested in reproducing motor resonance.

For our AM we chose Restricted Boltzmann Machines (RBM) [3]. The RBM is an ANN which uses a biologically plausible algorithm similar to Hebbian learning. We used its pattern completion ability. RBM was chosen also for its good performance when storing so called "sparse" representations, in which just small set of neurons carries the information. RBM received sparse representations generated from two separate ANN modules. These modules consisted of ANN which are able to process temporal data. One module was processing input from visual and second from proprioceptive modality. Representations generated from these modules were acquired during execution of three types of tasks in iCub robotic simulator.

Our RBM was able to successfully complete the missing parts of learned representations. This supports our hypotheses.

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Does Daytime Saving Time Steal Your Time?

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Mankind was dependent upon light in every area of our lives, so we adapted to be active during the day and to sleep at night. Vital for the process of sleep and wakefulness is the circadian rhythm, which is driven by a suprachiasmatic nucleus (SCN) whose functions are determined by light [1]. To receive more daylight during the hours when majority of people is active and to save electricity, the idea of changing current time one hour forward was widely introduced during the energy crisis in 1970's and is known as Daytime Saving Time (DST) [2]. Because no one is questioning the DST, we decided to conduct a research in collaboration with the Sleep Center in Ljubljana to statistically measure effects of DST on people. Our hypothesis was based on Richardson's [1] and Wright's [3] research, how the people who got an hour less sleep on the day of the switch, will be affected during the next day. The other hypothesis was that the surveyed will prefer the winter time set, because it is more "natural" (sun being on highest point at noon).

We conducted an internet survey involving 620 subjects (59% men, 41% women, aged 14-88 years) lasting from 31st of March (on the day of DST) till 8th of April 2013. Subjects were asked about changes in their duration of sleep in general and on the day of the switch, about the effects of DST after it, how long were the effects noted and what their subjective opinion on the DST is. The results were analyzed with the statistical program SPSS and the following findings are statistically significant ($p < 0,05$). 76.3% of the surveyed find the switch preposterous. 65.8% subjects who slept at least one hour less on the night of a switch felt the effect of tiredness and 33.4% had lack of concentration. The effects of the DST were felt by 53.9% subjects two days or more after the switch, which must have some negative effects on general productivity of society, in long term it could even result in some medical conditions. The favorable time set was in 75.8% the summer time, because surveyed like to have daylight after work.

Based on the results the surveyed do not find DST reasonable, because it takes their time to inure. There are doubts about DST decreasing general energy consumption and a big possibility that DST interferes with circadian rhythm and in long term there might even be some neurological issues that are not yet clear [3]. For this reason we believe that following research should be done on a bigger scale and on a long term basis, with different methods to investigate consequences of the decision made almost 40 years ago and is now widely taken for granted.

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Can a Change-Raising Scam Be Adapted to Measure a Cognitive Ability?

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I explore the possibility of recreating real-world situation as test in decision making tasks in can be a promising avenue for the future research and application. I adapted a change-raising scam, which is often used by con artists, for laboratory conditions and developed a test situation (the Monopoly task) that elicits a specific error in subjects' judgement.

In the Monopoly task, the experimenter plays a trading board game with the participant. The experimenter asks the participant to handle the bank. During the game, the experimenter attempts to get a change from the bank. The experimenter then begins buying an item from the bank before finishing the first transaction by confusing the participant. In the end of the joint transaction, the experimenter asks the participant how much money he owes the bank.

During the pilot phase of my research (N1=10) I manipulated with various aspects of the situation. When confronted with the described scenario, 2 of 4 participants responded with the amount of money lower by exactly how much they had given the experimenter in the first part of the transaction (erroneous answer).

In the second phase (N2=11), I examined the Monopoly task to determine if it can be reproduced and will result in a behavior comparable between subjects. I explored the relation between the performance in the Monopoly task and two established tests of possibly related personality dimensions. I measured the tendency to reflect on the first answers that come to one's mind with the Cognitive Reflection Test (CRT)[1]. I used the Vienna Test System to administrate an objective personality test that measures Impulsiveness vs. Reflexivity.

Five of 11 Monopoly tasks administrations were unsuccessful. From the remaining 6 participants, only 1 answered correctly and 5 gave the erroneous answer. Along with the observations and interviews that were conducted with the participants, the results provide a starting point for developing a test situation suited for experimental manipulation, that will allow investigations into cognitive processes involved in this error. I intend to create a game, where transactions studied in the Monopoly task will be occurring more frequently. I expect the new task to increase the robustness of the test and to shorten the administration time significantly.

The improved Monopoly task might find use in research, but could also inspire a creation of a new measure to assess the Resistance to Miserly Information Processing; a dimension of rationality proposed by Stanovich [2].

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The Influence of Attention on the Pattern Electroretinogram and Visual Evoked Potentials

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Purpose
Pattern electroretinogram (PERG) and visual evoked potentials (VEP) are important tests for diagnostics of visual disorders. They can objectively evaluate the function of the macula (PERG P50 wave), retinal ganglion cells (PERG N95 wave) and visual pathway up to primary visual cortex (VEP P100 wave) [1]. It is well established that head movements, muscle stiffness, changing eye position and poor fixation can contribute to abnormal responses [2], [3], but a technician can observe and correct them while recording. The problem arises when subject's cooperation and fixation appears appropriate, but their attention on their visual task is actually reduced. They may be daydreaming, concentrating on another task or their eye focus fixation may not be accurate. The aim of the study was to examine, if PERG and VEP might be affected in healthy subjects, when attention is decreased and whether that could lead to abnormal results and misdiagnosis.

Methods
A group of 10 healthy subjects participated in the study. PERG and VEP were recorded simultaneously from one eye, with Espion visual testing system (Diagnosys LLC, MA, USA). The stimulus was presented on a 21.6° X 27.8° screen stimulator, a 50' checkerboard pattern with 99% contrast was reversing 1.8 times per second. The recordings were obtained from non-dilated eyes, and 100 responses were averaged and repeated twice. 10 different sets of recordings were made, 8 with different tasks (simulating lack of attention or sensory distraction) and 2 with full attention (one at the beginning and the second one after the fifth test). Latency and amplitude of waves P50, N95 (PERG) and P100 (VEP) were analyzed.

Preliminary Results
Our preliminary findings in three subjects indicate that there is a difference in PERG and VEP amplitudes between the tests, obtained with optimal, full attention and those with lower attention. The biggest deviations from optimal recordings were observed, when subjects simulated blurred focus (percentage of the amplitude decrease: P50=35±16%, N95=17±9%, P100=16±5%) and near-distance focus (P50=22±4%, N=20±3%, P100=12±6%), and were most probably caused by a decrease of stimulus contrast. However, a notable deviation of the cortical response was detected also during the auditory distraction (percentage of the amplitude decrease for P100=7±1%), which did not appear with a simultaneous decrease of the retinal response (both P50 and N95 waves increased during that task), indicating an influence of complex interactions of the central nervous system.

Conclusion
Lack of attention doesn't alter the PERG and VEP patterns so significantly, that healthy subjects could deliberately produce abnormal responses. However, it can causes borderline results to exhibit false positive abnormality. In the aspect of cognitive science our results suggest that seeing is not a passive process, happening when the eyes are opened, but it rather reflects a complexity of visual system, which can be influenced by deliberate shifts of attention.

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Impact of Motor Action Familiarity on Motor Resonance

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Mirror neurons were originally discovered in area F5 (responsive to goal-directed hand and mouth movements) of the ventral premotor cortex in macaque monkeys. Neurons in F5 discharged not only during the execution of a certain grasping movement, but also when the monkey looked at the experimenter producing the same action. [1]

Some of the strongest evidence testifying to the presence of mirror neurons in humans, however, has been observed in a phenomenon called motor resonance. Motor resonance is a partial activation of motor neural circuitry, caused by sensory (usually visual) stimulation. In other words, this activation of the sensorimotor cortex, normally responsible for voluntary movement-based actions, is also witnessed when subject is perceiving that particular movement/action in question. This is a theoretical interpretation of empirically documented cases, where de-synchronization in μ-rhythm (EEG) led to linking this very phenomenon with the already established framework of the system of mirror neurons in humans. [2]

The experimental design in its entirety will consist of two groups of subjects – an experimental group (primed seven days prior to the experiment by repetitiously executing object-oriented action) and a control group (with no prior experience with the said action) will watch video stimuli, while their EEG waves will be recorded. The stimuli, a person exercising aforementioned particular object-oriented motor action and multiple other ordinary actions as a control, will be taped (various angles) beforehand to keep the conditions uniform for all the subjects.

The pilot part of the research, intended to test and adjust the experimental design and stimuli will compare two groups of subjects. The experimental group will entail professional makers of the traditional Slovak musical instrument – fujara. The control group will consist of subjects unfamiliar with the specifics of the fujara making process. The stimulus, a specific movement included in the process of fabrication, will be presented to the subject, with control stimuli in form of different types of other actions for comparison.

The hypothesis states that the observed de-synchronization of the μ-rhythm in subjects from the experimental group should be significantly higher with respect to the control group and to the control stimuli. Output in the form of density maps for spectral subtractions will be presented to demonstrate either corroboration or repudiation of the hypothesis. [3]

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Effects of Distraction on Creativity

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Distraction as Part of the Creative Process
There are anecdotes of creative writers who do different things during their writing process. One example is Trey Parker, the co-creator of the TV series South Park. He plays Lego, because he believes that it helps him to activate other parts of his brain. A closely related concept from creativity research is incubation, which is defined as "setting the problem aside for a time, after a period of preliminary work" [1]. Its beneficial role in the creative process has often been reported and is widely accepted in the scientific community [1,2].

Studies based on the incubation paradigm assume that we have to set the problem aside in order to take advantage of a distraction task. In this study, however, the goal is to examine the effects of distraction not only during incubation, but also during the creative process. If performing different routine tasks during creative work has similar effects on our creative performance as incubation, it might change our models of creativity and it might allow us to improve our creative processes.

Study Design
Divergent Thinking (DT) is the ability to generate many creative ideas about a topic and it is considered to be an indicator for creative potential [3]. In this study, the subjects have to perform a DT task which consists of finding as many ways as possible how certain objects can be used. e.g.: a brick (as weights for weightlifting, as sponge, etc.). As distraction task, the subjects have to solve very simple children puzzles.

There are three conditions: A control condition, an incubation condition and a multitasking condition. In the control condition, the subjects only carry out the DT task. In the incubation condition, the subjects have to perform the DT task, switch to the distraction task in the incubation phase and then they return to the previous DT task. In the multitasking condition, the subjects have to perform the DT task and the distraction task simultaneously. Creativity is measured through originality (relative frequency of a response) and fluency (total amount of responses of a subject).

Expected Results
Since the multitasking condition represents the strongest cognitive challenge, we have to expect that the subjects show the worst performance in this condition. If the subjects benefit from the distraction task, however, we might need to interpret previous studies on incubation differently. Further studies on the underlying mechanism would be required.

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Natural Language Analysis Using Machine Learning

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Human language is an intricate tool. However, we are able to quickly reach high level of proficiency by process of rapid learning. By observing and imitating human communication, we continuously gather vast amounts of meaningless data, which at some point start to make sense. We begin to see patterns in language. So why shouldn't we do something similar with machines?

As our collective knowledge continues to be digitized and stored – in form of news, blogs, scientific articles, books, images, sound, and video – it becomes more difficult to find what we are looking for. We need tools to help organize, search, and understand these vast amounts of information. One of the best algorithms for this task is Latent Dirichlet Allocation[1], but artificial brains, i.e. artificial neural network models, can perform and scale much better.[2]

In this study, we present an attempt to find a semantic structure in a collection of documents comprising of subtitles for movies and television shows. The corpus, provided by OpenSubtitles.Org, contains 216,303 documents in English language spread across various movie genres, years of production, countries of origin, etc. Our aim is to correctly predict genre of the movie solely by occurrence probabilities of 2000 most common word stems.

We used Replicated Softmax [2], an undirected topic model derived from Restricted Boltzmann Machine, for obtaining 50-dimensional semantic codes based on topic probabilities. After completing dimensionality reduction, we performed embedding onto 2D plane utilizing Barnes-Hut-SNE algorithm [3] and color-coded each document by genre associated with the document.

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Spectral analysis: case study of EEG in young adults

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Introduction

The purpose of the study was to process spectral analysis of EEG of ten age-matched healthy subjects that were later compared with spectral analysis of EEG of HIE patients who were part of a broader topic research. The latter learning disorder was observed in mild to moderate hypoxic-ischemic encephalopathy (HIE) patients in the absence of other neurological consequences. Spectral analysis was used to find specific frequency characteristics in alpha rhythm. The spectrum was expected to show coherency of learning success and local maximum of alpha oscillation.

Hypoxic-ischemic encephalopathy (HIE) is a condition after oxygen deprivation in the brain. Usually the term refers to injury sustained by newborns after injury or complications during birth but in general it refers to condition in which the brain does not receive enough oxygen. Other causes: respiratory failure, drug overdose, choking, extremely low blood pressure, drowning, blocked or ruptured blood vessel and others. The disease can cause long-term damage, including intellectual disability, delayed development, seizures, and cerebral palsy. It can also be fatal.

Methods

We studied ten healthy students: 5 females (50.0%) and 5 males (50.0%), mean age 23.2±1.1 years. Participants were examined and interviewed, follow-up with the EEG after sleep deprivation. They were also asked not to consume any alcohol, drugs and/or caffeine because of its possible impact on the alpha rhythm. EEG was made with 30 electrodes and recorded at 256Hz sampling rate. Electroencephalographic signals' features present wide frequency range and for that reason we used spectral analysis to decompose the signal into brain rhythms. When processing data we observed local maximum of alpha rhythm in relation to learning success of individuals who were declared not to have any learning problems in the past.

Results

In our group of healthy students 10 (100 %) had local maximum at mean 7 ± 1 Hz. Median value of spectrum rebounds was 57%, with distribution of values ranging from 18% (25th percentile) to 162% (75th percentile). These were successful students with no learning problems.

Conclusions

Local maximum in the alpha spectrum is observed in young healthy people with no learning disorder, while it is absent in patients with mild to moderate HIE showing learning disorder problems. With results of spectral analysis we can observe correlation of ones neurological features and learning success. For now we cannot talk about statistically relevant data, however, a follow-up research which will include more participants is planned in the near future.

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Assessment and correlation of hand function in children with unilateral hemiparesis after perinatal ischaemic brain injury with functional and diffusion weighted imaging

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Background
In hypoxic ischaemic encephalopathy (HIE), the corticospinal pathways, which are involved in voluntary skilled movements, may be damaged. The consequences can be recognized as various motor impairments, such as one-sided hemiparesis.

Aim
The aim of this study is to describe the evidence of corticospinal pathway reorganization following neonatal stroke, using functional magnetic resonance imaging (fMRI) and diffusion tensor imaging (DTI) techniques, as well as to evaluate and correlate success of work therapy with the Assisting Hand Assessment (AHA) and imaging results.

Patients and Methods
AHA is a hand function evaluation instrument which offers a new perspective to the validation of hand functions. It measures how effectively the affected hand and arm are used in bimanual performance and gives the opportunity to explore correlations with corticospinal pathway integrity. Comparing AHA and imaging results may offer insight into reorganization of the corticospinal tract and influence the goals and limitations/success of work therapy. DTI with tractography is a unique tool for visualizing and segmenting a white matter pathway in three dimensions and evaluating the segmented tract quantitatively and qualitatively. In the study, we include children with perinatal HIE, who have clinical evidence of perinatal hypoxia defined by Sarnat and Sarnat (year!) criteria, and who had a follow up at age of 2 which showed evidence of one sided hemiparesis, GMFCS 1-2. We also include children who completed work therapy and AHA at the University Rehabilitation Centre Soča, Ljubljana. In children who are able to follow commands included in the motor paradigm and lay still for thirty minutes, we are performing fMRI and DTI, thus concluding our study.

Results and Discussion
We want to show that perinatal HIE, which involves the corticospinal tract, is associated with maintenance and reorganization of corticospinal pathways and is sufficient to maintain some degree of hand function in the affected hemisphere.

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Shared Neural Underpinnings of Anticipatory Processes and Theory of Mind

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This paper renders the common neural underpinning of anticipatory processes and theory of mind. Recent studies account for neural correlates of an anticipatory system and theory of mind (ToM) in the anterior cingulate cortex (ACC). I argue that the ACC might instantiate global, large-scale inhibitory control and that this faculty is particularly necessary for ToM, anticipatory processes and, more generally, for higher-order intentionality.

Theory of Mind and the Anterior Cingulate Cortex

While the ACC was proposed to be the predominant underpinning of ToM, it is known that it embodies a decoupling mechanism, which is responsible for distinguishing mental representations of reality from virtual representations. Moreover, the ACC enables taking an intentional stance, especially when at least two individual minds have to be mentally separated. That is, the ACC facilitates second or higher order intentionality [1]. An immediate response to environmental stimuli has to be suppressed in the first place, so as to instantiate the cognitive disposition for higher-order intentionality. The suspension of first-order intentionality thus enables higher order intentionality.

Anticipation and the Anterior Cingulate Cortex

Still, one cannot find a unified neurobehavioral notion of anticipation. In contrast to ToM, anticipation has never been proposed to rely on the ACC activity in general, nor was the ACC suggested to be the prior mnemonic capacity that contributes to anticipation.

Nevertheless, it was found that the ACC is increasingly activated during anticipation in cognitive tasks, i.e. semantic judgment tasks. Before the task was performed, an increased hemodynamic signal was found in the ACC, suggesting that the anterior cingulate contributes to anticipatory, preparatory cognitive processes [2]. More specifically, the ACC has also been shown to be involved in anticipation of conflicting stimuli, anticipation during uncertainty and reward-related feedback. In the according specificities of anticipation, inhibitory control is essential in order to adapt sufficient temporal latitude for processes that instantiate decision-making.

Inhibitory Control and the Anterior Cingulate Cortex

In general, the ACC contains evolutionary novel spindle cells, which were speculated to contribute to reward delay and the execution of deception, which are based on inhibitory control [3].

In this paper I propose that ToM and the anticipatory system draw on inhibitory control that is implemented within the ACC. Following this, future research has to elucidate the according finding in more detail.

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Toward Automatic Feature Extraction in Brain-Computer Interfacing

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Introduction

Brain-computer interface (BCI) systems provide communication and help control capabilities to people with severe motor disabilities. In their non-invasive form, BCI systems use brain signals recorded from the scalp (EEG) to control the environment (e.g. neuroprosthesis, or wheel chair). Performance of BCI depends on the measured brain signals, signal processing methods that extract signal features, algorithms that translate these features into device commands, output devices that execute these commands, feedback provided to the user, and characteristics of the user [1]. BCI2000 is a widely used open software that can be used for BCI applications[1]. Typical BCI applications based on motor imagery provide two device commands corresponding to different brain conditions (extracted from the signal), such as imagined motor action versus relax condition.

Common Spattial Patterns (CSP)

CSP is a commonly used supervised linear feature extraction method used for maximizing discrimination of two conditions (of feature vectors). The projections of the preprocessed EEG data (in terms of their spectral characteristics) are chosen in a way so as to maximize variance for one condition and minimize for the other [2].

Using CSP in BCI2000

In BCI2000, feature selection is done by offline analysis tool that shows the difference between the two conditions for each electrode and frequency range after a training session. The CSP routines have been designed for off-line analysis to be integrated in BCI2000 that does not come with this feature extraction method [3]. The project goal is to use CSP for automatical selection of features (combination of electrodes and frequencies).

Method

Measured data from previous EEG experiments (using 8 channels) will be processed by standard BCI2000 offline analysis and by offline analysis using CSP using algorithm desribed in [3]. Their comparison will show the possibility of substitution of CSP filter for standard offline analyses. Using CSP online in the user application would be a useful step toward adaptive BCI systems, together with adaptive signal classification, that can also use CSP results.

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Are Swings Cognitive Artifacts? The Case of Pendulum Motion and its Effect on Human Cognition

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A suspension in space, a hiccup of weightlessness before a violent plunge, a pursuit of entropy against the pull of the equilibrium, a game against gravity: a swing is not merely a playground item but a complex phenomenon/experience with multiple sense-modalities. However, there seems to be little place for swings in the constellation of human adult games and play. With this research, we explore the influence of self-propelled swinging movement on a manifold of cognitive processes in adults.

The approach used for the research consists of two main parts, an analytical and an empirical study.

For the analytical part, we deconstruct swinging into three levels: the first level studies the pendulum motion from the point of view of physics and mathematics, a macroscopic perspective [1]. With a turn to kinaesthetics and body scheme theory, the first level spills into the second, microscopic level: an outlook from neurophysiology, where we investigate proprioception, sensory and motor systems involved, visual and vestibular systems and finally, the psychophysiological effects. Where the second level converges to psychology, we arrive to the third one: the cognitive science in humanities approach. Here we argue that swings are a physical interpretation of ilinx- a term in game studies that describes a kind of play that causes temporary perception disturbance. The third level finishes with an overview from philosophy ('what is it like' to swing), semiotics, ethology and cultural anthropology- building a case of a swing as a cognitive artifact. The initial three-level analytic part of our research concludes with a comparative study between the swinging motion as an (un)conscious oscillatory movement and the rocking motion as an ideomotor phenomenon.

The empirical core of the research is a synthesis of a questionnaire, an experiment and an EEG study. The questionnaire presents an overall statistical foundation and is an overview of 250 adult participants, their aerobic exercise habits [2], engagement in play behavior etc. The experiment employs 40 adults in two groups, swinging and control, both tested with a Torrance test of creative thinking, not evaluated by the experimenter to avoid rating bias. Lastly, the EEG study presents a pioneer measurement of effects of swinging such as neural oscillations, heart rate, pulse.

The results from the first, analytical part, present a ground base for the study of swings as cognitive artifacts/interface; while the second, empirical part, confirms our hypothesis that swinging motion has a substantial (immediate) effect on cognition i.e. increases one's creativity.

Our research shows that a simple phenomenon can lead to complex consequences; and while the study is ongoing and exploratory, the implications of this discovery can offer insight to cognitive technologies, play studies, environmental design and affective neuroscience.

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Tremor Analysis Using Computerized Spirography

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Tremor is the most common movement disorder [1]. It is described as rhythmic sinuisoidal alternating movement [2] and it is the result of a rhythmic and alternate contraction of agonist and antagonist muscles. Several methods of tremor quantification have been described: electromyography, accelerometry and spirography. Computer-assisted spirography has been used to evaluate tremor in different neurological diseases. The system consists of a computer, a digital tablet and a special pen. The task of the patient is to draw an Archimedean spiral [1]. Besides frequency, several additional parameters can be analyzed by spirography. These parameters, analized by a specific computer program, help to define the tremor more exactly.

We have tested computer-assisted spirography in 45 subjects (15 patients with Parkinson's disease, 15 patients with essential tremor and 15 healthy controls). Computer assisted spirography seems to have a high sensitivity (1.00) to detect cases without tremor. The sensitivity of this method for detecting essential tremor (ET) is higher (0.76) compared to tremor in Parkinson's disease (PD) (0.62). Similarly, computer-assisted spirography has higher specificity (0.95) to detect ET than tremor in PD (0.82). The advantages of computer-assisted spirography compared to other methods of tremor assessment are low costs and simplicity. It can be used as a complementary tool to determine tremor more accurately. The applicability of the method should be tested to evaluate other tremor types: dystonic, functional and cerebellar. Computer-assisted spirography should be compared to other methods of tremor differentiation, e.g. DaTSCAN (dopamine transporter SPECT imaging).

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Towards a Model of Juggling: A Comparison of Sensori- and Ideo-motor Theory

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This paper is meant as a point of departure towards a better understanding of juggling and thereby the link between perception, action and cognition. In order to begin exploring this topic current research in the sensorimotor approach is compared and contrasted with ideomotor theory, in terms of a complex motor task: Juggling. The goal is to demonstrate that through consideration of a practical example, advantages and disadvantages of a given approach can more easily be brought to light and that two opposing paradigms need not be mutually exclusive.

The sensorimotor paradigm suggests that perception guides action, whereas ideas/intentions make use of actions for their realization in ideomotor theory[1]. Both approaches come with a different idea of representations, as well as different intuitions on how perception, action and cognition come together. In order to discuss the implications of these paradigms, this paper first outlines the main points of sensori- and ideomotor theory and highlights some of the ongoing research. Subsequently research and personal experience from juggling is accessed in order to investigate the explanatory power of these approaches for specific examples:

1) learning of three-ball juggling [2] and learning of blind juggling (juggling against your body)
2) synchronous/asynchronous pattern stability in 4-ball juggling [3]

In 1) individual differences in learning need to be accounted for, as well as the relatively easy transition to blind juggling. This suggests a similarity between representations of information from different modalities. Concerning 2), studies have shown that contrary to previous research on bimanual coordination, synchronous and asynchronous patterns in 4-ball juggling are equally stable. Both the learning of three-ball cascade juggling and 4-ball pattern stability have been studied previously whereas data for blind juggling is gathered in the form of interviews.

In continuation ongoing research that incorporates ideas from both paradigms is considered and evaluated. In conclusion two implemented systems that make use of the aforementioned approaches are discussed in order to evaluate how the theory can be put into practice.

Finally, in the conclusion, findings are summed up and further possible steps towards a model of juggling are suggested. The expectation is, that neither approach can exhaustively account for the different phenomena examined, possibly not even between them, yet a tendency towards the ideomotor approach will be revealed.

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Control of a Robot Movement by Non-invasive Brain-Computer Interface (BCI)

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In our research we deal with the usage of an action invoked potential p300 to command a movement of a mobile robot.

We use the traditional model of P300 BCI Speller from the application BCI2000 that we modified for our purposes. We modified the size of a functional decision matrix to 3x3, its 8 boundary fields we used to determine the directions of robot movement and the middle one as "start/stop" activator of movement. This matrix is displayed on the screen and the subject is supposed to concentrate on the field with the direction he wants the robot to move. The application rapidly highlights random rows and columns of the matrix and when subject's field is highlighted, the p300 action potential is to be recognised. When the application has enough data it moves the robot in the most supposedly accurate way.

The robot is itself a simple SBot with two servo motors and CPU unit which uses a compass (HMC6343). We use the compass to monitor the current position of the robot in the context of global directions, and from it we calculate robot's next movement.
We solved the problem with higher voltage used by SBot (5V) and compass that is only able to work with 3V, by creating and adding a new circuit that changes the voltage. Furthermore we added another CPU unit (ATMEGA 232P) to communicate between the CPU of the SBot and CPU of the compass. Accordingly we programmed the necessary registers for the communication between them.

At the beginning of startup of our program the robot detects the global direction in which it is turned to and from this information it calculates the other 7 directions in which it would turn later. The movement of the robot is secured by two servo motors that are situated opposite each other, so the servos are moving in different directions when the robot is moving forwards. Their operation was not identical, therefore they needed to be calibrated to move with the speed as similar as possible.

Even though for the forward movement we also use the data from the compass. During the change of direction the robot rotates by an angle and then moves forward for few steps.
Our application is to be tested in laboratory conditions and also in the public place to determine its usability under normal conditions. We believe that the results could contribute to wider usage of general purpose robotics.

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The effect of 25 Hz rTMS on corticospinal excitability- a study with repetitive transcranial magnetic stimulation

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Transcranial magnetic stimulation (TMS) is a non-invasive method that uses magnetic waves to induce weak electric currents in the brain, i.e. electromagnetic induction principle. With single pulse and paired pulse TMS technique it is possible to measure the excitability of corticospinal neurons and intracortical interneurons, respectively. On the other hand, repetitive TMS (rTMS) techniques produce long term potentiation-like (LTP-like) and long term depression-like (LTD-like) effect in the stimulated brain region and are therefore a valuable electrophysiological tool to study cortical plasticity. Depending on the rTMS technique given over the primary motor cortex (M1), it is possible to either increase or decrease the excitability of the corticospinal neurons. In general, low frequency rTMS protocols produce LTD-like effect, while high frequency protocols (>1Hz) produce LTP-like effect., however the effect will also depend on the intensity of stimulation and the number of given pulses. rTMS has been intensively investigated as a treatment tool for various neurological and psychiatric disorders (e.g. Parkinson's disease, dystonia, depression) [1, 3]. For example, 25Hz TMS, was reported to improve motor signs in Parkinson's disease [2], however it is not clear if observed clinical improvement relates to any changes in electrophysiological measures induced by TMS. In particular, it is not known if 25Hz rTMS may induce plasticity changes in healthy subjects or PD patients. Therefore, in the present study, we assessed if 25 Hz rTMS given over the M1 may induce changes in corticospinal excitability, which would suggest that it is an effective protocol to probe motor cortex plasticity.

We studied the effect of 25 Hz rTMS over the M1 of dominant and non-dominant hemisphere in 5 right handed healthy individuals. Motor evoked potentials (MEPs) were recorded form Abductor pollicis brevis (APB) and Abductor Digiti Minimi (ADM) muscles. We first determined the optimal stimulation point, i.e. "hot spot" for APB muscle. After determining the resting motor threshold (RMT), we recorded 20 MEPs evoked at intensity of 120% RMT. To probe motor cortex plasticity, we then used 25Hz rTMS (1000 pulses given at intensity of RMT) and assessed the effect of this conditioning protocol on MEPs amplitude at 4 time points: 0, 15 min, 30 and 40 min after rTMS. Each subject underwent stimulation twice (once per hemisphere) on two different days at approximately the same time of the day.

We are still collecting the data, therefore no statistical analysis has been done yet and discussion is also pending.

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Debiasing the Framing Effect in Medical Decision Making: A Comparison of Methods

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Introduction

The framing effect occurs when different frames -- the way information is presented -- for logically equivalent statements elicit different decisions. This study compares two debiasing methods: an already proven successful procedure designed for decisions that are based on hypothetical medical decision-making vignettes (i.e., specific debiasing by listing advantages versus disadvantages of possible treatments) versus a general introduction to heuristics and biases, which has proven unsuccessful in previous studies. These two methods have never been tested in the same sample. Thus, this is the first study to compare all three approaches to the framing effect (i.e., no debiasing, general information, and specific debiasing) within one sample. Compared to Almashat et al.'s study [1], upon which we build, this study has a wider range regarding participants' age and nationality, thereby strengthening our results due to the de-correlation of possible influential factors.
We focus on medical decision making for maintaining the ecological validity by applying a realworld problem and increasing people's involvement due to personal relation to the topic.

Methods

Three experiments were established. The first measures the effect of a general introduction to cognitive biases and heuristics (the debiasing technique) versus general information about the causes of lung cancer (the control condition). The second assesses the effect of listing advantages and disadvantages of possible treatments against lung cancer (the debiasing technique) versus general information about the causes of lung cancer. The third evaluates the effect of listing the treatments' advantages and disadvantages (the debiasing technique) versus a general introduction to cognitive biases and heuristics. The test construction ensures that all conditions require the same cognitive effort and test duration. The bases for decisions are three vignettes that contain information about treatments for lung cancer in three hypothetical hospitals. The scenarios present information about the outcomes of radiation and surgery after the diagnosis of lung cancer and are either framed as a survival or mortality probability. All three treatment outcomes are presented in a cumulative probability format (CP), an interval probability format (IP), and a life expectancy format (LE). 84 participants were randomly assigned to one of the six groups.

Results

The chi-square analyses for the control group (mortality and survival frames) and the different formats (CP, IP, LE) yielded non-significant results ($p>.05$). Therefore, no framing effects were found and a further analysis to examine the debiasing procedure is not relevant as the debiasing effect can only be tested when the framing effect can be proven with a significant Frame x Condition Chi-Square value. Based on this result, a follow–up logistic regression would be performed to assess whether the expected debiasing effect can be shown. These results contradict the findings by Almashat et al. [1] and cast doubt on the possibility to show the framing effect under the given circumstances.

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Patterns of Verb Recovery and Their Influence on Sentence Production in Broca's and Wernicke's Aphasia

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Introduction

Specific grammatical class impairments are reported in the literature of aphasia. Investigating verb retrieval patterns in aphasics reveal several impaired parameters. These verb structures affect the establishment of the thematic and syntactic grid and play a role in the clinical classification of grammatical disorders. For this reason, interest in selective verb impairments is highly guided by the co-occurrence of such difficulties in sentence production. However, the relationship between oral sentence production and verb retrieval is not yet resolved. Furthermore, the different impaired aspects of verb usage as primary deficit are still under discussion [1].

In this paper, qualitative and quantitative analysis of verb production patterns produced by a Broca's and a Wernicke's aphasic in an oral sentence production task at two test times are discussed and the ramifications of these verb processing difficulties in terms of their hypothesized underlying cause are reported.

Methods

Participants

EB, a 70-year old retired engineer, suffered an intra-cerebral hemorrhage left temporo-parietal. Standardized language assessment (i.e. the Aachener Aphasia Test) revealed Wernicke's aphasia with a moderate degree of severity.

AD, a 30-year old restaurant owner with 13 years of schooling, suffered a cerebral insult left temporo-parietal. Initial testing revealed Broca's aphasia with agrammatic sentence production.

Procedure

Both patients received comprehensive language testing longitudinally past onset. An oral sentence production task to picture stimuli consisting of 80 items varying in verb valency and semantic reversibility was administered before and following provision of language therapy. The audio recordings were transcribed and their productions were analyzed mainly to selective variables from the "Quantitative Production Analysis" [2]. Various verb aspects and their relation to the overall sentence production are analyzed and compared within the time course of rehabilitation for the two patients.

Results & Discussion

This investigation aims to provide further data to the discussion if verb retrieval problems affect sentence production in first place by impaired access to different verbs aspects within the time course of establishing the syntactic frame. Preliminary results of EB's data reveal an increase in well formed sentences due to a recovery of verb argument structures and morphological and lexical aspects (e.g. the higher use of main verbs). Analysis of AD's verb production across time reveals a marked decrease in the use of the auxiliary verb "tut" and an increase in correct production of adequate main verbs. Comparison of EB's and AD's data partially reveals similar difficulties in accessing correctly inflected verb. Further analysis will determine whether the origin of the difficulties stems from the same or different processing mechanisms within the language system.

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Connectionist Model of Bilingualism

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One of the main question regarding bilingualism is about the way languages are stored in the brains. There are two most discussed hypothesis. According to the first one, languages in the bilingual brain use a single system of memory representation and processing for all of them. Second theory claims that there are two separated language systems, one for each of the languages [1]. Effective solution for simulating bilingual features is creating models of this phenomenon. Most of the bilingual models, whether localist or distributed, cope with deficiencies of language tags, artificial and often unrealistic languages. This project was inspired by the SOMBIP model, which does not use the language tags, neither the artificial language. It was created by Li and Farkaš. SOMBIP model is a self-organizing model of bilingual processing that has learning characteristics. It provides support to the first hypothesis described above, about single distributed lexicon in bilingual brain [2]. It was tested on Chinese and English pair of languages, which are very distinctive if considering phonological, syntactic or lexical structures. Combination of these two languages showed little integration of language representations in SOMBIP model. Comprehension was modeled as the activity map from phonology to semantics, opposite from production. Authors assumed that more similar pair of languages will provide output with more integrated phonological and semantic representations of the bilingual lexicon. Finding answer to this question was main goal of this project. Results point out whether similarity of language pair influenced integration of their representations. New bilingual corpus, of similar kind of languages, have been used. Meaning representations of the lexicon were generated from transcribed spoken language through a word co-occurrence detector, similar as with the original language pair. Next, this input data were processed by the neural network. Architecture of the model stayed original, so that we could compare results of this two simulations. Two self organized neural networks interconnected via associative pathways, trained by Hebbian learning have been used. Model has been created using DISLEX [3] - artificial neural network model of the mental lexicon.

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Influence of Response Type on P3 Characteristics

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Introduction

Recognition and management of cognitive impairment is an important aspect of clinical care in Parkinson's disease (PD). Standard neuropsychological tests used for the assessment of cognitive functions can be adversely affected by motor deficits resulting in inflated cognitive impairment estimates [1], [3]. EEG-derived electrophysiological measures reflect cortical cognition-related activity and might prove to be a less biased adjunct measure for cognitive dysfunction in PD. Therefore our hypothesis is that at the oddball task with required motor response (MR), the generated P3 amplitude would be lower and the variability greater comparing to the task, when the required response is mental.

Methods

EEG's were recorded while 20 healthy individuals performed a two-part oddball task and random motoric clicking task (64 channels, digital average reference and 0.15-30 Hz band-pass). P3 amplitude, latency and variability will be calculated and compared. Similar oddball tasks (40 channels, digital average reference and 0.15-30 Hz band-pass) included patients with PD in preliminary study.

Preliminary Results

Preliminary findings on four PD patients indicate that the MR task resulted in reduced (10-50%) and more variable P3 amplitudes (10-150% higher coefficient of variation) and increased P3 latency variability (27-66% higher coefficient of variation). Preliminary results show that the mental counting (MC) oddball version gives more robust P3 measures in PD.

We continue the study by examining P3 amplitudes of 20 healthy individuals, where the amplitude of P3 is expected to be lower and the variability greater due to the influence of MR.

Conclusions

Cognition-related potentials were studied in two variants of the active oddball task: mental counting and MR. Since the MR version requires motor cortex activation, it seems plausible that the superposition of movement-related potentials might introduce additional variability into standard P3 measures. Aim is to elucidate which oddball version gives the most reliable P3 measures in PD in order to develop an optimized oddball task for electrophysiological assessment of cognitive functioning in PD.

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Investigations into the Multidimensionality of VAK Personalities: Reinforcing the Augmented VA[S]K (Learning Preferences and Psychological Model)

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The augmented VA[S]K is conceived as a novel research tool for investigating the cognitive and psychological nature of Individuals. That is to say, it represents a means to model the learning preferences of an individual - based on its specific information-processing proclivities (visual, auditory, kinesthetic), as well as the pertinent personality traits that constitute this individual and are specific to the exhibited learning preferences.

What the initial research (Sutanovac 2012, in press) revealed is that a crude and exclusive categorisation of individuals into one of the three groups might not be an ideal approach to take. One of the reasons for this is the extremely low number of mono-sensory participants. Other, the fact that even those participants were not 100% mono-sensory.

Therefore, the underlying goal of this research project will be to revisit, revise and further advance the learning-preferences and psychological model (the augmented VA[S]K), formerly developed within the Models of Personalities and Emotions framework. Given the results of the initial research, main focus of this followup will be to probe further into the "multidimensionality" of the model itself, paying special attention to the multidimensionality of the VAK personalities. The secondary focus will be on revising and refining the former tools of investigation (VAK questionnaire and Big-Five-Personality-Test questionnaire) in order to increase their investigative validity and, consequently, their efficiency with respect to results. Furthermore, additional complementary analysis tools will be introduced (KMO Measure of Sampling Adequacy, Common/Principal Factor Analysis) for the purpose of allowing an even more rigorous empirical scrutiny. The particular significance of such complementary tools lies in the fact that they provide a sturdy foundation for extrapolating the pertinent variables and, consequently, for devising more up-to-the-point questionnaires. This will, in turn, not only increase the overall accuracy of the master questionnaires and, thus, yield significantly more valid overall empirical results, but, equally importantly, also increase the overall accuracy of the model itself. Finally, the tertiary focus will be on:

A) devising one unified refined questionnaire - to be implemented in the form of a software; and

B) graphically simulating the reinforced learning preferences/psychological model.

The ultimate goal of the research in question is to provide valuable insights into and a stepping stone for the advancement of knowledge concerning individual higher-level cognitive faculties and mechanisms that lie at their foundations, their relationship to the individual-specific microcosm[s] - personality, and the related individual-specific usage of natural language.

*In the context of VA[S]K, the term (higher-level) cognitive faculties is an umbrella term encompassing cognition per se, learning and communicative preferences

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When Does Prosocial Behavior Lead to More Prosocial Behavior

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According to [3], making a prosocial act, beneficial for society, might lead a person to subsequently less altruistic, or even harmful behavior in the near future. This effect is called licensing effect.
According to [1], licensing effect only takes place, if the initial prosocial act was costless, i.e. does not impose any cost on the agent. If the initial prosocial behavior, in contrast, does imply any cost to the agent, i.e. agent has to spend his money or time to engage in this prosocial behavior, agent tends to behave prosocially in the near future.
Hence, by the example granted by the authors of [1], if you oblige yourself to answer some questions in a survey in future, which does not imply you any cost at the moment, you tend to behave less prosocially the next time, you are faced with similar choice. Yet, when you actually answer a few questions in a survey, which costs you some time, you tend to behave more prosocially in the future.

I believe a more continual understanding of this phenomenon would be beneficial, rather than binary division into costly and costless.

In my experiment, I am about to approach random people on the street and ask them, if they have a few minutes to participate in an experiment. When a person agrees to participating, I label this willingness to participate as a prosocial act. Then I will assign each participant into random class by paying him. This payment will be executed right after he agrees to participate in the experiment. Payment classes, depending on what participants get for participating:
*nothing - this should make their participation in the experiment a costly prosocial act
*fair monetary compensation - this should make their participation a costless prosocial act, or behavior very close to a costless prosocial act, since they are going to be compensated for their effort.
*less than fair price
*material gift, like a box of chocolates
*affective gift, such as written thank you note from a faculty representative

Afterwards, I need to determine for each participant, if he is subsequently going to behave in prosocial manner. For this purpose, I will use a dictator game from [2].

After assessing, how prosocially did each of the classes behave in subsequent test a more continual scale of costliness of prosocial behavior is expected to arise.

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A Visuo-Spatial Cueing Experiment for Unconscious Peripheral Vision

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The claim that our consciousness and visual attention are not fully dependent on each other is a commonly accepted claim nowadays. Visual attention is claimed to be partially a bottom-up process instead of a completely top-down process as a basis of the aforementioned claim [3].

When attention is voluntarily directed towards a target in line with our intentions and goals it is called top-down attention. Bottom-up attention is when our attention is directed towards a target in spite of our goals and intentions that are different from the target [3].

Mulckhuyse et al showed in 2007 experiment that "an abrupt onset cue that is not consciously perceived can cause attentional facilitation followed by inhibition at the cued location" [2].

In my paper, an experiment setup to investigate the hypothesis that the bottom-up effect produced by the subliminal cue is real will be revealed. The present experiment is a further variation of the paradigm by Mulckhuyse et al 2007 [2]:

It will be conducted with at least 24 subjects. As in [2], subjects will be cued by a subliminal contrast stimulus. The first variation of the task is that subjects will have to respond to a color target. Color targets are used that are either subjectively or objectively equated to the gray background in terms of their luminance. This is to rule out that individual differences in color luminance perception can account for the cueing effects that are observed for color cues or color targets [1].

In addition to the color targets, two distractors are shown in two different colors, also either subjectively or objectively equated to the luminance of the color background. This is to rule out that the cueing effect is based on a singleton color search strategy that subjects use.

Instead of the Go/no-go task, multiple-choice task is used: Subjects have to report the direction of a colored Landolt ring target. This is to rule out cueing effects that are produced post-attentional by the task, as Go/no-go tasks are generally suspected to produce cueing effects post-attentional by interference with the motor system.

Statistical data analysis will include repeated-measures ANOVA to assess whether a cueing effect can be found – that is, reacting to targets at cued locations should be faster than reacting to targets at non-cued locations. If the bottom-up effect produced by the subliminal cue is real, we expect to find a cueing effect in this paradigm. If no cueing effect is found, we have to systematically disentangle the different possibilities.

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EEG-fMRI Source Localization

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Introduction

In the following paper we will make an attempt to present the method of combined EEG and fMRI in source localization. Synchronizing EEG recording with fMRI is a new technique that can provide insight, which reaches further than one received by each technique individually. This two non-invasive methods in cognitive science have complementary advantages with regard to their spatial and temporal resolution. One of the suggested resarch, that will be carried out in the future, is the source localization in epileptic patients.

Method description

The purpose of this multimodal technique is to track dysfunctional activity embedded into physiological brain processes with good temporal resolution of EEG and precision of fMRI in localizing the spatial topography of same neural processes. This method is combining different mathematical algorithms, special hardware and software, purpose-tailored experimental design and analysis strategies in getting more reliable results important for neuroscience. It is useful in localizing source of epilepsy by showing the haemodynamic effects of interictal epileptiform activity (IEA) [1].

In analyzing data is significant to have designed artifact reduction algorithms. Three main artifact types arise from MRI scanning; cardiac pulsation and the amplitude and topography of the previous artifact types are affected. The strategy of this analysis includes finding averaged EEG event related responses and fMRI-derived activations. The goal is to limit EEG source localisation and identify a functional state of the brain which is associated with the EEG features. Moreover this data can be used to interrogate the simultaneously measured fMRI data [1].

Applications

Examples are brought from simultaneous EEG during fMRI in clinical neurology (localization of the epileptic sources) [2]. Integration of electrical and haemodynamic measures of neuronal activity presents new method which can be helpful not only in clinical neurology, but in cognitive and system neuroscience as well. Studies study could take advantage of the presented method in focusing on getting more detailed insight into cognitive functions mechanisms (e.g. working memory).

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Friend or Foe – Cooperation and Relationship Quality in Ravens

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Introduction

Cooperation in behavioral biology spans from sharing of intracellular products in viruses to coalition formations during fights in primates. Here, we focus on forms of cooperation in which individuals are flexible whether or not to cooperate [1]. Melis et al. suggest a correlation between relationship quality and the ability to solve cooperative tasks in dyads of chimpanzees [2]. Ravens are also capable of cooperating flexibly e.g. during gang formation at food bonanzas [3]. Therefore, we investigated a possible correlation between successful cooperation and the relationship quality of the cooperating individuals. We hypothesized that dyads with high relationship quality will be more successful in a cooperation task than dyads with low relationship quality.

Methods

In order to investigate our hypothesis, we tested eight ravens (five male and three female; age: 1yr.), living in an outdoor aviary. Each of the 28 possible dyads were semi-randomly assigned to seven sessions such that each bird participated once per session. Sessions were held on different days over the course of three weeks.

For the cooperative task, we used a transparent box with a drawer containing an 8 kg metal weight (rendering it too heavy for one raven alone) as well as two trays, each of which was baited with several food items as rewards. Per trial we separated the appropriate dyad in a separate testing compartment. Each trial started with the experimenter explicitly placing the reward on the trays and closing the drawer. In case of successful cooperation (= subjects opened drawer and removed reward) the trays were refilled. Each trial lasted for ten minutes. We measured the number of instances of successful cooperation, the elapsed time between such instances, the amount of lone attempts, the amount of cooperation attempts (= unsuccessful cooperation), and the frequency of aggressive behavior.

To measure relationship quality and rank differences (a possible confound), we measured allopreening, contact sitting, and displacements in additional focal observations and monopolization experiments respectively.

Presently, we do not have sufficient data to draw conclusions. Nevertheless, the dyad that came closest to a successful cooperation (so far we have recorded only lone attempts) was the dyad with the best relationship quality in the group. Consequently, this might be an indication of a trend that supports our hypothesis.

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List of Participants

The affiliations mentioned in the list of participant refer to the home university of the students.