MEi:CogSci Conference 2020
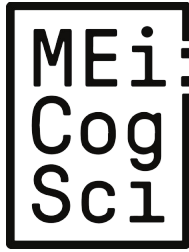
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MEi:
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Middle European
interdisciplinary
master's programme in
Cognitive Science

MEi:CogSci

Middle European
interdisciplinary
master's programme in
Cognitive Science

Proceedings of the

MEi:CogSci Conference 2020

Online, Vienna

Editors:

Laura Gschwandtner, Lucas Jeay-Bizot, Andras Makai, Tim Reinboth, Elisabeth
Zimmermann
University of Vienna, Austria

Igor Farkaš
Comenius University in Bratislava, Slovakia

Proceedings of the MEi:CogSci Conference 2020

The conference took place as an online conference on 18-20 June, 2020, hosted by the University of Vienna

Welcome!

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

Welcome to our 14th MEi:CogSci Conference; the first one happening as an online conference!

This year we are more than ever experiencing the impact of technology on our personal and academic lives, the change of learning and working situations as well as the influence of technologies on social interaction in general…all topics that have been investigated within the field of cognitive science in the past years. We are proud to be able to contribute to this field and its applications in a wide variety of interdisciplinary domains. Furthermore, MEi:CogSci aims to educate not only experts in cognitive science, but also humans acting in an ethically and socially responsible manner in this highly relevant and impactful field.

We want to welcome our invited speakers Natalie Sebanz (Central European University, Budapest & Vienna), Martin Takač *(*Comenius University, Bratislava), and Andreas Kalckert (University of Skövde). Thank you for joining us this year and for sharing your expertise and knowledge with us.

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

We thank Nicole Vella for creating the cover art for the conference proceedings.

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

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

And last but not least, it is you, Coxies, who make this conference happen. Your posters, talks, and initiatives will make the MEi:CogSci Conference 2020 an exciting and joyful event!

Thank you all for joining online this year! Enjoy the 14th MEi:CogSci Conference!

Laura Gschwandtner

Lucas Jeay-Bizot

Andras Makai

Tim Reinboth

Elisabeth Zimmermann

Editor's Note

We, the editors, thank all MEi:CogSci students/authors for submitting their work to the MEi:CogSci Conference 2020. We are happy to present your work in the conference proceedings and to contribute to the field of cognitive science by covering such a variety of interesting topics.

The MEi:CogSci conference and its proceedings are a joint effort. The editors ensure that the work submitted to the conference is in accordance with the conference guidelines for authors. Thus, the editors revise the submissions in respect to formal criteria and formatting issues. Participating students/authors are expected to adhere to good scientific practice and to honour the regulations relating to good academic conduct. The students'/authors' responsibilities include the usage of references and citations in a transparent, precise, and correct manner, as well as issues regarding style, spelling, and grammar of their abstracts. Despite our best efforts to meet our responsibilities as editors, the MEi:CogSci Conference 2020 proceedings may contain errors and we apologise for any inconveniences.

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

Fourteenth Middle European Interdisciplinary Conference in Cognitive Science (MEi:CogSci Conference 2020)
Online, Vienna
18-20 June, 2020

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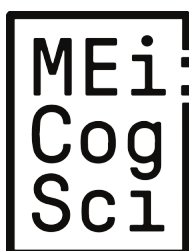
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Invited Talks

Moving or Having a rubber hand – The role of multisensory integration and motor control in bodily illusions

Andreas Kalckert

University of Skövde,
Skövde, Sweden

It has been suggested that the experience of the bodily self is constructed out of two complimentary sensations: the sense of ownership, i.e., the experience that the body I experience is my own, and the sense of agency, i.e., I control the movements of my body. The sense of ownership has been investigated with the rubber hand illusion paradigm. In this illusion, visual and tactile stimulation leads to an illusory ownership sensation towards a fake model hand. However, this illusion is typically conducted in static conditions, in which the participants do not move. However, the experience of our body is rarely static. The body is a typically a moving body, which moves and acts in the world. Thus, classical rubber hand illusion paradigms exclude not only a range of sensory cues from kinaesthetic sources typically present in the experience of the body, but also excludes the dimension of agency. Hence, the rubber hand illusion paradigm may provide only limited insights into the experience of the bodily self.

In this talk I will provide an overview over rubber hand illusion experiments which use movements instead of visuotactile stimulation. I will discuss differences and commonalities between the moving and classical rubber hand illusion paradigms. In particular, I will discuss the relationship of the sense of ownership and agency, and the mechanisms underpinning both these experiences. As we will see, the inclusion of movements provides valuable insights into these processes, and the way the experience of the bodily self is constructed out of sensory and motor cues.

Social Minds

Natalie Sebanz

Central European University,
Budapest, Hungary and Vienna, Austria

Taking others' perspective and coordinating with them are crucial abilities for social interaction. In this talk, I will give an overview of recent research that sheds light on the mechanisms underlying these social abilities. I will present studies showing how people spontaneous adopt others' visuo-spatial perspectives, form joint task representations, and consider differences in knowledge during communication. On the one hand, these findings reveal that people are strikingly attuned to others and benefit from interactions with multiple different partners. On the other hand, they suggest that thinking too much about others can have negative effects on coordination. I will conclude by outlining perspectives for future research: addressing the implications of joint action research for the evolution of communication, the experience of commitment, and for collective decision making.

Intelligent Technologies and Society - Risks and Opportunities

Martin Takáč

Comenius University in Bratislava,
Bratislava, Slovakia

Current boom of artificial intelligence and intelligent technologies has and will have a significant effect on the society and individual lives. How to reap its benefits and avoid its risks? In this talk I will elaborate on several topics where technological decisions have ethical/moral dimensions: human-AI value alignment, big data, predictive algorithms and human autonomy, and effects of AI deployment on job market.

Posters

Guidance of Visual Attention by Shapes

María Arias Sutil, **Markus Grüner**

University of Vienna
a11722357@unet.univie.ac.at

Introduction

Previous research studying visual attentional guidance by simple geometric shapes showed that only target-matching cues capture attention while non-matching cues did not. These results are in line with the contingent-capture hypothesis, according to which attention is guided primarily based on search goals, and salient but non-matching cues do not capture attention [1].

In a previous study, the non-matching cue was a hexagon amongst circles. Although it is assumed that the hexagon is a salient stimulus that should be able to capture attention in a stimulus-driven way [2], this assumption could not be empirically shown. Indeed, Theeuwes reported no distraction by an additional shape singleton (in contrast to a colour singleton) [3], which might indicate that shape singletons are not as salient as other singleton features. Therefore, in this experiment, we use a triangle as the non-matching cue since a triangle is visually more distinctive from circles as a hexagon and thus presumably more salient.

Method

Participants search for a hexagon amongst other shapes (two squares and one diamond) and report the colour of a disk inside the target shape. Preceding the target display, a cue is presented at the same position as the target (valid trial) or a different position (invalid trial). The cue is either matching (same shape as the target) or non-matching (triangle). For data analysis, we will calculate the validity effect, which is the difference between reaction times in valid and invalid trials. Faster reaction times in valid trials compared to invalid ones will indicate attentional capture since attention is in valid trials already allocated at the target position.

Discussion

If we find a validity effect for the non-matching cue, a triangle amongst circles is salient enough to capture attention. However, if we do not find a validity effect for the non-matching cue, it might be that the top-down attentional control setting effectively prevents attentional capture by the non-matching triangle or that the non-matching triangle is not salient enough to capture attention at all. In the latter case, further research should investigate attentional capture of singleton shapes in the absence of top-down control settings.

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Comparison of OpenSesame and Experiment Builder

Ajda Bergant, **Anja Javorič**

University of Ljubljana
ab1882@student.uni-lj.si

Creating computer-based experiments in Cognitive Science is important but often time-consuming. The programming environments vary from usability as well as compatibility with data-collection imaging tools. We are recreating an experiment that will be used in a neurolinguistic study. Its goal is to identify connections of reading abnormalities and the early stages of Alzheimer's disease (AD). Studies show that patients with AD and mild cognitive impairment showed an increase in total fixations and saccade regressions and longer fixation durations [1]. Due to COVID-19, the study is not ongoing, so we decided to focus on comparing two commonly used programs for designing eye-tracking experiments, OpenSesame (OS) and Experiment Builder (EB). Our goal was comparing the computer-based interfaces to help users find their best fit for designing similar experiments.

Methods

After familiarizing with the experiment with EyeLink 1000 Plus eye tracker, we recreated it first in OS and later in EB. We had no preexisting experience or knowledge of working with the programs. We relied on available online sources, suggested by our mentor.

The data was collected by two self-reports and combined into a qualitative comparison of the programs. We focused on the learning curve, program flexibility, user support accessibility, the input of the stimuli, time consumption and both the negative and positive aspects of both programs.

Results

According to reports, OS has a steeper learning curve and is less time consuming compared to EB. User support of OS and EB is respondent, but not helpful enough to solve technicalities. OS is generally flexible, is more visually attractive and self-explanatory but EB is way handier for text formation (much like Word). Both, but especially EB, are well-compatible with Eyelink eye tracker. Both programs' components are drag-and-drop, but EB is far more complex.

The results show that OS is more user friendly and easier to start without foreknowledge, where EB requires an extensive study of the user manual and other resources. EB has better and cleaner text input but a more complex procedure of retrieving multiline text from data source which is important for experiment formation, where text input in OS is more simple and straightforward.

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Measuring Social Rewards in Humans and Animals

Isidora Bojkovska

University of Vienna

The majority of research dealing with the underlying mechanisms of reward builds on the incentive salience hypothesis [1]. The incentive salience hypothesis proposes that upon considering reward as a phenomenon, it is important to distinguish between the processes of 'liking' (hedonic pleasure) and 'wanting' (motivation for reward pursuit) [1]. In addition to deriving pleasure from non-social rewards such as food, drugs or money, animals and humans also derive pleasure from social interactions and social rewards [1]. Midbrain dopaminergic areas, the striatum and prefrontal cortex have been implicated in reward processing [1].

Some disparities have been detected in the methodologies measuring 'liking' and 'wanting' in animals and humans [3]. Half of the studies in one review effort appeared to measure 'expected pleasantness' while intending to measure hedonic 'liking' [2]. Expected pleasantness as a construct refers to the pleasure that is expected to be derived from a reward and is depended on encoded memories of said reward [2]. Another issue arises from the vague differentiation of 'wanting' and 'liking' in the literature specifically relating to social reward [3]. As a result, studies do not adhere to uniform guidelines of how they operationalize the constructs they measure in social reward.

Therefore, this review aims to provide some clearance regarding the types of methodologies employed in animal and human studies on social reward. This effort might foster the understanding of various forms of psychopathology characterized by social impairment (e.g. autism, schizophrenia).

Methods

A systematic search of animal human literature will be performed with 'social reward' 'dopamine' present in the title or abstract. Only experimental studies will be considered. The information extracted will relate to the reward concepts being measured, the experimental paradigms used, measures of social reward implemented and definitions of social reward employed.The results will be organized in a reduced number of categories and the differences between animal and human literature will be discussed.

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Keeping the Breath in Mind

Asena Boyadzhieva

University of Vienna

In Sanskrit *prana* means *breath*. At the same time, it means *life*. This linguistic tie is a global one, present in many ancient cultures. The reason is simple - breath brings us into life and carries us all the way through it. Still, respiration is more than a matter of gas exchange. Some cultures have recognized this millennia ago, adopting various breathing exercises as part of their spiritual practices. Interest has since spread from the East to the West and from the spiritual to the scientific. Research about the ways in which breath influences our cognitive, emotional, and physical well-being is on the rise. And yet, little is known about the underlying processes. The aim of this project is to unify these into a coherent framework, which when developed can become ground for research in the field.

Attentive breathing as a bridge

Respiration's role as a mediator of emotional and physiological control has predominantly been studied on the behavioural and physiological levels. Recent advancements in neuroimaging reveal that the breath constitutes a fundamental rhythm of brain function, tightly coupled to cognitive and affective functioning [1]. However, the studies remain scattered across the psychological and neuroscientific landscape and the routes connecting them - underexplored. The current theoretical project addresses this gap.

Theoretical and empirical findings are integrated into an opinion article, which uses the predictive processing framework to formulate a regulatory process, in which attentive breathing can modulate top-down priors by bringing bottom-up sensory information into the foreground. This is especially relevant for interoceptive signals, where priors are less prone to change [2]. While increasing the gain of a sensory modality increases the chance of overriding predictions, not every interoceptive signal is a suitable mediator, as they are normally inconspicuous and resistant to direct modulation. The breath, however, is different. Not only can it be easily brought into awareness, its rhythm can be readily adjusted. This means that through active and perceptual inference, attention to respiration can alter the enaction of felt experience.

Implications

The implications of this theoretical investigation span beyond mere curiosity, as aberrant sensory processing is associated with numerous conditions, such as anxiety, depression, and alexithymia [2]. The study of breathing-entrained dynamics is relevant not only for bridging bottom-up and top-down processes but essentially for dissolving the gap between body and mind.

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Tribalism in Scientific Methodology: Quantifying the Differences in Brain Research Between Clinical Neurology and Neuroscience

Evita Božiček, **Darja Čepon**, **Tisa Pavlovčič**, **Jan Jug**, **David Sakić**, **Jurij Dreo**

University of Ljubljana
eb8606@student.uni-lj.si

Introduction

While a gradual loss of cognitive performance is usually observed in normal aging, a faster decline is usually related to a dementing illness. As we are amidst a population aging trend we are bound to observe a continuous growth of dementia incidence. Various methods such as cognitive tests, structural imaging (CT and MRI), cerebrospinal fluid analysis, genetic testing, functional neuroimaging (PET, FDG-PET and SPECT) and EEG recording may be used to aid in dementia diagnosis. Past research into EEG and Alzheimer's disease has indicated a number of potential biomarkers but apart from visual EEG inspection for rare cases, none have been integrated into routine clinical practice [1].

Having preliminarily examined a number of papers, we noticed that papers published in clinical journals (compared to basic science journals) tend to put less focus on EEG-based methods. This difference might indicate a lack of sufficient science communication between basic research (neuroscience) and clinical practice (neurology). We hypothesize that a quantitative analysis of a sufficiently large number of clinical and basic science papers will show that electrophysiological (EEG) methods are relatively under-represented in clinical neurology, compared to brain imaging and bio-chemical methods. Such a discrepancy might indicate a kind of methodological tribalism between two very related, but still separate professional disciplines.

Methods

We will quantify keywords frequencies related to 15 different categories of brain research methods (EEG, psychometric tests, MRI etc.) in a minimum of 1000 papers related to dementia published since 1990. Paper abstracts will be manually inspected to ensure relevance. We will then compare the relative frequencies of keyword categories between clinical and neuroscience journals to detect possible differences in referencing various brain-research methods. Based on the h-index, we have selected twenty-one leading journals from the fields of neuroscience and clinical neurology for this comparison. Keyword data will be extracted automatically using a custom-written Python script from paper pdfs.

Results

Based on a preliminary analysis of 500 papers, we observed that the proportion of papers referencing EEG methods in dementia research is rather low (about 8-9% of total). To obtain more statistical power in detecting possible differences in referencing various brain research methodologies between clinical and neuroscience papers, we will double our current number of included papers, bringing the total to 1000.

References

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Creating Slovene Language Resources

Neža Brezovnik, **Miha Sterle**

University of Ljubljana
nb8423@student.uni-lj.si

Introduction

Lexical datasets, such as the English Word-Net, are important and useful resources that can help with many of the natural language processing (NLP) tasks facing us today. Some languages are, in respect of creating and maintaining such digital analogs of real-world lexical resources, more fortunate than others – the English WordNet, for example, was built manually at Princeton University by a team of lexicographers and computer scientists [1]. Other languages, like Slovene, sacrifice some of their "peculiarities" to be able to leverage the existing WordNets, parallel corpora, bilingual dictionaries, and Wikipedia, to automatically create their own (Slo)WNets [2], hoping to someday arrive at manual revision. Our respective projects deal with aspects of this automation, their overarching goal being to improve the state of the existing Slovene language corpora and the SloWNet, making both a better fir for practical NLP tasks, such as text analysis, text generation, and machine translation.

Methods

First, we are going to compare the Slovene WordNet to the English WordNet with regard to some basic network statistics: number of nodes (words representing semantic concepts), number of edges (synonymity between a word and a semantic concept), number of edges per node (a measure of connectivity), and degree of distribution (how many nodes have a certain number of edges). This will give us some information about the present state of the SloWNet and provide a baseline to measure further improvements. Second, we are going to create a Slovene language sense-labeled dataset and derive out of it tasks for testing word-sense disambiguation (determining which sense of a word is used in a sentence [3]) algorithms. For example, we could test the algorithm on distinguishing between the two senses of the word "love" used in "My love for you will never die." and "Please, bring me the book, my love." Since most of the tasks will be based on already existing English ones, we will adapt them to the Slovene language context.

Results

We expect that the SloWNet will have fewer nodes, fewer edges, and fewer edges per node than the English WordNet but a similar degree of distribution. We hope that the set of Slovene language tasks created for testing word-sense disambiguation algorithms will provide a stepping stone for further resource development in this area of research.

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Estimating Emotional Well-Being on Twitter

David Cserjan

University of Vienna

Introduction

Twitter is a widely used social network that engages a high number of users word-wide. Every time users post a tweet, they leave behind digital traces of their thoughts and feelings [1]. These traces can provide insights into the emotional state of users. We use sentiment analysis to analyze text data and to categorize it according to its emotional content (positive – neutral – negative). Location information in tweets allows us to map them to geographical regions. Our goal is to find a reliable way of estimating subjective well-being (life satisfaction, positive/negative emotion, a sense of meaning and purpose [1]) from Twitter data. Our data consists of geotagged English tweets from the USA.

Problem

Measuring subjective well-being through surveys and interviews is time and resource intensive. Recently, geotagged Twitter data is showing promising results in predicting well-being in regions when compared to a gold standard survey [1]. The primary aim of this research is to reproduce the results in [1] with methods that are more recent and tailored to Twitter data.

Approach

VADER [3] is a sentiment analysis tool, which has been developed with social media in mind. First, we use VADER to assess the sentiment of a set of geotagged tweets from 2014 and aggregate them based on their location to estimate the subjective well-being of regions. These estimates of well-being are then compared to standard measures of well-being. Then, we will extend the analysis by linking the estimates to other socio-economic indicators such as income (Easterlin paradox).

Impact and Limitations

If the replication of the methods used in [1] succeed, this research contributes towards useful estimates of subjective well-being of areas where survey data is prohibitively costly to gather or not available at all. These estimates of well-being can be used to contribute towards understanding collective emotions [2] and monitoring subjective well-being in real time. This research is limited by the nature of Twitter data. We aim to overcome some of these limitations and extend the analysis.

Acknowledgments

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Fighting Cashless Effects with Frictions in Online Store UI

Flávia Lujza Csikyová

University of Vienna

Context

Non-physical payment methods can impair consumers' ability to keep track of their expenses. The salience of the payment is decreased due to the more abstract, opaque visual and physical manifestation of the money and the transaction, as well as the effortlessness of the process [1]. Such usability mechanisms embody the Frictionless Design Paradigm (FDP) [2], a creative framework that encompasses findings from user-experience and behaviour research to create interfaces with a minimal cognitive load on the user. Its agenda is opposed by some authors [e.g. 2], who, in line with the human-centric perspective on human-computer interaction [3], remind us that the way visual and interactive structures are implemented in online platforms may have a huge ethical impact.

Aim

This research aims to test the viability of approaches suggested by the opposers of FDP to create more conscious payment environment online. It treats the premises of FDP and the instances of the cashless effect as findings incorporable into 4E cognitive paradigm and plans to investigate usability friction as a cognitive affordance.

Method

The experiment takes the form of a decision-making game based on a set of mock e-commerce websites and surveys. Subjects are presented with a virtual credit, a story and a shopping list. They are asked to develop a plan and then purchase items from categories, aiming for the best possible products, while keeping track of their budgets. Afterwards, they try to recall the amounts they spent on particular items and categories. Accuracy of this, the overall spendings and the ability to stick to the plan are compared across websites. The stores differ in frictionless qualities. The effects of two types of frictions are investigated: The number of steps necessary to take in checkout and the presence of a graphic add-on, which halts the user with price amount visualisations. I hypothesise these two frictions can increase payment salience and recall accuracy [1].

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Age-Related Changes in Idiom Processing

Aylin Dincer, **Eva Smolka**

University of Vienna

Introduction

Figurative language refers to non-literal language such as metaphors or idioms [1]. Idioms like *to reach for the stars* are multiword expressions whose meaning cannot be derived from the constituents only [2]. Idiom decomposability indicates to which extent the single words contribute to the overall figurative meaning [3].

Apart from a general cognitive decline, healthy older adults show a language decline in the lexical retrieval of nouns and in text comprehension [1]. Age-associated effects of meaning resolution are described for idioms as well [3].This study investigates whether age-related changes that occur in idiom comprehension are affected by idiom decomposability.

Method

Fifteen younger (age 18-30) and 15 older (age 60-72) native speakers of German perform an online literality judgement test. Stimuli are 20 sentences with non-decomposable idioms (e.g. *Er hat sie durch den Kakao gezogen*; figurative (F): *He pulled her leg*), 20 decomposable idioms (e.g. *Sie ist immer aus der Reihe getanzt*, F: *She always stepped out of line*), and 40 literal controls (e.g. *Sie hat als Kind gerne Ballett getanzt*; literal (L): *As a child, she loved to dance ballett*).

Literal sentences are matched in length (seven words), form (perfect tense, sentence-final participle), and predictability of the sentence-final participle. Participants read a sentence and decide whether it is literal or non-literal.

Hypotheses and Results

This is an ongoing study. Consistent with a previous literality judgement task [3], faster and more accurate responses to literal than idiomatic sentences, and faster responses to decomposable than non-decomposable idioms are expected in both age groups.

By contrast, an interaction of response accuracy, but not of response latency is predicted for older adults only. They should show an effect of decomposability, that is, ratings are expected to be less accurate for non-decomposable idioms.

Conclusion

Differences between the two groups indicate age-effects in idiom processing. Even though both age groups expose more difficulties with the processing of non-decomposable idioms, a more distinct manifestation of this effect of decomposability for older adults indicates that these phrases require a maximal co-activation of figurative and literal meaning. Cognitive aging theories and the difference between healthy and impaired aging will be discussed.

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Stress Prediction Based on Physiological Measurements

Zala Ferlinc, **Vanesa Močilnik**, **Niko Kroflič**, **Ajda Ogrin**, **Maša Primožič**

University of Ljubljana
zala.ferlinc@gmail.com

Introduction

Real-time physiological data tracking is an important aspect of optimization of human-computer interaction. Monitoring these signals enables the computer to adapt to its user and detect certain deviation states, such as long-term stress levels [1]. Stress is a stimulus-triggered physiological response and can, therefore, be detected with different measurements. Increase in heart rate, temperature etc. are all physiological reactions that can vary from person to person, even if they are all presented with the same stimuli. It is, therefore, harder to predict, whether something will be perceived as stressful or not [2]. Reliable detection of stress is especially important because of the severe side effects long-term stress can have on an individual [1].

In our research, we will be using WESAD [2], an online dataset that includes physiological measurements under different conditions. Our goal is to graphically present stress responses in comparison to a baseline response and try predicting stress from different signals with machine learning algorithms.

Method

The data was acquired from the WESAD dataset [2]. It contains data from 15 subjects (M = 24.47, SD = 2.45, 80% male) for different sensors and conditions (baseline, stress, amusement, meditation). We extracted stress data and computed basic statistical features (mean, STD, range, max, min) for 5 sensors (EDA, EMG, RESP, TEMP, ECG). For modelling, we split the data into a training and test set with 80/20 ratio, normalized the data and built and optimized an Adaboost classification model for each sensor type [3]. Lastly, we used the optimal parameters found in each model and measured their accuracy on the test set.

Results

Currently, we only have preliminary results showing some physiological differences between stress and baseline condition. The results also indicate that some sensors have higher classification accuracies than others, but further analysis is needed to confirm this.

Discussion

Our preliminary data suggests not all sensors are equally accurate while predicting stress, meaning not all are necessary. Therefore, in future stress predicting studies, fewer sensors can be used, saving researchers' time and money. For further research, we suggest predicting other conditions in the dataset (amusement, meditation) and applying other algorithms (neural networks).

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Discrimination of Modulated Vibration

Andrej Filipič, **Janja Pečan**

University of Ljubljana
af9246@student.uni-lj.si

Introduction

Tactile haptic interfaces, such as modulated vibrations (MV), can facilitate human-machine interaction. Haptic discrimination, as discussed in this research, is the ability to distinguish between patterns of MV. This research explores individuals' abilities to discriminate between amplitude and frequency modulated vibrations and the effects of age or disability (e.g. blindness or deafness) on this. It also assesses individual subjective experiences of variously modulated vibrations. The main research questions address different aspects of vibration discrimination: i) does age affect the ability to discriminate MV?; ii) do blind and deaf individuals discriminate better than non-disabled ones?; iii) which part of the hand is most susceptible to different types of MV and iv) do participants' interpretations of MV vary?

Methods

The first two research questions are answered through a literature review. The third and fourth are supported by pilot empirical research, using an in-house developed device with a single eccentric rotating mass (ERM) vibration motor. The ERM motor was chosen due to its ability to generate higher amplitudes at any given frequency [1]. Participants will either hold the device in their palm or press fingers on it. They will discriminate between types of MV (amplitude, frequency) of varying duration, combined into different patterns. Throughout the discrimination testing, they will express their interpretation of the MV via a questionnaire.

Expected results

Based on our literature review it is possible to conclude that i) due to a gradual sensitivity decrease with age, differences between younger and older participants exist [2], ii) because of neural plasticity when permanent sensory deprivation occurs, differences between deaf or blind participants and non-disabled ones exist [3]. We expect iii) the highest sensibility on the palm [1], iv) Due to interpretation being based on each individuals' previous experiences, we expect intersubjective variability in the perceived meaning; patterns may emerge.

Discussion

Research findings could facilitate communication for both disabled and non-disabled individuals, by encoding information in MV instead of audiovisual signals (e.g. transmitting encoded essential information through the steering wheel could contribute to road safety). Additional research could focus on inter-cultural differences of vibration pattern interpretation.

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Collectivism and Individualism Through Colexification

Tamas Gömöri

University of Vienna

Introduction

The purpose of this research is to investigate if there are any correlations between language use and different national identities falling on the individualism-collectivism scale. Specifically, using the CLICS3 database of cross-linguistic colexifications – which consist of homophonies, or words pronounced identically but having different meaning, and of polysemies, the possibility of multiple meanings for one word [1] – this research examines how colexification networks in different languages are correlated to national identities belonging to nations speaking those languages. These national identities are based on the data collected and analysed by Geert Hofstede, which classifies national cultures according to different dimensions (including one centered around individualism-collectivism) [2].

The Individualist/Collectivist Model

The individualist/collectivist distinction can be understood as the orientation toward personal goals and higher self-regard, or the orientation toward cohesiveness of a group and a focus on common values and goals [3]. By itself, it would be an insufficient characterization of the cultural complexity in any population. Individualism and collectivism are not necessarily exclusive cultural qualities, but can be considered along with other dimensions proposed by Hofstede (such as the power distance index, which shows how willing people are in a group to accept inequalities in social hierarchy) [2]. Thus, the present research aims to contribute to an understanding of the individualism/collectivism spectrum keeping in mind theoretical models that highlight the importance of different contexts influencing this spectrum [3].

Methods

Using a random walker algorithm, we will construct colexification networks of languages based on the CLICS3 data. We will tie each language with the nation containing the largest number of the language's speakers. Using the national identities as starting points, we will look for which colexifications in the networks of each language family could be meaningful in reflecting a preference for individualism or collectivism.

Results

We hypothesize that there will be statistically significant differences between the colexifications of languages whose national identity is more collectivist and those whose national identity is more individualist. Seeing the conceptual connections between words in different languages could prove to be influenced by and influential to cultural preferences in a linguistic context.

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TermFrame - Karst Evokes Imagination: Experts Associations to Karst Terminology

Severin Hutinski, **Amanda Saksida**

University of Ljubljana
hutinski.severin@gmail.com

Introduction

Frame Semantics is a linguistic approach that focuses on analyzing and tracing cognitive frames in language processing. A frame is described as an abstract background or content knowledge, necessary for understanding the semantic meaning of a single word [1]. Frame Semantics has been applied to lexicology, syntax, and recently also in the field of terminology and specialized knowledge [1]. The project TermFrame focuses on context, language, and culture that frame specialized knowledge in karstology, with the aim to create a dynamic framework of specialized concepts and definitions for educational and research purposes.

In a separate study within the project, we contrasted expert knowledge frames with the corpus data and the lay knowledge on karstology, in order to assess contextual specifics of the expert compared to the non-expert knowledge, which may not be revealed if we only compare specialized and general corpora.

Methods

We tested a group of experts (N=14), members of the Institute for karstology and speleological society in one of the rooms of the Institute. 28 keywords in Slovenian were selected based on the list of the most frequent terms found in the specialized karstology corpus. Each participant received a randomly selected list of 14 keywords.

To assess the knowledge frames for a list of keywords, we asked participants to type free associations for the presented 14 keywords. The average testing time was 15 min. For the same keywords list, we extracted the word sketches (i.e. collocations and combinations) from the specialized corpus on karstology, Sketch engine.

For both response lists (one collected by participants and the other from the corpus), we added type frequencies, lexical and semantic categories. We compared the experimental vocabulary (data from the expert group) with the most common words from the corpus list by performing a qualitative analysis.

Results

The results show a relatively low overlap between expert responses and corpora collocations (24,26%), with almost half (46.91%) semantic categories not represented in corpora. The presented keywords evoked more responses related to karstic landforms (especially underground) and processes, then found in the specialized corpus; whereas in the corpus, more words were related to the properties. This corresponds with the relative prevalence of adjectives in the corpus and noun phrases in the participant's responses.

Conclusion

The group of control lay participants remained untested, so the analysis between expert and non-expert knowledge is still to be done. With further comparison, this study aims to contribute to a more accurate representation of expert knowledge in the final dynamic frame definition.

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Personality Reflects Through Brain Activity

Sara Jakaj, **Teja Štrempfel**

Pedagoška fakulteta - Cognitive Science,
Univerza v Ljubljani
sj6828@student.uni-lj.si

Introduction

"Personality describes persistent human behavioral responses to broad classes of environmental stimuli" [1]. The Big Five theory defines five personality domains: Neuroticism, Extraversion, Openness to Experience, Agreeableness and Conscientiousness. Previous studies used the resting state functional connectivity to study neural correlates of these domains using seed regions. Seed regions are brain centers that have the most connections to other parts of the brain [2]. Similarly, our research focuses on human personality and its reflection through brain mechanisms. Its principal theoretical starting point is that the brain is the foundation of our personality, cognitive ability and our intellect. As the previous studies, we also presuppose a correlation between personality traits and brain activity patterns. The purpose is to study how personality traits reflect through brain activity.

Methods

We performed a study with 45 healthy volunteers (21 females, mean age 21±3 years) that underwent several behavioural and cognitive testings and simultaneous EEG and fMRI recordings. During the course of three EEG-fMRI scanning sessions the participants either had to rest, first with their eyes closed and later with their eyes opened, or solve a spatial memory task, in which they had to remember the position of simple stimuli on the screen. Standard activity in specific brain areas, while the participant is resting, indicates that these brain regions are responsible for the participants personality attributes. Meanwhile, temporary brain activity, the activity that changes throughout different scanning sessions, is responsible for variable attributes, like the participant´s mood. To find the correlation between personality traits and functional connectivity of various brain regions, the results of multiple questionnaires will be compared with the neuroimaging data.

Conclusion

We expect to confirm our assumptions and find correlations between functional connectivity among different brain regions and measured personality traits.

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Reducing Susceptibility Towards Fake News: Taking Advantage of Heuristics and Biases

Surya Knöbel

University of Vienna
a1151489@univie.ac.at

Introduction

The rise in smartphone users and subsequent increase in social media platforms is changing the news-related media landscape. While traditional newsrooms are radically shrinking due to the loss of advertising money, *"tech giants"* have become the most powerful publishers who do not employ journalists but serve advertisement and news to audiences based on what they know about their interests. Nowadays, anyone with an internet connection can publish content. This results in a wide variety of sources, which is unprecedented in human history. This makes new forms of political participation possible and gives voice to the excluded and visibility to those previously invisible. It, however, also blurs facts, makes people susceptible to online manipulation and nudging, and tends to increase social polarization. It is thus vital to empower end-users regarding their socio-cognitive actions of searching and sharing information online [1].

Theoretical Framework

I will combine theories on how individuals seek out preferable and reject unfavorable information with the predictive processing framework. Predictive Processing describes our brains as predictive machines, where action and perception are generated by constantly matching incoming sensory input with the brain's top-down expectations and predictions of what is perceived [2]. Human beings, according to this view, constantly make their sensory input fit their expectations and test their hypothesis by seeing how much prediction error it generates – the lower the prediction error, the better the internal model. False beliefs come into play as they reduce prediction error by putting more weight on the favored model and prior beliefs.

Methods

The idea is to minimize error between incoming sensory data and what people's prior beliefs say the data are. This will be done by testing if triggering the use of specific heuristics and biases, such as the affect heuristic or the bandwagon effect, can increase prediction error and thus counter biased decision making in cases of fact-checked fake news. An online experimental survey with two conditions and one control group will test how participants rate fifteen Covid-19-related statements. In the control group, the participants will receive target statements with additional information aimed at increasing error signals by placing them into a contextual mindset, while the control group will not. Expected results would show a reduced rating score in the study group.

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Neuromarketing: Green Advertising for Future Generations

Tanja Kolenc, **Mina Ličen**

School of Economics and Business

Nowadays companies are trying to respond to consumers' demand by adapting technological procedures, products and services to more sustainable ones. However actual market adoption is not meeting the expectations [1]. Namely it has been shown that people are generally inclined toward green products, but when it comes to actual purchase, they decide for the standard ones. It is now up to marketers to find more efficient way to promote green products. For that they need to understand what kind of an advertisement would elicit the right emotions for it to have long-term impact, big enough to influence the actual purchase.

What underlying mechanisms, such as fear, feeling of guilt or responsibility, social acceptance or just pure selfishness, guide our perception of pro-environmental ads? There are some valuable insights on how some subtle features like temporal framing or type of voice (young vs. old and female vs. male) subconsciously influence us [2]. Although self-reports demonstrate substantial preference toward green products, it has been shown there is quite a discrepancy between those reports and fMRI results (greater activity in regions correlated to personal value and reward when viewing standard ads) [1]. What is it when making a final decision that influences the actual acquisition? Is having some small financial benefit right away more compelling than making a positive impact on some far-fetched idea of the future world?

Although entire population is taken in consideration, the focus is on the generation Z, since their buying power is increasing and more importantly, environmental issues concern them the most. On the other hand, they come with quite new and unique set of characteristics, preferences and aptitudes. Because they show high aversion to ads, remarkably short attention span and are highly intrigued by interactivity [3], they represent an even bigger challenge to the marketers.

Fields of neuromarketing and sustainability are quite new, hence researches incorporating both are relatively sparse. For that it is planned to intertwine some psychological studies and marketing researches to fill in the gaps and get a more complete picture. As a result of all the data gathered and synthetized, the end goal is to produce one all-encompassing report with concise and straight forward green advertising guidelines apt for the future.

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Does the Source Affect the Degree to Which You Believe Fake News?

Lubica Komarova

Comenius University in Bratislava

Introduction

Fake news is not a new idea or phenomenon. Pennycook and Rand claim fake new has become major aspect of modern media [1]. With wide popularization of fake news and fake media we need to ask a question why people believe such made up stories from a cognitive perspective which includes decision making. For example, political fake news seems to be mostly driven by partisanship [2]. Secondly, people tend to believe news aligned with their own personal beliefs [2].

Methodology

We wanted to take a look at the source of the false stories and whether it affects reliability of the received story. We have conducted four hypotheses in this study, three of which have been proven right. Firstly, we established that news with legitimate source have higher reliability, then we claimed faulty source is less reliable. We thought news with no source are less reliable and also that people believing in conspiracy theories tend to believe fake news.

For the methodology, we have created an online questionnaire. Questionnaire is consistent of three parts, first is a demographic data. Second parts portraits different conditions. We have chosen one legitimate newspaper and one online magazine known to be faulty for expressing the source. Our third option is news with no source visible. Each one includes two articles. One made up and one true. News with the source simulates posts from the social media. News with no source is implanted between articles from unknown magazine web page. After each of these six questions there is a question about whether the participant is willing the share these articles on their social media. Third part consists of five questions from known conspiracy theories.

Results

We have conducted a Two Sample t-test to determine whether the legitimate news is more reliable and also whether news with faulty source is less reliable. Both have proven right with p-value = 0.038 for legitimate source and p-value = 0.037 for faulty source. With the correlation test we have proven strong positive correlation of value $r = 0.55$ and p-value 0.01 between believing in conspiracy theories and believing fake news.

Discussion

Follow up questions about sharing the content on participant's own social media can be used in further research. Here, we see a big opportunity to find out if people believing what they see on their social media are more likely to share the same content. From the gathered demographic data, we can extend this research to finding a group more likely to believe in such stories.

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Effects of Mindfulness Meditation Techniques

Wilma Konrad

Comenius University Bratislava

Originating in ancient Buddhist meditation, mindfulness meditation (MM) has found its way to the western world. It relies on focused attention on present moment sensations. This kind of non-judgmental awareness has been found to have beneficial effects on health and well-being. MM emphasizes the connection of the mind and the body and has proven helpful in therapy of psychological disorders like depression, anxiety and post-traumatic stress disorder [1].

This study tries to answer the question what about this simple task of paying attention to one's momentary experiences has so powerful effects on the body and the mind. We focused on the original instructions from traditional Buddhist texts. In accordance with these instructions a subdivision into three categories was done, namely the Mindfulness of Body, Feelings and the Mind. In order to answer the research question, an extensive review of relevant literature was conducted, the findings were compared and summarized. This review study aims to provide a novel insight into the physiological mechanisms that underlie MM.

For 'Mindfulness of Body', studies showed a connection between breath, emotion and the mind. This is underlined by a neural connection between attention, - and arousal centres and breath control regions in the brain. According to this a calm breath will induce a calm state of mind, resulting in emotions of calmness and relaxedness [2]. Similar has been found for the suggested seating position. Studies point toward the fact that body language and seating position are strongly influenced by mood and vice versa. Hence a straight, upright seating position will result in positive emotions whereas a crooked seating position will generate less positive feelings. Concerning the 'Mindfulness of Feelings', a strong similarity between the traditional instructions for the meditation and the well-established intervention of cognitive behavioural therapy suggest psycho -social benefits of the meditation practice [1]. With respect to the 'Mindfulness of Mind', we found that MM can lead to meta-awareness of internal, - and conscious states. Meta-awareness in turn can give rise to increased self-awareness and has been found to improve general life satisfaction [3].

In addition to the theoretical research, we are working on an experimental design that will use transcranial electrical stimulation to improve the progress of MM practice in novice meditators.

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Can the Effects of Alcohol on Motor Task Performance be Negated By the Effects of Cocaine?

Michal Kováč

Comenius University in Bratislava

Introduction

Stimulants and depressants are classes of drugs that increase and decrease central nervous system activity accordingly. With seemingly opposite effects an unanswered question of what happens to cognition when these substances are mixed arises. We focused on fine motor task performance (FMT-perf), measured by keyboard typing speed. We chose alcohol as a depressant and cocaine as a stimulant. This choice was made for a set of reasons most important of which are high popularity [1] and proven effect of decrease [2]/increase [3] in FMT-perf. A no-compromises experiment design was created first and then simplified to an extent necessary to allow us to conduct it.

Methods

The experiment was done on recreational cocaine users. Participants were found on anonymous Internet forums and have done the experiment by following instructions, self-administering the drugs and reporting the results. Informed consent was obtained in the beginning of the experiment. Dosages were set to 0.6 g of pure alcohol and 1.4 mg of cocaine per body weight kilogram. Instructions included pauses that allowed the drugs to take full effect. The keyboard typing performance was measured in characters per minute using a standardized tool. Each participant did three measurements: sober, on first substance, on both substances. The substance order was randomized. An in-depth description of the methods and a discussion about the reliability are a part of a separate document linked in the Supplementary Resources.

Results and Discussion

The hypothesis was that cocaine can cancel out negative alcohol effects on FMT-perf. So far, we haven't recruited enough participants to do a meaningful statistical evaluation. Preliminary data (N = 7) show that the average effect on FMT-perf was 17% for alcohol, +7% for cocaine and 9% combined. Cocaine increased and alcohol decreased the FMT-perf in all participants. Doing the no-compromises version of the experiment was beyond the means of this project because of formal and budget requirements. However, the simplified version suggests this topic is worth studying.

Supplementary Resources

Full methods are available on this URL: http://davinci.fmph.uniba.sk/~kovac254 /cogsci/semproj/methods.pdf

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Subjective Cognitive Complaint: Predictive Markers for Progression to Mild Cognitive Impairment and Alzheimer's Dementia

Nina Lang

Univerza Ljubljana

Introduction

As the population grows old, the number of people with dementia rises. Subjective Cognitive Complaint [1] is a recently proposed phenomenon that has been acknowledged as a potential predecessor of Mild Cognitive Impairment (MCI) and could be the first preclinical sign of Alzheimer's Dementia (AD) [2]. Among other cognitive deficits, patients with SCC, MCI, and AD show working memory deficits, so understanding of working memory function might be crucial for early diagnostics of AD. Altered theta-gamma coupling (TGC) in electroencephalographic recordings is thought to be a neurophysiological marker of working memory disturbance. It has been found that TGC low working memory performance is accompanied by progressively decreased TGC levels in subjects with MCI and AD [3]. The purpose of this study is to apply the accumulated knowledge about behavioral and neurophysiological changes in patients with MCI and AD to explore if those changes are already present within the senior population with SCC. The main goal is the possible determination of biomarkers that would help in non-invasive early diagnosis of individuals whose cognitive decline will progress to dementia.

Methods

Approximately 50 people with SCC and a similar number of healthy individuals of matched age took part in the study and their cognitive status was confirmed with a standard neuropsychological battery. The subjects' brain activity was measured with electroencephalography during rest and while they performed a working memory task. A 64-channel EEG system with active actiCap electrodes was used (BrainAmp, Brain Products). The exact conditions of the N-back working memory task were adjusted to enable TGC observation and included visual and spatial modality. Stimulus (letters and/or colored squares) were shown on a 3x3 matrix. The participant had to determine if the appearing stimulus is the same or different from the stimulus shown N - attempts back. Stimuli were presented on a computer screen, one by one on a static background. Each letter was shown on the screen for 250 milliseconds, which was followed by the reaction time period of 3000 milliseconds. Conditions 0 and 2 - back were presented in continuous 15-minute blocks of presentations of stimuli.

Implications

The results could have good applicable value for the identification of individuals in the early stages of neurodegenerative disease.

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When Emotions Go Viral – an Analysis of the COVID-19 Infodemic

Constanze Leeb

University of Vienna & Complexity Science Hub Vienna
a1308758@univie.ac.at

Introduction

Even though, historically, pandemics seem to be the rule rather than the exception, the scope of the COVID-19 outbreak poses novel challenges due to the high global interconnectivity nowadays. But it is not only the disease that spreads rapidly. The term *infodemic* emphasizes the critical role of the spreading of (mis)information [2]. The COVID-19 pandemic disrupted lives profoundly. The global population is facing challenges that can lead to worries and sometimes even fear. Anxiousness and insecurity are common in difficult times. In the quickly changing (social) media landscape this leads to uninformed beliefs, the spread of fake news [1] and sometimes even conspiracy theories. People's behavior and social response can be influenced, altering the epidemic process and effectiveness of countermeasures [2] which is why social media analysis becomes essential. Our focus is Austria and we hope to gain valuable information about the spread of conspiracy theories. What topics play an important role for Austrians in the first months of the COVID-19 outbreak? Do conspiracy theories emerge and if so, which ones do, how prevalent are they and who is spreading them?

Methods

We analyze the comments on the Live-Tickers of "der Standard" from 25/02/2020 to 17/05/2020. We use topic modeling to get an impression of the relevant topics for people active online. In collaboration with the domain experts of an Austrian fact-checking website [3], we build up background knowledge on conspiracy theories. We visualize time series of the mentions of terminology connected to narratives of conspiracy theories. Furthermore, we extract users associated with the narratives and look at their activities and with LIWC analysis at their posts, maybe identifying specific traits that make them susceptible to conspiracy theories and trigger their spreading of such content.

Outlook

Based on the project at hand it is possible to get a first impression of the topics relevant for Austrians active online and the spread of narratives of conspiracy theories in times of COVID-19. The same analysis can be done for other Austrian social media platforms or other countries. Comparing these findings will reveal interesting insights into the dynamics of groups susceptible to these contents and those spreading them. Furthermore, the larger analysis of associated users will help to understand their behavior and the spread of (mis)information better.

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Processing of Nonwords with Different Morphological Violations in Slovenian, Greek and Russian

Nina Leonova, **Eleni Tsaprouni**, **Christina Manouilidou**

University of Ljubljana
leoninelle@gmail.com

Introduction

The current crosslinguistic research is focused on the similarities and differences between processing of pseudowords in Russian, Greek and Slovenian. Previous studies [1] and [2] have stressed the importance of thematic and categorical morphosyntactic features in lexical processing. The study aims at finding out the factors that affect comprehension of deverbal adjectives, as well as the corresponding neural responses during lexical processing.

Selection of nonwords

Four different types of violations are used in pseudowords: categorical violation refers to construction of a nonword from an adjective suffix and a typically nominal stem, instead of a verbal one ("chairable"). Thematic violation is created by a combination of an adjective suffix and verbal stems that are not normally combined with such suffixes ("goable"). Aspectual violation refers to a combination of an adjectival suffix and a verbal stem being in the opposite aspect of which the suffix is normally combined with ("бросанный —to be throwing+able"). Finally, novel nonwords describe pseudowords that were created without any violations ("bringable").

Methods

Data is acquired by a lexical decision task and EEG recordings. Native speakers of Greek, Russian or Slovenian with no cognitive or language impairments are presented with nonwords of four types. They are instructed to decide whether these words are permissible in their native language. The language decision task measures the level of acceptance and reaction time to different nonwords, while EEG helps define corresponding neural activity of the brain during word processing.

Interdisciplinarity

Following the interdisciplinary approach, the research merges topics and methods from linguistics with those from neuroscience.

Expected Results

We expect the reaction times to be the shortest for categorical nonwords followed by thematic nonwords, then aspectual and lastly novel ones, as found in the previous studies [1]. The opposite patterns are predicted for the level of acceptance, with greatest acceptance for novel nonwords followed by aspectual, thematic and finally categorical categories. As for EEG results, we expect to find larger N400 responses which would mark the mechanisms of semantic processing of pseudo-words violating different derivational constraints.

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Homeorhesis in the Context of Generalized Anxiety Disorder

Tzu nung Lin

University of Vienna

Generalized anxiety disorder (GAD) is one kind of mental disorder that is clearly defined in the Diagnostic and Statistical Manual of Mental Disorders [1]. In psychiatry, treating GAD is to prescribe patients antidepressant drugs such as serotonin reuptake inhibitors (SSRIs). However, a paper from Moncrieff indicates that little evidence shows that antidepressant drugs can reverse or correct the patient's brain from an abnormal state to a normal brain state [2]. The idea that the antidepressant drug can reverse the brain state is based on the disease-centred-model which is originated in the homeostasis concept. The distinguish between homeostasis and homeorhesis is critical when understanding how the organism constantly stabilizes in an environment. From the perspective of the homeostasis, the organism will return to its original configuration and therefore protect itself in a stable internal environment. As for the homeorhesis, it illustrates the mechanism of how the organism arrives in a different trajectory to stabilize itself. The visualization of the interaction between genes and the environment which creates developmental pathways differentiation within the cells can be defined as an epigenetic landscape [3]. In this thesis, we will use an age-old concept homeorhesis which is originated in the epigenetic landscape from Waddington [3] to explain why the phenomenon of the antidepressant drug action in the context of curing GAD will not reverse one's patient brain state but transfer into a novel brain state which is suggested in the drug-centred-model [2].

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Effects of Caffeine on Brain Activity Using the Auditory Oddball Task Paradigm

Tjasa Moze, **Matej Poljak**

University of Ljubljana
moze.tjasa@gmail.com

Introduction

The aim of the research was to examine changes in the brain networks when performing the auditory oddball task after receiving a psychoactive substance (coffee). Inclusion criteria required participants to be regular coffee drinkers with no history of any neurological disorders and are placed in left hemispheric dominance according to the Edinburgh handedness inventory with normal EEG activity. Half of the participants drank either decaffeinated coffee with only placebo or decaffeinated coffee in which a dose of caffeine was measured depending on the participant's body weight. The equivalent of 200 - 500 mg of caffeine (6 mg / kg body weight) dissolved in 150 ml of instant decaffeinated coffee was used. The study was performed under randomized, double-blind crossover conditions. Auditory oddball paradigm II was recorded 20 min after administration.

Method

EEG is a method used to measure the electrical activity of the brain with electrodes placed directly on the scalp. Activity is displayed in the form of waves with different amplitudes and frequencies. Repeated measurements according to a specific task produce a wave which is called an event related potential (ERP). The oddball paradigm is a commonly used experimental design utilized for studying cognitive functions. Participants are presented with sequences of repetitive stimuli which are infrequently interrupted by a deviant stimulus and the reaction of the participant to this "oddball" stimulus is recorded. Data obtained from previous caffeine studies show that caffeine is linked to shorter reaction times and better performance on cognitive tasks.

Implications

Similar studies [2] with hypotheses similar to ours suggest that we can expect improved sustained attention, showing less changes in performance from the beginning to end of the task and cognitive effort as well as reduced motor response time (right-hand index finger pressure on the response tracking device) to stimulus after caffeine consumption, result of a reduced target evoked potential (P300) latency, associated with a positive potential over the frontal cortex [1] and a higher P300 amplitude in participants receiving caffeine than in participants only receiving placebo [2].

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Build[ing] Experience

Lena Müller-Naendrup

University of Vienna

Context

Architecture has always served as both an expression of aesthetic art and functionality. In contrast, the relation between built-environments and the human mind and body has only gained attention recently [1]. Furthermore, growing cities demand more and more functional spaces that shelter, transport, educate, administrate, and entertain their inhabitants. However, not uncommonly the intended functions of spaces do not meet the users' experiences.

Previous research has mainly involved structural analyses of entire urban neighbourhoods such as Kevin Lynch's theory of urban perception [2]. Lynch attempted to investigate people's subjective perception of the built-environment by studying their memories of such spaces [2]. However, how exactly our experience is shaped by the structural aspects constituting the built-environment and to what extent this experience can be analysed and understood by examining individuals' memory recall of the specific environment, has yet remained unanswered. Thus, the project aims at developing a mixed-methods approach comprising a new empirical tool to disentangle the human-environment relation.

Project

Essentially, Lynch's approach to understand human perception and memory recall of the built-environment has been expanded with theoretical concepts from enacted and embodied cognition that have been proven relevant in context of human-environment dynamics [1]. While Lynch's mental maps technique serves as the empirical tool to gather subjective, first-person data, the newly included theoretical concepts provoke an analytical shift to aspects such as the role of the body and body memory, possibilities-providing structural affordances, embodied action and enacted experiences [1]. Furthermore, besides studying the user's subjective experience in a space, the originally intended function of such space and the public's expectations have to be incorporated as well [3]. Therefore, large-scale surveys examining users' expectations in combination with a couple of in-depth interviews addressing the individually sketched mental maps are included in the methodological framework.

Implications

This mixed method will provide a tool to further unfold how built-environments are shaping individuals' perception and to disclose potential discrepancies between users' experiences and a space's purpose. Consequently, discovered dysfunctionalities or positively perceived structural elements can be used to restructure already existing buildings or build new ones by following a more human-centred design approach.

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Discovering Language Biases With Word Embeddings

Marko Narat

University of Ljubljana
narat.marko@gmail.com

Introduction

Word embeddings are a framework used to represent, analyse and discover relationships between words. The approach is used in the context of natural language processing (NLP) - a field of computer science that explores the processing of natural spoken and written language with computers, primarily using machine learning. Word embedding is a representation of words using vectors. Adding and subtracting these vectors allows us to encode and understand analogies such as "London is to England as Paris is to x" in which case the correct answer is France. The reason the embeddings can give the correct answer is that subtraction of vectors for the word "London" and "England" is parallel to the vector difference between Paris and France[1]. The captured analogies provoke a list of interesting research questions, some of which concern word biases - is the distance between "woman" and "doctor" different from "man" and "doctor"? Biases in language can provide insight into topics of social sciences. In the aforementioned research it has been shown that the biases found in different embeddings "can be used to quantify historical trends and social change"[1].

In my apprenticeship, I use word embeddings to discover language biases in Slovenian language. I concentrated on gender biases in word embeddings of Slovene language.

Methods

To conduct my research I used a pre-trained word embedding model published by Jožef Stefan Institute (Word embeddings CLARIN.SI-embed.sl 1.0) and explored it using Python 3.7 and the Gensim Python library. The Gensim library has many features that allow developers to work with NLP. I used it to load the CLARIN.

SI model and compare distances between feminine and masculin words to specific words for professions.

Results

The results show many strong biases for certain occupations, for example auctioneer, mathematician and postman where the appropriate feminine word was rarely found when subtracting vectors. There was also an interesting bias found with words physicist and chemist, where the feminine word for the profession was not found, but the most frequently found word was still the feminine version of scientist (znanstvenica).

Conclusion

There are many biases to be found in embeddings, and there are many more embeddings of the Slovenian language to explore. This apprenticeship was based on the study of Garg, Schiebinger, Jurafsky, Zou[1], who showed that biases in word embeddings correlate to historical trends in the United States. Further research should be conducted on word embedding models from different decades and explore how biases in Slovenian texts have changed through time.

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Multilingual Language Experience and Heschl's Gyrus Structure

Anna Palmann, **Narly Golestani**

University of Vienna

Introduction

Different aspects of multilingual language experience, such as number of languages, and age of acquisition/proficiency of these have been found to be related to structural differences in a variety of brain areas [1].

For example, in the auditory cortex, a higher volume of Heschl's gyri (HG) has been reported in bilinguals compared to monolinguals [2]. Yet, it remains unclear what these structural differences arise from exactly, which shall be addressed in the present research.

The Present Study

In existing structural MRI brain scans of 86 mono-, bi- and multilingual subjects with diverse language background, we will explore relationships between anatomical measures of HG, such as volume, surface area, thickness and curvature, and language-experience measures like number and proficiency of spoken languages, as well as age of acquisition and duration of exposure.

TASH, a new toolbox for the automated segmentation of HG [3], allows a more precise and reproducible assessment of HG anatomy compared to traditional manual segmentation methods, enabling a more detailed exploration of relationships in this study.

Expected Results

We expect to find larger HG volume, surface area and thickness measurements in bi- and multilinguals compared to monolinguals and accordingly, also a positive correlation with the number of languages spoken. This is for both, total number of languages, as well as number spoken more proficiently or learnt earlier.

Implications

This study will help to elucidate the precise structural features of HG that differ as a function of a number of aspects of multilingual language experience. Evidence for differences in the strength of such relationships may shed light on the relative contributions of nature versus nurture of language experience on brain anatomy.

Results may also help to explain contradictory findings in the literature. Such may arise from differences in the language experience-measures tested and/or from differences in the actual language combinations spoken in multilinguals and subsequent incoherencies in sample selection or classification.

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Artificial(ly) Talent(ed) - Using Comparative Swarm Simulations to Define Individual Qualities

Kevin Purkhauser

Comenius University in Bratislava

Introduction

In order to get scientifically significant data to understand qualitative phenomena, in this case talent, various logical and comprehensible definitions are tested and implemented as a parameter in an AI algorithm. These AI's can then be observed and comparatively analyzed in order to illustrate if there is significant change of behavior, which could then be redefined as the qualitative confirmation of the phenomena that was looked for.

Walkthrough

In anticipation to detect a certain, but arbitrarily initialized value for talent (τ) [2] a particle swarm optimization (PSO) model is used [3]. The swarm intelligence acts in a comparative state while all particles are urging for one aim (global minimum) and start from the edge of a topological quadratic environment, which guarantees equal radii to the center for every individual. After the first series of runs the data gets collected (null hypothesis). Since hitherto there was no variable τ included, this follows for the second series of runs. Depending on the prior definition of τ it reveals a slight advantage in time (dt), or in direction (dx) towards the center. The detection of each individual presupposes the usage of a particle filter. Therewith the behavior of every particle can be observed independently [1]. Afterwards the particles get compared by using performance landscapes to illustrate the variances.

Interdisciplinary

The highly interdisciplinary approach lies in the different perspectives and techniques. Therefore this project seeks a meta-heuristic analysis of an abstract question. Hence a rather linguistic approach that deals with the etymological part leads to a mathematical function, which in turn runs a computational model to tie in an interpretation in analytical philosophy of language.

Results, Discussion

The results mainly show that at a certain increase of the factor τ the consequences are getting effectual, but for small changes (2%) it remains arbitrary. Likewise there is no remarkable difference if τ is represented as a factor of time or direction.

Following this findings it remains necessary to collect loads of data to be able to draw precise regression at which value of presupposition the consequences are inevitable and then stressing if this can still be defined as talent. So far the experiment strengthens the critics that argue: talent is nothing but a descriptive way of describing a quality that is not entirely understood. Bach once claimed it is 2% talent, the rest is practice. Finally this findings should emphasize to put the focus on the being, thinking and acting, instead of trusting I.Q., GMAT, or hidden variables.

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The Influence of Listening to Music on the Psychophysical Well-being of the Elderly

Katja Rašl

University of Ljubljana
kr6952@student.uni-lj.si

Context

Music has calming or activating effects on the autonomic nervous system (ANS) [1]. By stimulating emotions, music affects the activity of brain structures and causes consequent changes in cardiac activity, including heart rate, heart rate variability, respiratory rate and blood pressure [2]. Heart rate variability (HRV), which is an indicator of cardiac vagal tone index (parasympathetic nerve), is widely used in psychophysiological research and is significantly associated with survival as well as self-regulation in the cognitive, emotional and social domains [3].

Purpose

With this study we will compare ANS response in the elderly to two types of music (self-selected music and pre-selected music, based on specific tempo and music genres - Gregorian coral, baroque, classical and ambient music, that have the most positive effects) in comparison with silence and check the practical use of listening to music in elderly. We will monitor the influence of musical background of individuals and collect data about psychological well-being before and after recording. We hypothesize that self-selected music will have decreased modulatory activity of parasympathetic (vagal) autonomic nervous function when compared to silence or pre-selected music and that self-selected music will be more pleasant for the participants than pre-selected music or silence.

Method

30 elderly (60+ years) participants will participate in the study. First, we will gather information about their musical background and medical condition, using MoCA and SOC tests. Participants' physiological responses to stimuli will be measured under three different conditions: in silence without music, while listening to pre-selected music and while listening to individually pre-prepared music. Participants will be lying on their back with earphones on, while we will record their HRV, HR, breathing frequency and galvanic skin response. Biopac M35 (Biopac Systems) will be used for physiological measurements. Statistical analysis will be performed in statistical programming language R.

Implications

This study aims to contribute to the understanding of the impact that music has on the ANS, the psychophysical well-being of the elderly, and the practical aspects of music application in nursing homes.

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Determining the Structure of the DMT Experience (Neurophenomenology of Entropic Mind)

Jelena Rosic

University of Vienna

Introduction

Following from the first-ever placebo-controlled investigation of the effects of DMT (N,N-Dimethyltryptamine, a fast-acting tryptamine psychedelic) on spontaneous human brain activity via multivariate EEG [1], the aim of this study is to further investigate the related structure of experiential dimensions [1]. Using phenomenological methods alongside the analysis of neural bases of consciousness transitions under DMT can help further elucidate the neurobiology of consciousness while significantly advancing our understanding of mind-brain relationship [1]. This methodological bridge presents the main objective for a comprehensive scientific study of consciousness instantiated by Francisco Varela's neurophenomenological research programme in cognitive science.

Method: micro-phenomenology

The micro-phenomenological method [2] in this research context is designed for eliciting aspects of experience (pre-reflective) that suspends pre-defined categories of experience. This first-person data can be used to detect, guide and interpret neural correlates and form a joint analysis with third-person data (brain and behaviour; quantitative). As a trained practitioner in the micro-phenomenological method [2], I will perform the part of the analysis of first-person interview data from the DMT study (collected by Millière and Timmermann [1] towards the larger collaborative project on the structure of DMT experience). As an iterative and explorative study, the process of data analysis will be first organised as invariant phenomenological categories with synchronic (in-depth) and diachronic (over time) dimensions of experience and further modelled by specifically defined operations of clustering by iteration [2].

Significance: Structure and complexity of the DMT experience

It has been proposed with "the entropic brain hypothesis" and supported by growing empirical evidence [3] that "subjective quality of any given conscious state, and specifically its "richness", can be indexed by a quantitative measure of the magnitude of entropy (in the information theoretic sense) in a given parameter of spontaneous brain activity" [3]. The method prosed here of first-person data analysis would present the step towards the idea of "entropic mind" that follows from the entropic brain hypothesis pointing to the need of improving mappings between spontaneous brain and mind phenomena as a major scientific challenge that can contribute to treating psychiatric and neurological disorders [3].

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Normative Data for Semantically Associated Slovene Word Lists That Create False Memories

Minea Rutar, **Jaša Černe**

University of Ljubljana
minea.rutar@gmail.com

Introduction

Interest in false memory research skyrocketed after the publication of Roediger and McDermott's seminal work on in 1995 [1]. Many studies since then have investigated remembering events that never happened or remembering them quite differently from the way they happened using the Deese-Roediger-McDermott (DRM) task to measure the proportion of falsely recalled and falsely recognized words [2]. Research shows up to 66% of words participants recalled were lures (critical words related to but not present on the lists), which represent false memories [2,3].

The goal of this research was threefold: 1) to create a Slovene version of the DRM task because it is important the task uses participants' mother tongue and 2) to test whether we can detect the same effect as prior research.

Methods

The study was carried out online using the PsychoPy platform for conducting experiments. The data was acquired on 90 subjects (73% female; M= 22,34; SD = 3,62). Three groups of 30 randomly assigned participants listened to 12 different lists of 15 semantically related words which are associations of one critical word, not presented on the list. They then wrote down the recalled words and completed the recognition test (noting whether they recognized the word on the test from the list or not). The proportion of accurately recalled and recognized words, critical and unrelated words was measured as well as their response time. The word lists will additionally be used for comparing the phenomenology of correctly and falsely recalled and recognized words.

Results

Preliminary results indicate a lower rate of false recall (of critical or unrelated words) than that in the original study but overall indicate statistical significance. The rate for critical word recall ranges from 0 up to 46% in some cases. Analysis still has to be conducted but preliminary results indicate the Slovene adaptation of the task was successful.

Conclusion

Creating a Slovene version of the DRM task contributes to the development of false memory research in Slovenia. The obtained rates of false recall and recognition, lower than in the original study, indicate that false memory creation might not be so prevalent or is specific to particular word lists. Further research is needed to determine why certain lists create high levels of false memories while other do not create any.

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Implementing Full Body Movement into Virtual Reality Cognitive Training

Viktor Sojka

Comenius University in Bratislava

Virtual Reality and Cognitive Training

The subject of a cognitive training using a virtual reality (VR), in this case, using VR with a head mounted display (HMD) has been a target of multiple studies. We would like to continue research to expand the potential of this technology. As already shown in a recent study [1], VR has the ability to improve immersion, presence in a task and participants are generally excited from VR use in cognitive training. In order to fully implement movement into VR, we need to address multiple problems that arise from using VR, most notably, nausea caused by incorrect tracking of movement in VR [2].

Implementation of Full Body Motion – Experiment Proposal

Based on previous study [3], we would like to find out, whether adding an omnidirectional treadmill, a specialised treadmill that allows user to move in all directions, to cognitive training with HMD will positively affect cognitive training. The plan is to compare full body movement in virtual reality with conventional means of movement in the virtual environment, such as teleportation. We propose an experiment with a simple task of solving a virtual maze with an added task of finding 5 objects inside the maze before finding the exit. This will be 1st part that will be considered as a spatial training exercise done in VR. After 24 hours, participants will be tasked to solve the same task, however this time in real life. We will measure multiple variables such as: nausea caused by VR, memorisation of maze objects, spatial orientation and memory and most importantly which type of locomotion will better transfer information from the training exercise to the real world. Our hypothesis is, that using the treadmill will yield better spatial memory in 2nd task, thus participants will solve real life maze faster and with fewer errors.

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The Effects of Grammatical Gender on Processing Occupational Role Names in Slovene: An ERP Study

Anja Terglav, **Jasna Mikić**, **Andraž Matkovič**

University of Ljubljana
at4198@student.uni-lj.si

Context

Recent experimental research [1, 2] has focused on investigating the use of gender information in role name processing. Gender stereotypes influence occupational role perception in languages with semantic gender systems (e.g. English). However in languages with grammatical gender (e.g. Slovene) the effects of violation of formal grammatical gender agreement have been studied more commonly. Our research studied gender agreement rules and their violations with event-related potentials (ERP) method. Specific gender markedness of Slovenian language has led to adaptations in study design, where in comparison to previous studies, we observed (masculine and feminine) marked verbs (instead of nominals). Our aim was to investigate the relations between the gender of antecedent and anaphora, and its influence on reader's mental representations.

Hypotheses and Method

We anticipated that difficulties in resolving the anaphor will point to a mismatch between the anaphor and the antecedent and inform about which features of antecedent guided the understanding. Three hypotheses were made, referring to whether violations of occupational role representations would occur. Based on previous studies we anticipated that P600 would be evoked with syntactic violations and N400 with semantic. Violations were expected to occur in cases with feminine verbs following an antecedent in plural generic form. In cases with masculine verbs and in cases with either of the gender marked verbs following an antecedent in gender-balanced form, no violations were expected.Twenty-six students (aged 18-23), participated in the study. Their mother tongue was Slovene. Pairs of sentences were presented on a screen in front of them word-by-word. After every pair of sentences, participants answered whether sentences appeared logically coherent, by pressing a 'yes' or 'no' button. Whilst they were solving the task, EEG activity was recorded.

Conclusion

As the research has not been finally published, results should not be discussed. Specific design of this project could offer new forms of understanding the extent to which language influences occupational role representations. Further, it would be interesting to explore longitudinal effects of this study in connection to brain plasticity concept.

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The Effect of Testosterone in Public Prosocial Learning

Carina Ufer

University of Vienna

Introduction

Testosterone is commonly associated with physical aggression and it is often believed to cause egoistic, antisocial behavior. However, in humans testosterone was found to promote prosocial behavior in terms of fairness and cooperation. Therefore, [1] argue that the traditional view of testosterone needs to be reassessed, suggesting that the behavior modulation is better explained as social status seeking. Human status seeking strategies can take complex forms where it can be adaptive to act pro-socially to acquire a higher status. This becomes especially important in public situations with social interaction. Until now, the causal effect of testosterone on prosocial learning driven by social status seeking has not been investigated. Therefore, a placebo-controlled single-dose testosterone administration study was conducted. We addressed the question whether testosterone can promote prosocial learning and if this effect is especially present in situations of public recognition.

Methods

A probabilistic learning paradigm (two-armed bandit) was adopted from [2] where participants can gain rewards depending on their chosen option. Throughout 16 consecutive trials they learned that one option was rewarded with a higher probability (75% / 25%). Participants performed the task six times, alternately gaining rewards for themselves or an NGO which served as prosocial condition. Moreover, as a between factor participants played the task either in private or with an observer.

The latter creates an interactive situation where we hypothesized that status seeking motivation is triggered. The results are analyzed with a computational model using a reinforcement learning approach which is established in social neuroscience. The data were fitted to an actor critique model using a value-based learning algorithm to guide decision preferences and a SoftMax function for action selection.

Results

In general, participants learn to maximize their reward above chance level in all conditions. The group level learning curves show that the percentage of correctly taken choices was around 75% for all conditions. The data was fitted to the model and learning rate and inverse temperature parameter were estimated with a maximum likelihood function. We expect to find differences in the estimated parameters between groups that account for the interaction of testosterone and public performance. This interdisciplinary research can provide causal evidence and will help refine the role of testosterone in humans.

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I Like to Move It

Eva Urbančič

University of Ljubljana

The kinaesthetic approach to teaching is based on findings that body movement promotes learning and understanding of complex concepts. It is based on the embodied view of cognition that includes the sensorimotor system as a part of our cognition. Therefore, we should explore all the possibilities it can offer us in terms of improving teaching methods. In this study we will try to include the body, as a valuable requisite in the process of learning about electrical engineering concepts in high schools.

After finishing my degree (BSc in Electrical Engineering), I got the opportunity to teach electrical engineering subjects in a high school. I started implementing the learning-by-moving (kinaesthetic) method in my lectures and gained insight into the execution of the method and the results it brings. With my mentor, we came up with a case study where I would deliver lectures using kinaesthetic method to a class of students (experimental group) and using with ex-cathedra approach to another class (control group) of the same study year. We want to explore the possible advantages that kinaesthetic teaching brings to high school students of electrical engineering. We expect the kinesthetic teaching approach would lead to greater participation of students, enhance the social relations between students and help them understand sometimes difficult and abstract concepts better.

The study methodology includes the lectures and questionnaires to evaluate the effects. After the lectures, both groups of students would answer a short questionnaire (such as was used in the referenced study [1]) about their experience with the teaching process and their subjective perception on the knowledge they gained. With the analysis of the qualitative data collected during the study we would obtain valuable details of students' experience with the creative movement method [1]. All the movement-based presentations of concepts and the research plan are prepared and ready and waiting for the re-opening of schools.

I want to follow through with the planned study. I am continuing with the development of different movement-based presentations of electrical and mathematical concepts and I am studying diverse options for possible future research (e.g. collecting data from students wearing bio-metric sensors). My goal is to further deepen my knowledge of the creative movement approach to teaching and use it in my future teaching opportunities.

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A Social Robot in the Role as Novice for the Learning by Teaching Approach

Jan-Ove Wiesner

University of Vienna

Social robots in education

Social robots have different roles in educational contexts and have been shown to be effective at increasing cognitive and affective outcomes. While in the scientific community the roles of social robots primarily as tutors or teachers are investigated (90% of research), the roles of social robots as peers or novices (10% of research) fall behind [1].

Considerable educational benefits are obtained from a robot that takes the role of a novice, allowing the student to take on the role of a tutor for the robotic tutee. This concept is widely known as learning by teaching in human education [2].

To implement this concept into a social robot, a Pepper robot [3] was chosen for its human-like embodiment, its ability to express emotions and its capacity to communicate a wide range of autonomous behaviours, such as speech output and gestures.

Project

In this project behavioural animations for the Pepper robot, that present it as a novice to the domain of arithmetical calculations, will be developed. Thereby the robot will present faulty calculations on its tablet and its corresponding behaviour should invite 10- to 12-year-old children to identify the mistake and correct it according to the learning by teaching approach.

The aim is to model how the mind of a novice, that makes certain mistakes when solving arithmetical calculations, would behave. Therefore typical mistakes in this domain will be analysed to simulate the learning process and task improvement of the robot tutee.

The theoretical considerations will be implemented as animations of the robot and will be tested as part of a Pepper robot demonstration in a one-to-one interaction dialogue with 10- to 12-year-old children as tutors. The interaction will be guided by the presenter of the demonstration.

Implications

This project contributes to understanding critical aspects of educational interactions between 10- to 12-year-old children and the social robot Pepper in the learning by teaching approach.

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Towards Computational Cognitive Modelling of Fighting Game Players

André Zitterbart

University of Vienna

In *Video fighting games*, opponents controlled by artificial intelligence (AI) often appear predictable, dumb, or unrealistic. To avoid these shortcomings, my first step towards an AI controlling fighting games characters similar to how human players do it, is to research computational cognitive models (CMs) of a human playing rock-paper-scissors (RPS). RPS is a valid starting point because fighting games are based on its mechanics (e.g., in *Street Fighter II*, *attack* beats *grab*, *grab* beats *block* and *block* beats *attack*).

A CM consists of a *cognitive architecture*, whose fixed, interrelated components and processes embody a cognitive theory, configured with knowledge about the tasks to be modelled [1, p. 76]. One way humans play RPS is through *sequence learning*: tracking and modelling the opponent's last choices to predict their next move. Lebiere and West [2] created related CMs. Pitted against each other, each CM learned the sequences of hands thrown by its opponent and chose its actions accordingly. A CM able to learn sequences of three *hands* showed similar pattern of wins and losses as humans did when pitted against the same type of CM. In follow-up work, West and Lebiere [3] showed that assigning different *payoffs* to RPS outcomes (i.e., win / loss / draw) results in models of humans playing *aggressively* (trying to force wins by avoiding sequences that led to draws in the past). This exemplifies how aspects of *personality* can be captured in a CM.

I want to expand on these findings by scanning the literature for CMs that (partially) exhibit further human factors (HF), like e.g. emotions and motivation. From this research, I am gaining knowledge about how algorithmic and implemen-tational changes to CMs influence the behaviour they exhibit. Using these insights, I aim to conceptualize how other aspects of HFs relevant for fighting game players (e.g. tolerance of frustration or thrill seeking) could each be made to *emerge* from one CM's behaviour. Finally, I may try to *integrate* the CMs found in the literature and those I conceived myself into a single, more comprehensive CM in a *sound* manner, studying related theory and best practices.

Given the limited size of this project, I do not expect to necessarily complete such integration, nor to carry out (substantial) empirical evaluations. Irrespective of that, the project allows me to employ my background expertise in psychology through another of cognitive science's core disciplines: AI. In this way, I am gaining a first impression of the realities of interdisciplinary work. Additionally, I am acquiring knowledge and skills that should serve me well for my further career as a researcher in any field.

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Talks

Coordination Without Explicit Intentions

Kemal Ozan Aybar

University of Vienna

Context

In philosophy of mind, one prominent line of inquiry concerns how individuals are able to do things together. This is studied under the heading of collective intentionality. Relevant phenomena include diverse social interactions like playing a game of chess, preparing a meal together, co-authoring a scientific article. Prominent works in the field of collective intentionality develop analyses of interactions where the agents have more or less explicitly decided to coordinate their actions. But as pointed out by some critics, there are social interactions which we neither intended to initiate, nor made plans to continue and yet we take part in them [1]. Situations of emergent and implicit coordination can be reviewed under this domain [2]. In brief, current research in collective intentionality focuses too narrowly on activities that result from explicit intentions.

Purpose

In this study, I will discuss aspects of collective intentionality which appear to be understudied. To that end, I will argue that individuals are able to coordinate their actions even in the absence of explicit intentions to do so. To show how implicit coordination is possible, I need to discuss how intentions can be implicit but still relevant for guiding actions. Recently, certain philosophers have introduced a distinction between manifest and operative intentions [2]. Intentions that we recognize as guiding our behaviours have been called manifest intentions while intentions that actually guide our behaviours are called opera-

tive intentions. When operative intentions exceed manifest intentions, we can say that there are implicit intentions that guide the behaviour. My claim is that having shared implicit intentions makes it possible for us to coordinate our activities without explicitly agreeing to do so.

Methods

Expectations I will conduct a literature review on the relevant topics of collective intentionality, shared activities and implicit coordination. I expect to find that current analyses of shared activity rely extensively on synchronic and explicitly coordinated actions, demonstrating a neglect for many social activities that fall beyond this scope.

Implications

This argument implies that a substantive part of social life is overlooked in the philosophical debates and in turn, philosophically informed experimental research on joint activity suffers from blind spots. Having a more complete picture of shared intentionality will allow us to examine social activities that are not necessarily explicitly coordinated by the participants.

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Fake Vs. Real News: Interaction of Cognitive and Social Factors in Accepting Fake News in Politics

Hansoo Bae

Comenius University in Bratislava

Introduction

Why are some people good at discerning fake news well but some people not? It is becoming increasingly important to investigate the cognitive factors for wide-spread acceptance of fake news, especially in the context of rising social media influence on people's beliefs. Fake news doesn't simply deliver misinformation to the public, but also sometimes it causes social problems. In this research, we will focus on political news, regarding that it is important for our society and it is understudied. It has been suggested that accepting political fake news is based on the bias from partisanship[1][2]. In other words, People use motivated reasoning for the information against their political ideology to argue the information is incorrect whereas people uncritically accept information supports their political ideology. Another possible explanation is connected to the dual- process theory, people who accept fake news might use the autonomous thinking system rather than analytical thinking system. The analytical is correlated with the cognitive reflection test(CRT), which demands more analytical thinking.

If the phenomenon is explained better by analytical thinking, CRT score will show a negative correlation in accepting fake news. If the partisanship can explain the phenomenon better, political ideology will predict how people accept fake news.

This study will replicate the previous research [3] on Slovak population. Considering the differences between Slovakia and U.S.A, we will use political news related to immigration in order to replicate in a similar condition.

Method

We will have one thousand participants from online who are above 18 years old and using social media.

The attitude to immigration will be measured with 8 questions in the scale from 1 to 6. If the participants support conservative or liberal will be also measured. There will be 30 news headlines (15fake, 15 real news). Participants will be asked to do the extended version of CRT first, then they will rate the news headlines how likely the headline will be true by the scale from 1 to 5 scale. There will be extra questions such as if they like to share the news in social media and if they share such a thing often.

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The Effect of Contextual Information on Art Viewing Behavior and Exhibition Reflections

Flora Bakondi

Eötvös Loránd University, University of Vienna
bakondif99@unet.univie.ac.at

Introduction

The way art is presented in museums and galleries influences how visitors perceive it [1]. When composing the exhibition space, curators have a powerful instrument in their toolbox: they can decide about the amount and form of contextual information visitors receive. In 2018 the permanent collection of the Austrian Belvedere Gallery was re-displayed, and four paintings that were exhibited both before and after the rearrangement received an additional interpretive label (i.e. a short description about the backgrounds, themes and styles of the paintings). This occasion provided a great opportunity to examine the effect of these additional interpretive panels on how visitors look at art and how they remember it. My thesis work is part of the large-scale Belvedere Before and After project [2].

Research questions and methodology

The thesis is founded on three research questions: RQ1) How did the viewing times of artworks and label areas change after the rearrangement? RQ2) How did the scanning pattern of artworks and label areas change after the rearrangement? RQ3) How did the interpretive labels alter visitors' memories in their exhibition reflections? Mobile eye-tracking data of before and after the rearrangement were compared using a non-parametric significance test (Mann-Whitney U-test). Unstructured interview transcripts were analysed.

Results

It was found that at least a segment of visitors read the interpretive labels, and usually visitors read these explanations only once, even though they often return to artworks to observe them again. However, the viewing times of artworks and their scanning patterns could not be shown to be different when interpretive labels were provided. The possible reasons are discussed, the most important being the complexity of the uncontrolled museum environment (compared to lab-based empirical studies on the topic, e.g. [3]) that offer various sources of distractions in the process of observing art. The memories visitors formed in the exhibition rooms were slightly influenced by the narrative of the label when the artworks were lesser known. In case of well-known pieces, even though many visitors have read the labels, they were unlikely to reflect on them, possibly because they already had rich mental representations of the paintings prior to their visit.

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Brain Computer Interfaces in Stroke Rehabilitation: A Machine Learning-Based Meta-Analysis

Anna Cornelia Barbulescu, **Moritz Grosse-Wentrup**

University of Vienna

Stroke is a debilitating medical condition that affects approximately 14 million people worldwide on a yearly basis, often causing severe motor impairments [1]. Despite its high prevalence and scientists' efforts to identify appropriate treatments, the development of effective rehabilitative strategies remains an active area of research. Brain computer interfaces (BCIs) are suggested as a novel approach to neurorehabilitation, providing tools for a therapy in which activity-dependent brain plasticity can be induced [2]. The project aims to examine the conditions under which BCI-based rehabilitation is successful.

Methods and Results

Studies using BCIs in post-stroke rehabilitation were compiled in a review and meta-analysis with the goal of evaluating their efficacy in motor recovery. The data collection resulted in an operationalized dataset of patient and treatment details. The studies' results were categorized based on outcome (significant improvement/no significant improvement), as reported by the authors. Pearson correlations and permutation tests were conducted. 56 studies with 761 patients were included in the analysis. With twice as many male compared to female participants, 580 patients (55.1 ± 9.6 years old, 32.4 ± 49.9 months since stroke, mean$\pm$SD) underwent BCI rehabilitation and 181 (58 ± 4.9 years old, 14.2 ± 17.1 months since stroke, mean$\pm$SD) were allocated to control groups (CGs). Predominantly used in experimental groups (EGs) are BCIs conjoined with visual feedback (71%), electrical stimulation (33%) or exoskeletons (28.5%). CGs mostly received electrical stimulation (19%) or robotic assisted movement (25%). Physical therapy is used in 47.6% of EGs and 81.2% of CGs. Significant improvement of motor function was reported in 65% of EGs and 68% of CGs and no improvement in 35% and 32%, respectively. Preliminary results show significant correlations ($p0.05$) between outcome and physical therapy, age, gender and impairment side. No significant correlations between BCI type and outcome were identified.

Considerations and Impact

The generally positive results for both EGs and CGs can be explained by the fact that research with insignificant results is less likely to be submitted for publication [3]. Unavailability of all necessary data required imputation methods which may affect the results reliability. Nonetheless, the comprehensive review and operationalized dataset can serve as a basis for methodological and practical considerations in applications of BCIs for post-stroke rehabilitation, highlighting indicators of success and possible research biases.

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Experience and Time

Julian Lyles Bass-Krueger

University of Vienna

This thesis will investigate how time structures experience and consequently how experience structures time. This broad question will be examined across three experiments.

I. The first experiment uses a standardized task to compare two of the most established phenomenological methods—Descriptive Experience Sampling (DES) and micro-phenomenology [1, 2]. DES involves interviewing participants about experience that occurs directly preceding random beeps. Micro-phenomenology involves interviewing participants by creating an evocation state of a past experience. Here we examine both methods using a mental imagery elicitation task. As a result, DES and micro-phenomenology reveal different aspects of experience. Temporal scope is a major factor for these differing aspects. How then can altering temporal scope reveal new facets of experience?

II. The second experiment establishes a new method: dynamic Descriptive Experience Sampling (dDES). This method adds a more direct temporal dimension to DES. Instead of asking about just one moment before the beep, here we will ask about two moments, as well as the temporal relation between these moments. Results include a variety of such temporal relations, which can then be grouped into categories (e.g. transformation, overlapping). How can this method be useful to the rest of cognitive science?

III. The third experiment tests out dDES with an established psychological study—the Libet task, investigating free will [3]. This task involves participants freely choosing when to press a button. Neuroactivation shows a response (the readiness potential), preceding the reported time of free decision. What are participants' experiences like over time courses that correspond to this readiness potential? Results include findings that may challenge phenomenological assumptions of the Libet setup, for example the assumption that there is nothing leading up to a decision before its reporting.

The first experiment surveys the scope of existing methods. The second experiment introduces a new method to investigate temporal experience. The third experiment shows the applicability of our new method and helps question its validity. These three experiments help address further philosophical concerns, including existing models of temporal consciousness.

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Effects of Acoustic Parameters in Voice on Language Perception

Žiga Bogataj

University of Ljubljana

Introduction

The phonaesthetic preferences of any given listener are assumed to be influenced by multiple factors, e. g. phonetical characteristics of a language, familiarity with the language, tempo of speech and acoustic features of the voice [1], such as: (i) fundamental frequency (F0); (ii) an approximate frequency of the (quasi-)periodic structure of voiced signals that we subjectively perceive as "pitch"; (iii) fluctuations of amplitude (shimmer); and (iv) frequency (jitter) [2]. A recent study [1] showed that attributes used in psycholinguistic research of language perception can be reduced to five main components: "Beauty", "Culture/status", "Eros", "Orderliness", "Sweet/soft". In the study, English language was perceived as the most cultural and orderly, whereas French peaked in other categories. However, the effect of acoustic parameters of the voice was not systematically investigated. This brings us to our research question: How acoustic features of the voice interact with language perception? The aim of this study is to somewhat disentangle the seemingly inseparable bond between the human voice and its perception.

Methods

Our goal is to find 16 participants of each language-family group (Romance, Germanic, Slavic, Finno-Ugric, isolated European languages).

Recordings of a fable "The North Wind and the Sun" in 15 European languages will be used as stimuli. Acoustic parameters of stimuli will be preliminary analyzed. Participants will listen to all stimuli in random order and will have to choose one from a pair of descriptive attributes, referring to above mentioned components. The procedure will be repeated until all combinations will be fulfilled for each stimulus. At the end, a questionnaire about familiarity with the heard languages will be added. The task will be implemented in an online platform.

Expected results

We expect to find significant correlations between "Beauty", "Eros", "Sweet/soft" and Romance languages and an interaction with F0 and jitter. Furthermore, "Culture/status" and "Orderliness" are expected to significantly correlate with Germanic languages, also an interaction with F0 and jitter is plausible.

Implications

Our potential findings might open up new dimensions of multidisciplinary research in fields of psycholinguistics and psychoacoustics. Another implication would be optimizing the marketing industry. Further research, including the factor of speech aesthetics and more thorough breakdown of phonemes, would be needed for the latter.

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Assessment of Sustained Attention with Neurobeans Cognitive Tool

Gregor Bohnec

Cognitive Science, University of Ljubljana

Sustained attention is basic cognitive ability that is foundation for more complex mental activities like learning, problem solving and social interaction. The performance of this ability is therefore linked to important outcomes such as school performance and career success [1]. Being able to evaluate children's ability to sustain attention without the need of professional assistance and in simple non-technical way could help to motivate activities to increase attentional performance and therefore enable better school performance. Even though there is a need in the field of solutions for attentional problems the proper tools for simple and reliable evaluation in school related domain have not been developed yet

Goal

In this research we are interested in evaluation of newly developed cognitive tool Neurobeans that promises to accurately assess cognitive ability of sustained attention with a specific cognitive task and recurring time measurements. The benefit of Neurobeans method comparing to similar tools and tests is that it is simple to conduct and is therefore appropriate for wide usage, is not computer based and therefore not biased towards digital influence and it involves movement. The results will be compared to widely used continues performance test (CPT) Test of Variables of Attention (T.O.V.A.) that have been proved reliable to measure attentional domains [2].

Method

The study will involve 7th grade pupils from elementary schools. Participants will be asked to complete a survey and conduct two cognitive tests on two different days. On one day they will do Neurobeans test and on the other day they will do TOVA test. Both tests measure a variety of attentional variables such as inattention/distractibility, impulsivity, performance drop, etc. [2]. We will analyse correlations between corresponding variables in aim to detect the ability of Neurobeans to assess attentional domains. Additionally, the results will be paired with pupil's school performance, learning problems and digital usage in aim to see wider usability of both tests.

Expected Results

The research will show whether Neurobeans method measures the same domain as TOVA test. Results will enable further development and optimization of the new approach to measuring the ability to sustain attention. More broadly, the results of the research will contribute to a better understanding of measuring attentional domain, added value of movement component and value of focused attention on an object placed in working memory.

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Finding the Best Arm Position for Muscle Relaxation: Implication for Tremor Recording in Patients with Parkinson's Disease and Patients with Essential Tremor

Ena Bratić, **Maja Kojović**

University of Ljubljana (Faculty of Education)

Introduction

Tremor is the most common movement disorder in a population of patients with mobility disorders [1]. It is defined as involuntary rhythmic movement of a body part, occurring at rest, typical for Parkinson's disease or during voluntary muscle activation, as a characteristic of essential tremor (ET) [1]. There is a common diagnostic dilemma, whether a patient has ET or Parkinsonian tremor (PT) since almost a fifth of individuals with ET also have a rest tremor component [2].

Purpose

In clinical practice, the occurrence of tremor depends on the position of limbs during the examination. We hypothesize that the rest tremor component in patients with ET appears due to patient's failure to relax. There is no data in the literature on what is the best position to achieve relaxation, especially when examining the patient in the sitting position, which is the most common scenario in clinical practice. This research is comparing a standing, lying, and four sitting positions with the aim of defining the best position with complete relaxation of the arm muscles. The main goal is to allow a more reliable differentiation between ET and PT patients, which is currently possible only with expensive functional imaging. ## Method The study will include 18 participants without tremor, 10 PT patients and 10 ET patients who also have tremor at rest. Muscle activity is measured with EMG surface electrodes adhered to the following muscles: m. biceps brachii, m. triceps brachii, m. extensor carpi radialis and m. flexor carpi radialis. For each individual, measurements are performed in six different positions for two minutes: (1) standing, arms along the body, (2) lying on the back, arms in supination, sitting: (3) arms on thighs in supination, (4) arms on thighs between supination and pronation, (5) arms on chair arms, hands hanging in pronation, (6) arms along the body. The third position will also include subtraction from 100 (by one) for 30 seconds to provide additional data during cognitive effort.

Conclusion

We expect to find a position in participants without tremor, in which it is possible to achieve (almost) complete relaxation of the upper limb muscles. Furthermore, PT will be the most prominent in this position, while the rest tremor component in ET will become less notable. These findings are important for clinical practice, as they would reduce the influence of external factors and will help in differential diagnosis between ET and PT.

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Role of Gamma in Visual Perception

Jan Anton Bregant, **Zoltán Nádasdy**

University of Ljubljana

Introduction

The study stems from the idea that electrical patterns of brain rhythms, which can be measured by EEG, are organizing principles in cognitive activity of humans. The synchronization patterns of certain brain oscillations have been shown in numerous cognitive tasks as important indicators of the neuronal activity [1].

This particular research is trying to evaluate the role of brain oscillations in the certain gamma frequency ($\approx$40 Hz), in relation to the cognitive process of conscious visual perception. Different aspects of gamma brain activity were a subject of debate over the years [2].

We suggest that gamma rhythms are an enabling factor of information transfer in the visual information flow. We hypothesize that they have a specific role in the encoding process and are indeed a causative factor rather than an emergent event during visual perception.

Methods

By presenting a set of pictures in a limited time frame, we will measure spectral power of the oscillations. The participants (5-10 healthy volunteers, balanced demographics) wearing an EEG gel cap will be presented with a rapid sequence of pictures within a certain category. After this quick display of the pictures, the participants will be asked to recognize previously flashed objects from a gallery. The rapid flashing sequence basically limits the processing of individual images, thus also restricting the person's ability for recognition to only few of them.

By measuring time with a photo sensitive diode, we will establish the phase of the current gamma oscillation for each individual frame. The stimuli itself will be generated by Matlab using Psychtoolbox, for data analysis we will use ASA software. We will aim to compute average gamma phase, gamma onset and coherence across different stimulus levels and conditions.

Expected Results

Preliminary results suggest that the design of the task is acceptable for further expansion with supplementary equipment and slight modifications in methodical approach. The important finding was a significant phase difference between recognized and unrecognized images from the previously described task. The latency or the onset of the significant phase difference happened as early as 10-15 ms after the stimulus onset, which is well earlier than the latency of the visually evoked response in the visual cortex. As for now, we are in the process of gathering experimental data, but we anticipate to be able to reproduce those early results as well as expand on them by taking eye movement conditions into account.

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Sense of Embodiment in Human-Robot Interface Design

Patricija Brečko

University of Ljubljana

Introduction

Rubber hand illusion (RHI) shows that in humans sense of embodiment can be elicited for different extracorporeal objects [1]. This is important for human-robot interface design, as the feeling of being embodied into a robot supposedly increases teleoperation performance, but more studies are needed on the topic [1]. Our aim is to research the sense of embodiment by comparing two different types of user interfaces to a robotic arm. The first interface will mirror the actions of the user as precisely as possible (the congruent condition), meanwhile the second interface will kinematically translate the user's movements, so it will be less intuitive to use (the incongruent condition). We subsequently believe that the congruent control will allow for successful use from the beginning and the incongruent won't. Both groups will have to do a simple motor task. We hypothesize that the congruent control will elicit a stronger sense of embodiment than the incongruent without any training. Our second goal is to investigate whether sense of embodiment changes when a human adapts to incongruent control, which is why we will give the incongruent group time to practice after the first test. Here we hypothesize that with enough training, the incongruent interface will elicit roughly the same degree of embodiment as the congruent interface. The last goal is to assess the task execution proficiency, which we believe will be equal for both conditions after training.

Method

Participants will be split into two groups, one for each condition. The motor task in both cases will be to move the end-effector of the robotic arm along a designated trajectory displayed on the screen. We will measure task performance by calculating the area between the executed and desired trajectory. To assess elicited sense of embodiment we will use a questionnaire and measure skin conductance response, which has also been used in some other studies [2]. Measures of task performance and sense of embodiment will be done once for the congruent group and before, during and after training for the incongruent group.

Conclusion

If the degree of embodiment will be similar in both conditions, it seems that with learning, human brain can embody objects even if they do not completely reflect the morphology of the human body. By connecting the fields of robotics and psychology, we hope to learn more about the cognitive mechanism of determining what belongs to the body.

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Transformation of Consciousness and Self in Meditation and During Psychadelic Drug Use and Neuroscientific Findings

Izabela But

Faculty for Education, University of Ljubljana

Introduction

Questions about the human consciousness and the self are very interesting and complex. There are many different theories on what is consciousness or the self and also whether they exist. I think our consciousness is just a phenomenological base for further phenomena, such as the self. And the self, in my opinion, is complex and time-persistent cognitive entity. On the other hand, Buddhists say that there are no such phenomena as the self and that our consciousness is only a part of anatman, a string of constantly changing mental states without solid and changeless base. [2] I decided to investigate how the consciousness and the self are changing during the Buddhist mindfulness meditation and during usage of psychedelic drugs. by changing the consciousness and the self, I mean, how our brain activity changes, how our perception of ourselves changes and how can both processes influence our brain and what are the consequences. I posed a few hypotheses. The first hypothesis is that brain images from fMRI studies are similar for people who practice meditation and people who use psychedelic drugs during the observation. Next hypothesis is that long term meditation can have a positive effect on better self-perspective. The last hypothesis in this research is that the use of certain psychedelic drugs might have a positive effect in curing some of the psychological disorders, such as PTSD and depression.

Methods

As a cognitive science student, I decided to combine the philosophical knowledge of the problem and the analysis of neuroscientific evidence on already done research.This is a meta-research of existing researches on the topic. Firstly, I found several pieces of literature on considered topics. Then, I examined them to decide which would be the most useful for my research. Further steps will include evaluating and comparing the results of suitable researches.

Results

Since I haven't finished my work yet, I cannot present any results. Although, I expect I will confirm my hypotheses.

Conclusion

I chose this topic due to my personal interest in it. I am expecting to confirm the posed hypotheses and I think that problems as complex as human consciousness should be examined from different points of view.

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What Is It like to Have a Dissolution Experience?

Jaya Caporusso

University of Vienna

Phenomenon of Interest and Research Questions

We are conducting an exploratory empirical phenomenological study whose aim is to investigate what we call "dissolution experiences", i.e. experiences during which there is a feeling of dissolution of the psychological and/or sensory boundaries or salience of the self and/or a feeling of unity and/or identification with the surrounding environment, with other people or objects, or with something perceived as "bigger" [1].

Dissolution experiences have been reported in scientific and non-scientific literature in relation to different contexts, such as meditative practices, use of psychedelic substances and artistic creativity [e.g. 1,2], and under different names: dissolution of the sense of boundaries, ego death, oceanic feeling, self-transcendent experiences, and so on.

The investigation is focusing on what it is like to experience these phenomena, and includes a comparative phenomenological analysis of descriptions of dissolution experiences across subjects and contexts.

Method

We are conducting one-hour-long phenomenological interviews with persons reporting on dissolution experiences, that they experienced at any moment of their life. The interview technique is informed by micro-phenomenology, "an interview method which enables us to bring a person, who may not even have been trained, to become aware of his or her subjective experience, and describe it with great precision" [3]. We expect this technique to allow the interviewer to reach descriptions of subjective experience beyond the context-bound conceptualisations often used in describing target phenomena. We plan to conduct interviews on approximately thirty experiences that occurred in different types of contexts.

Research questions and methodology are based on a pilot study that we have already concluded and that showed promising results.

Expected Results and Implications

We aim to provide a phenomenological and conceptual clarification of dissolution experiences, which have recently become object of growing interest in the scientific community, consequently enabling further research. Our findings could also be relevant for current trending topics in cognitive science, e.g. the discussion about the sense of self, and the epistemological and methodological issues in first-person research.

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Understanding the Headless Rider: Awareness and Intent Communication as Common Language Between Autonomous Vehicles and Other Road Users

Julia Forke

University of Vienna

Context

Autonomously driving vehicles (AVs) are neither an idea from science fiction, nor are they a vision for our far future anymore. The development of such "headless riders" is so advanced that they are already tested in the field in several European cities. Therefore, research on the implementation and acceptance of this technology in our society cannot be postponed any longer and has to be tackled now. One challenge for AVs and human road users is the change of communication culture in traffic situations: Where once a human driver sat, making his or her awareness of other road users and also his or her intentions clear through eye-contact, facial expressions or gestures, there is nothing behind the windshield of autonomous vehicles communicating. At the beginning of the implementation at least, this sudden and complete omission of informal communication between other road users (ORUs) and AVs will lead to a strongly decreased general feeling of safety and might lead to a rejection of the new technology in society at first [1].

Research Aim

Awareness and intent communication provides a promising tool to compensate for the lack of information. The aim of this project is to analyse already existing designs and develop a new screen-based approach to awareness and intent communication of AVs. Furthermore, the research is aimed on examining the effect of awareness and intent communication on ORUs' feeling of safety and their trust in AVs.

Methods

For this purpose, two field studies are carried out: the first study will focus on internal communication of an autonomous minibus with its passengers. In the scope of this study a questionnaire is used to measure passengers' needs and preferences for internal communication. In the second study, a between-subject experiment, one group of participants will be confronted with only awareness communication via an LCD-display in the windshield, whereas the other group will be confronted with awareness and intent communication, while being pedestrians on a test track of such an autonomous bus. Subsequently participants have to fill out a questionnaire assessing their comprehension of the AV's actions, their feeling of safety, their trust and acceptability of AVs. For both studies an autonomous minibus already implemented as part of the public transport on a two-kilometre-long test track in Aspern, Vienna is used.

Hypothesis

It is hypothesized that the more information about the AV's actions and intentions is given, the more trust and stronger feeling of safety in participants arises and with that their acceptability of AVs increases.

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Magnetic Resonance Imaging for Identifying Activity in Distinct Brain Regions During Tadpole Transport

Barbara Furdi, **Eva Ringler**

University of Ljubljana

Parental care is a key element of social behaviour in many vertebrate species that induces behavioural and physiological changes in both parents and offspring. Neuronal mechanisms behind and core brain regions controlling the behaviour are weakly investigated outside lactating mammals and laboratory rodents. Most studies available focus on the neurobiology and neuroanatomy of the maternal mammalian brain within a non-pair bonding system and paternal brain of a biparental system, in which parents form a bond and invest in their offspring. It remains unknown whether the same or different brain areas mediate parental behaviour in uniparental systems, where care is predominantly provided by one sex.

This study aimed to identify and compare brain regions involved in parental behaviour in male poison frogs. Our study species, the Neotropical poison frog *Allobates femoralis*, naturally exhibits tadpole transport as the only form of parental care and is predominantly performed by the male [1, 2]. To visualize the neuronal representation of tadpole transport behaviour we used *in-vivo* manganese-enhanced magnetic resonance imaging (MEMRI) on anaesthetised animals. The method provided us with T1 weighted, 3D echo-spin images of high resolution that enabled to monitor the increased accumulation of paramagnetic manganese ions ($Mn2+$) [3] in response to tadpole transport. To simulate transport, we transferred tadpoles to the frogs' backs with a brush, whereas in the control condition no tadpoles were transferred. Images obtained on 6 male frogs will be used for a comparison between experimental conditions. Similar to findings in other vertebrates, we expect to find enhanced brain activation, during parental care, within the preoptic area (POA), hypothalamus, lateral septum and/or medial pallium.

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Evaluation of Heart Rate and Electrodermal Activity as Objective Indicators of Simulator Sickness in Virtual Reality Environments

Vesna Fülle, **Jože Guna**

University of Ljubljana

Context

Virtual reality is a technology that has been gaining in popularity in recent years. It is becoming more frequently used and has applications in areas such as professional training for medical, military and aviation purposes, as well as in education, therapy and entertainment [1].Simulator sickness, a syndrome similar to motion sickness, is often experienced during exposure to virtual reality environments and as such poses an obstacle to efficient learning, therapy and obtaining data. Several theories try to explain simulator sickness in different ways, most commonly either as discrepancies between different sensory systems (visual, vestibular, proprioceptive) or a mismatch between received sensory information and prior knowledge based on past lived experiences [2]. Identified symptoms of simulator sickness include nausea, oculomotor disturbance and disorientation [2].

Measurements of simulator sickness can be both qualitative via the Simulator Sickness Questionnaire or quantitative via several physiological measurements, such as heart rate, electrodermal activity and respiratory frequency.

Purpose

In this research study we aim to investigate heart rate and electrodermal activity and examine whether they can be used as objective indicators of simulator sickness in virtual reality environments. The goal is to compare obtained physiological results with results provided by the Simulator Sickness Questionnaire and investigate the possible correlation and co-occurrence of both the subjective and objective symptoms of simulator sickness.

Implications

The findings are potentially important across all applications of virtual reality, as improvement of user experience is crucial in order to provide users with efficient and safe tools for therapy, education or immersive entertainment.

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The Use of Psychophysiology in the Study of the Syllabus Difficulty, Synchronization and Use of Kinaesthetic Learning

Tina Giber

University of Ljubljana

The rather complex process of learning is traditionally understood as a purely mental process, separated from bodily states and actions. Conventionally, children's brains have been viewed as an empty cup in to which static knowledge can be poured in, resulting in a sedentary, traditional approach of learning, where children sit still for hours, day after day, year after year, expected to perceive visual and auditory information [1]. However, trying to reduce the sedentary time of children and to improve learning outcomes, pedagogy nowadays tries to incorporate the findings from other fields, for example, learning with bodily movement [2]. As several studies have shown, learning with movement activates many of our mental capacities. Therefore, when children use their bodies to express, form and create educational content, they learn more efficiently [3].

For the general comparison of the traditional and kinaesthetic learning approach, observation of the physiology changes for different lesson difficulties and synchronization of children's physiology, we will be measuring the physiological changes of fifth graders during Science classes, which will be taught in traditional and kinaesthetic way. Throughout the class the children and the teacher will be wearing the wearables; devices that measure energy expenditure, intensity of movements, electrodermal activity (EDA), body heat flux and skin temperature [2]. In order to compare the obtained measurements, we will also be gathering data with an observing protocol, questionnaires about feelings and attitudes and a written examination.

In general, we expect to find differences between the learning approaches. In addition to the general comparison, we foresee to observe higher electrodermal activity for more difficult lessons – which can be interpreted as higher psychological activity; and also, synchronisation (EDA) of children's physiology when learning using the kinaesthetic approach – we assume children are more emotionally engaged in that kind of learning environment, which can lead to synchrony and more effective learning.

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Learning in Children Through Serious Games Compared to Learning With an Educator

Ana Godec

University of Ljubljana

Introduction

Over the last 20 years, we have witnessed a major growth of multimedia technologies. Today's children are born into a world of all kinds of software products and video games (VG). They are called the "Digital Native" or "Net Generation". "Serious games" (SG) are VG which purpose is not just pure entertainment [1]. Children in schools are required to interact with the computer and some evidence suggests that using VG as learning tools is more effective than traditional methods [2].

The research goal is: (i) to explore the child's attitude towards learning new words in a foreign language with two different learning methods; (ii) to compare the learning performance of self-directed learning through SG with the learning through similar but analogue games with an educator; and (iii) what are the differences between the two groups of participants, in terms of attitude towards learning methods and in their learning performance.

Methods

The participants (age 6 - 8) will be healthy children and children with motor impairments. At the beginning of the experiment, we will pre-test the prior knowledge of the chosen content. We will include two types of learning (LT): 1. learning through SG and 2. learning through similar but analogue games with an educator. Half of the participants will first make use of the 1. LT for 15 minutes and will then take a mini-test in order to examine their newly acquired knowledge. Then, they will learn with the 2. LT for 15 minutes and again complete a mini-test after. The other half of the participants will follow the same procedure with the opposite order. We will finish the experiment with the Intrinsic Motivation Inventory (to test the process of learning, their effort, motivation …). We will also conduct an interview where we will ask about the child's well-being, which LT he or she liked the most, how they perceived the tasks, the presence of an educator etc. Throughout the experiment, we will perform the method of direct observation (observing their effort, mood at learning, possible difficulties, sweating, frustrations …).

Conclusion

We propose that learning will be more efficient when an educator is involved in the process. However, children might enjoy the novel LT through SG more and find it more motivating. The findings could be used to improve learning processes in lower grades of schools, for example, to make lessons more interactive and motivational.

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Deep Learning for Detecting Interictal EEG Biomarkers to Assist Epilepsy Diagnosis

Laura Pauline Gschwandtner

Comenius University Bratislava

Background

Diagnosis of epilepsy is tedious and time-consuming. Long-term video EEG monitoring (VEM) is necessary to differentiate epilepsy from organic or psychogenic non-epileptic seizures (PNES). Current state of the art is to wait until a seizure (ictal event) is captured by VEM and thoroughly analyze the recording. Only then a diagnosis can be attempted. Additional biomarkers have been identified in interictal EEG recordings, but have not yet proven enough reliability, being ambiguous or tricky to detect. However, research suggests that a unique combination of such interictal EEG biomarkers could provide high diagnostic value [1]. It could enable faster evaluation of potential epilepsy patients, rule out non-epileptics from lengthy examination and ineffective treatment with physical or psychological side effects could be avoided. Identification of suitable EEG biomarkers requires highly complex pattern detection. Thus, we chose to utilize Deep Learning methods that have proven to be successful in previous research [2].

Ethical issues of applying AI to the field of medicine are a major focus of this thesis. High accuracy and transparency should be particularly valued in medical diagnostics. Medical practitioners can only gain trust, if automated decisions are logical and the reasoning process can be explained. As this is not inherently the case in Deep Learning algorithms, we explore the concept of Explainable AI (XAI) and attempt its implementation [3].

Methods

307 EEG recordings of epileptics and controls are provided by five clinical sources. The recordings do not include any epileptic seizure activity. We built a supervised Convolutional Neural Network (CNN) with residual structure in TensorFlow. This network is used to classify the raw EEG data into epileptic and non-epileptic patients. Three common approaches to XAI are tested and compared. Results are cross-validated and statistically analyzed.

Findings

We aim to develop an explainable AI algorithm that can reliably differentiate interictal epileptic from non-epileptic EEG recordings. XAI provides insight on what the CNN is paying attention to in the data and offers guidance to create more valuable AI. Further, novel knowledge about the type of brain activity that might trigger ictogenesis could be acquired.

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Digital Literacy and Pseudoscience in Crisis Response. The Case of COVID-19 in Austria.

Rita Gsenger

University of Vienna, Vienna University of Economics
a00805412@unet.univie.ac.at

During the COVID-19 pandemic, which reached Europe in January 2020, explanations of the origins, dangers and cures of the respiratory disease caused by the Corona virus surged in great numbers on social media and the Internet. Information contradicting official sources such as scientists and health care officials is spreading even more abundantly and becoming increasingly mainstream. Such information is however often pseudoscientific. The definition of pseudoscience is under discussion, it might be defined as sound conclusions drawn from invalid premises [1].

Cognitive Biases and Digital Literacy

Cognitive biases [2] as well as lacking scientific literacy [3] play a fundamental role in the formation of pseudoscientific beliefs. The medium of the Internet, however, requires additional skills in order to identify the accuracy of information. What role digital literacy plays in the formation of pseudoscientific beliefs is the central research question of this thesis. The main hypotheses are that people with lower digital literacy are more prone to adopt pseudoscientific beliefs and digital literacy itself is dependent on socio-cultural factors. Furthermore, effective crisis communication would reduce the adoption of pseudoscientific beliefs. In order to answer the research questions, pseudoscience during the COVID-19 pandemic in Austria needs to be investigated and other factors such as the societal context of users, as well as crisis communication need to be taken into account. Understanding the formation of beliefs and the factors that influence them might provide valuable insights for future crisis communication in Austria.

Methods

Theoretically, this research is influenced by weak social constructivism, assuming that beliefs and scientific knowledge are constructed, emphasizing their social nature. Moreover, it is based on attribution theory in social cognition, stressing the social context of human decision-making and assuming that human beings are prone to biases. Empirically, the master thesis is using an online questionnaire based on a digital literacy and pseudoscience scale, whereby the latter is updated to include pseudoscientific theories, which surfaced during the COVID-19 pandemic. Results in accordance with the hypotheses would provide insights in the possibilities of effective crisis communication and reduction of prevalence of pseudoscientific belief adoption.

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Investigation of the Perception of Economic Inequality Using a Novel Online Experimental Paradigm

Hooman Habibnia

Eötvös Loránd University

Introduction

While economic inequality hits its highest record in many countries and around the world, some studies indicate that people underestimate the level of inequality [1, 2]. To predict people's behaviors, attitudes and tendencies towards different welfare policies, it is crucial to understand and evaluate their perception of inequality. In this study, by using a novel experimental paradigm, we aim to assess two potential reasons underlying the economic inequality underestimation:

1. While people learn about the distribution of income through their personal experiences, they underestimate the effect of *rare events*, the income of the top 1% rich people.

2. Scale insensitivity may reinforce the people's misperception of super-rich incomes.

Method

Previous studies assessed people's understanding of economic inequality by asking them to estimate the level of inequality with respect to the society that they are living in [1, 2]. In contrast, we conducted a web-based behavioral experiment in two rounds with students of Eotvos Lorand University (533 participants in total). The experiment consisted of two similar phases. In each phase, subjects learned about the incomes of 100 people, by clicking on avatars were shown to them. Afterward, we assessed their perception of income distribution by asking them to estimate either 1) average income in different chunks of the population, or 2) the total share of income. The distributions in the two phases were identical, except in two differences. One of the changes was that distribution was multiplied by a constant (7), and the other was that we replaced the highest income in one distribution (5% of the total income distribution), with a roughly 10 times higher number (35% of the total income distribution). We labeled these numbers as "rare events."

Results and Further Studies

The data indicated that participants ignored the impact of rare events in their estimations. Their estimations of total shares of income in different chunks of the population were almost the same in two distributions; however, the rare events had a huge influence on the income distribution objectively.

In the next step, we want to replicate the study with different inequality perception measurements. Moreover, we would like to use the same experience-based inequality perception to investigate people's risk-taking preferences in different economic populations.

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The Role of Working Memory in Controlled Semantic Cognition

Klára Horváthová

Comenius University in Bratislava

The semantic system is crucial for context-relevant behaviour. The controlled semantic cognition framework [1] proposes that this system is not just the storage of conceptual knowledge, but it consists of another system responsible for control. It is suggested that this semantic-specific control system interacts with general-domain cognitive control and working memory to executively manipulate the retrieval of semantic representations that fit the current demands or situation. Our aim is to study the interaction between working memory and semantic retrieval using the Associative chain test (ACT) [2], a novel experimental paradigm assessing automatic and controlled lexical-semantic retrieval. We hypothesised that a concurrent working memory load will increase the average retrieval latency in both retrieval conditions (automatic and controlled), but this impairment will be more substantial for controlled processing.

Method

We recruited 45 healthy young adults (age 22, SD = 3), all native Slovak speakers. The task contained two blocks (working memory (WM) measures, main task). The main task - ACT utilizes the word production approach in two conditions, automatic and controlled producing associates and dissociates, respectively. Producing dissociates demands the inhibition of automatically retrieved associations and thus employs controlled mechanisms. In this task, we manipulated the cognitive load by introducing a concurrent task engaged in loading the WM capacity (no, low, high). The response time was measured for each word production. To determine the WM capacity, we used Backward Digit Span and Operation Span tasks at the beginning of the experiment. The effect of retrieval condition and the load was modelled using LMEM.

Findings

The main finding showed a significant effect of the response type (associate, dissociate) and WM load (no, low, high). The latency of responses in controlled (dissociate) condition was substantially higher than in automatic (associate) condition. Although, higher load correlated with higher response latency, the effect was similar in both conditions. Thus, we have not found a significant interaction effect of response type and WM load.

Discussion

WM load affected both retrieval conditions which may suggest that WM is part of a domain-general system facilitating also semantic activation and inhibition. Further research is needed to elucidate the role of WM in controlled semantic retrieval.

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Test-Retest Reliability Of Emotion Regulation Networks In The Resting-State

Lucas Jeay-Bizot, **Stella Berboth**, **Carmen Morawetz**

University of Vienna

Background:

Emotion Regulation (ER) is the ability to alter the emotional impact of a stimulus or situation. The reaction to a stimulus generates an emotional response, which can, in turn, be modulated by changing the way we think about the emotion. Thus, this process consists of emotion generative (EG) and regulatory (ER) processes. In our study, we investigated the resting-state functional connectivity (i.e. how strongly two brain regions are connected during rest) underlying EG and ER networks using functional magnetic resonance imaging (fMRI). Identifying biomarkers for ER in the brain could help in the diagnosis and treatment of several affective disorders that involve dysfunctional ER, such as depressive or anxiety disorders. Biomarkers can only be established based on reliable metrics. Thus, we test the reliability of the connectivity of EG and ER networks during rest to set the foundations for biological markers of ER.

Method:

28 healthy participants (23f, mean age = 22.8 ± 3.1) underwent three resting-state fMRI sessions, eyes open (rs-fMRI) with a 1-week test-retest interval.Besides 6 minutes of rs-fMRI, a condition during which participants are only instructed to fixate a cross, for each session, participants also performed a standard ER task during which they were asked to down-regulate their emotions in response to aversive images [1]. The behavioral performance during this task was used as covariate for the rs-fMRI analysis (ER success).In the analysis, we focused on 4 predefined networks involved in EG and ER [2]. EG networks included subcortical regions like the amygdala, which is implicated in emotion processing. ER networks included mainly lateral prefrontal regions, important for attention, working memory, and language. Reliability was tested by calculating the intraclass correlation coefficient, an indicator of how likely it is for a measurement to be repeated in a new session and subject.

Results:

Reliability analysis revealed that ER networks were more reliable than EG networks during rest. Covariate analysis revealed that the rs-fMRI connectivity between the amygdala and the right dorsomedial prefrontal cortex covaried with ER success.

Conclusion:

Our results demonstrate that brain regions involved in ER are reliably connected during rest. In addition, evidence for potential rs-fMRI biomarkers for ER success was identified in our covariate analysis.Our results support the idea of reliable networks involved in ER that could be used in future studies with the main scope to explore resting-state networks in both healthy and patient populations.

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Looping Effects of Violence Risk Prediction

Katarina Jevšenak

University of Ljubljana

Introduction

In the early 19th century, the distinction was made between individuals who were said to have innate, biological criminal tendencies and those, who merely acted in a violent way by force of circumstance. From such a dichotomous division a new domain was established within the legal system, whose goal was concerned with the prediction of future dangerous behaviour. [1] The tendency to biologically explain complex cognitive phenomena that seems to permeate the scientific, political and social spheres resulted in a number of attempts to identify functional or structural brain abnormalities that can be correlated with the symptoms of different behavioural disorders, that are said to correspond to the onset of violence. There is a growing hope, that the use of such information will lead to more effective prevention and intervention strategies, but there are also many potential pressing consequences to such endeavours. I will mostly focus on how these new modes of explanation influence the individual's sense of self.

Methods

I will use critical discursive analysis as my primary methodological approach, because the main goal is analysing the ways in which existing scientific and political narratives establish, reproduce and influence individual's self-understanding and identity construction.

Goals

As Hacking (1995) noted, different historical contexts and different environments bring about new options for constructing people's identities. [2] The shift from a "disciplinary society" as termed by Foucault, to what Beck called "the risk society" gave rise to new ways of governing, new technologies and new ways of dealing with "deviant" and abnormal patterns of human behaviour. My first goal is placing this rising field of using biological information for violence prediction in the current social background of risk society. I will then try to critically evaluate this new dimension of risk assessment through the lens of Hacking's looping effects of human kinds and consider the possible consequences of such categorizations. The problem of "looping" is particularly relevant within this specific framework, because labelling an individual as biologically predisposed to violent behaviour can lead to extreme stigmatizations and to maintaining dichotomous "us and them" divisions that only reproduce and reinforce existing social patterns and prejudices.

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Disruptifying Expectations: Exploring Factors That Impact the Processing of Morphologically Complex Words

Georgia Knell

University of Vienna

The cognitive nature of grammar in language is still widely debated, primarily between generative grammarians, who see grammar as a computational and independent process in the mind, and cognitive grammarians, who see it as more similar to and dependent upon other cognitive processes [1]. Although grammar is usually studied in terms of the combinatorial possibilities of words, there is also a rich though less-understood facet of grammar that constrains the formation of words themselves, namely that of morphology. The rules constraining such word formation are usually attributed to the relationship between morphology and other grammatical components, especially phonology, syntax, and semantics. Speakers tend to follow these rules inherently without explicit knowledge of their nature or even existence. Previous research indicates that morphologically complex words are processed by decomposing them into constituent morphemes [2]. The processing of a word should therefore include rapid access to the grammatical aspects specific to a word's constituent morphemes, such that also restrict word formation [3]. This study considers how such factors present themselves in and impact upon the cognitive processing of complex words.

To do this, three sets of pseudowords were created, each based on a violation of a theorized morphological constraint. These pseudowords are presented along with existing complex English words and nonwords in a lexical decision task, where participants must decide whether each letter string is an English word. Rejection rates measure the "strength" of the violation, while reaction times indicate the mediating effect of each violation and its associated information on the decomposition process.

The results should provide insight into the type of information accessed during word processing and the nature of the associated mental lexicon. Moreover, this is the first of such studies to use words with two-suffix combinations as stimuli and consider factors specific to these words. Finally, this study is one of few to compare these effects between native and non-native speakers of English, in order to consider the similarities or differences between a first and second language in this particular phenomenon. These various aspects help contribute to the general understanding of cognitive language processing, as well as broader implications with regard to grammar as a cognitive mechanism.

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The Influence of Cultural Cognition on Improvisation within Emergency Response Teams

Lauren Kondratiev

Comenius University in Bratislava

Organizational improvisation, or OI, is considered to be improvisation employed by multiple individuals at varying hierarchical levels within any given organization [1]. OI is regarded as a mind-set, rather than an isolated concept. This mind-set may include, but is not limited to bricolage, strategic reasoning, expertise, intuition, and spontaneity.

The goal of this particular thesis work is to focus on organizational improvisation within emergency response teams. The difference between a life saved or lost can at times depend strictly on a team member's or the overall team's improvised action to an event [2].

If we can advance our understanding of how improvisation is employed in such organizations – lives could be saved. This thesis aims to investigate what organizational ecosystems encourage or hinder the use of improvisation in teams. The work strives to do so by looking at what types of internal relationships within emergency response teams lay a foundation of trust. The work will also peer into what level of expertise one may feel adequate enough to improvise at, and how organizational memory influences OI. These phenomena will be explored under the lens of cognitive distribution. Meaning a framework wherein cognitive distribution is a cultural ecosystem of human cognition. This will guide the current work to examine and study how closely intertwined are varying factors of a crisis team's culture to its proclivity for organizational improvisation. As posited by Hutchins, distributed cognition or the cultural-cognitive ecosystem essentially looks at cognition as "a dynamical system in which certain configurations of elements emerge preferentially," [3].

The majority of this work's insights will be gained through interviews compiled using the critical decision method interview style, which prompts the interviewee to engage in a hypothetical scenario that would be plausible in his or her everyday professional life. This scenario would incite the expert to make critical decisions in demanding situations. Members of various fire brigades, who have fought the recent bushfires throughout Australia, will be the interview subjects.

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Comparison of Preferences for Repetition or Meter in Humans and Budgies (Mellopsitacus undulatus)

Jan Kopač

University of Ljubljana

In this research I will be focusing on exploring the effect of meter and repetition on preference towards auditory stimuli. I will be expanding on a previous research by Hoeschele and Bowling [1] which has shown that female budgerigars (Mellopsitacus undulatus) and humans prefer rhythmic auditory patterns to arrhythmic. Instead I will be focusing on preference for meter and repetition in auditory stimuli. Meter is an inferred or imposed meta-structure of patterns possible in different modalities based on a cognitive capacity for perception and anticipation of elements in time, that allows synchronization of movement with external source stimuli [2]. Repetition of sonical elements on the other hand induces in us a sense of flow, as is demonstrated with the speech to song illusion, which essentially consists of a repeated spoken phrase percieved as sung [3]. The experiment will be conducted on both humans and female budgies which are vocal-learning avians from the parrot family. Relevance of the study is in understanding if meter and repetition affect our preferences for auditory stimuli along with across species comparison.

The research will consist of two experiments. In both I will be making use of the place preference paradigm. First one will focus on budgies and will be conducted on a sample of 12 female budgies. I will be using an apparatus designed by Sharzad Afroozeh. The apparatus consists of a hexagonal cage with three perches equipped with infra-red beams and connected speakers on the exterior side of the cage. Everything operates through a microprocessor and is run by an experiment script. When a bird lands on a perch it triggers specific auditory stimuli that are either metric or repetitive or both. Preference towards repetition or meter is then assessed through statistical analysis of the time different birds spent with a particular stimuli.

The second experiment will be on human participants (N=30), both males and females. Exclusion criteria are all hearing impairments. Experimental design is roughly the same as with the first experiment. Exceptions are that it will be conducted in a sound proof room. Room will include three chairs equipped with infra-red beam and the rest of the setup will be identical to the first experiment. The participants will receive instructions to sit in different chairs. Preference will again be determined through the overall time spent listening to particular auditory stimuli.

The stimuli will be created using a MatLab script to create a metrical grid with consequently displacing elements off the grid to make it non-metrical and repeat or prevent repetition of phrases in the case of repetitive stimuli. Stimuli created for the budgie experiment will consist of Praat generated chips based on recordings of budgie vocalization while the human stimuli will consist of different percussion samples. The auditory patterns will be created with all possible permutations of the two variants to create stimuli such as repetative/metric, non-repetative/metric etc. This will allow us to test different conditions and determine whether these is an actual preference for either of the two variants in question.

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Is Cognitive Information in the Eye of the Beholder? Information-Theoretic Foundations of the Free Energy Principle

Moritz Kriegleder

University of Vienna

The free energy principle is a neuroscientific theory that aims to explain how cognitive systems maintain their order in a dynamic and complex environment [1]. It is a mathematical model of cognition that assumes that the brain minimises free energy to reduce the difference between its internal model of the world and sensory information. By borrowing concepts from thermodynamics, artificial intelligence, and Bayesian probability theory the free energy principle provides a unified framework of action and perception called active inference.

Free energy is an information quantity that depends on how surprising sensory states are to the predictions of the cognitive system. However, the role of information in the principle is still debated. Is sensory information a property of the observed environment that is processed by the brain or does the agent construct this information to make sense of the environment?

To analyse the foundations of the free energy principle, I will use methods of the philosophy of information to identify how information is used in the equations and applications of the principle to cognitive phenomena [2]. After this analysis, I can compare the theory to paradigms in cognitive science and see if it fits into cognitivist or enactivist approaches to cognition. Cognitivism assumes that the brain is a processor of external information and enactivism envisions cognition as a dynamic interaction of agent and environment [3].

By borrowing mathematical ideas from Bayesian probability theory, I argue that the free energy principle is an agent-based theory. The probabilities which represent the predictions of the incoming sensory states are beliefs of the cognitive agent about the environment. Therefore, the information used is a subjective construct that cognitive systems use in sense-making.

So far, the role of information and the use of Bayes rule in the free energy principle have not been clarified. I argue that a Bayesian interpretation of information suggests that the beliefs of the cognitive agent are purely subjective and therefore constructive by nature. Butt to fully incorporate enactivism in the free energy the concept of cognitive information has to be extended into an enacted quantity between agent and environment. In my project, I will discuss the possibilities and limitations of an enactive concept of information and it's fundamental role in the free energy principle.

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Breaking the Barriers of Pro-Environmental Behaviour

Lucia Kubíčková

Comenius University

With increasing carbon dioxide emissions, energy use, and rapid growth of the human population, humankind is more often facing the urge to start acting pro-environmentally. Yet, numerous actions are hindered by factors, individuals face when they try to acquire a more sustainable lifestyle. The barriers that are holding people up from pro-environmental behaviour might include structural, social, cultural, or psychological aspects. The presence of barriers is often influenced by several internal factors such as lack of self-efficacy or missing cognitive resources. Self-efficacy refers to the belief that an individual can execute behaviours that are necessary for successful outcomes of the tasks. Studies have shown that this belief has a positive impact on achieving the goals when people can obtain favourable outcomes after initiating activity to improve the environment. [1] The effect of cognitive resources has been addressed mainly by the role of working memory as a successful indicator of the ability to overcome obstacles of pro-environmental behaviour. [2] We have decided to compare the effect of preceding factors, to discover, whether the greater influence is psychological or lies in our cognitive development.

The experiment will consist of two measurements executed on 90 participants. The first measurement will assess the participant's cognitive resources through the cognitive reflection test which is, similarly as working memory associated with intelligence. At the same time, we will measure their self-efficacy in connection with environmental topics. Furthermore, through the DIPB scale [3] we will examine the participant's barriers towards pro-environmental behaviour. Before the second measurement, we will divide participants into three groups: a, a control group; b, a group with self-efficacy training through the set of facts that demonstrate the effects of one's actions; c, a group enhancement of their cognitive resources through the sets of mathematical tasks.

We believe that this study can contribute to broadening the knowledge of reasons behind the barriers of pro-environmental behaviour. As well, we hope our results will be a valuable indicator for future research in this problematic.

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Linguistic Effects of Huntington's Disease Across Languages

Rebecca Rose Lebens

Comenius University

Introduction

Linguistic data is presumed to be divided into two components in the brain, the mental lexicon and the mental grammar. The mental lexicon is the mind's dictionary and the mental grammar is the set of rules and principles that govern the lexicon. Bilingual speakers are presumed to be weaker than monolinguals in retrieving lexical information and in the application of grammatical rules. It is unknown whether this weakness is due to competition between languages, a difference in mental organization, or another cause. In the context of certain types of brain damage, tasks such as pluralization in English allow for comparison between regular grammar rules and irregular lexical retrieval. One example is Huntington's Disease, a neurological degenerative disorder that causes impairments in rule application, possibly due to damage in frontostriatal and frontotemporal regions [1]. Further research into this impairment may improve understanding of the neural structures involved in grammatical and lexical processing as well as the processes themselves [2]. It also has the potential to allow for earlier diagnosis of the disease [3].

Question

HypothesisIs there a significant difference in the organization and processing of the mental lexicon and mental grammar in bilinguals compared to monolinguals? I hypothesize that there will be a difference in subregular rules, which are less frequent than regular rules and follow semi-predictable patterns unlike irregular forms.

Methodology

Participants will perform sentence completion tasks that test rule application and lexical retrieval following the methods of previous studies [3]. The results will be analyzed to determine whether there is any significant difference between the linguistic effects between languages as well as between monolinguals and bilinguals.

Discussion

Investigations into the mental lexicon and the mental grammar of bilinguals may help to better understand neuroligical changes caused by learning multiple languages. Variations between languages and individuals may provide evidence of whether rule application and irregular retrieval are equal between languages and monolinguals versus bilinguals.

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Cues to Joint Agency - A Theoretical and Empirical Investigation of the Sense of Agency in Joint Action

Maximilian Marschner

University of Vienna

Perceiving oneself as the author of one's actions and their resulting effects in the environment - the sense of agency (SoA) - is a central feature of human experience and self-awareness. As previous research on SoA has mainly addressed actions carried out by single individuals, an open question is, how SoA is constituted during joint action. Recent proposals suggest that people's agentive experience in joint action reflects a sense of joint agency, meaning that the experienced unit of agency extends beyond the individual to the group as a whole [1]. Although recent studies provide evidence for this proposal [2], still very little is known about the sources and mechanisms underlying the sense of joint agency. Targeting this gap, it was explored what cues people use to sense agency in different joint action contexts.

An experiment was conducted to investigate the influence of sensorimotor, perceptual, and cognitive cues to agency in a joint sequence reproduction task. Pairs of participants coordinated finger taps under different coordination demands (high: alternating tapping; low: sequential tapping) to reproduce the tempo of a short tone sequence and reported whether tones heard during tapping had been controlled by them (joint control) or by the computer (external control). Additionally, participants rated their agentive experience after each sequence on a scale that ranged from shared to individual control.

Overall, participants reported stronger feelings of shared as opposed to individual control, indicating that people do experience joint agency during joint action. Against findings from previous studies, coordination demands were not found to moderate this effect. Coordination demands had also no effect on participants' ability to distinguish between joint and external control mode. Response-locked analysis of participants tapping performance revealed that independent of coordination demands, both sensorimotor and perceptual cues were used to sense agency. Additionally, there was evidence for an influence of cognitive cues on participants' responses, again irrespective of coordination demands.

The results suggest that the sense of joint agency stems from an integration of both private sensorimotor cues and publicly accessible perceptual and cognitive cues which is in line with hierarchical models of action planning and control in joint action and extends their explanatory value to research on agency. Against theoretical assumptions, the analyzed joint action contexts did not seem to alter the strength of joint agency nor the weighting of different agency cues. Implications of the findings for the theoretical conception of joint agency are discussed.

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Attitudes in the Enaction of Knowledge, Thinking and Communication - Content and Relationship Level

Jar Žiga Marušič

University of Ljubljana

Introduction

Different participants of the same communicative situation can experience it differently. One can experience it as an exchange of information, whereas another may view it as a way of maintaining a friendly relationship. I propose the name **experiential attitude** to refer to the phenomenological aspect of intention that we attribute to enaction of knowledge, communication or thinking. In simpler terms, experiential attitude refers to the way a person experiences a particular situation.

Model

In my master's work I will propose a spectre of attitudes or orientations, that spans between two poles/levels - the content level and the relationship level. A person is relationship-oriented when a situation is experienced as a means to form and maintain social relationships or to build consensus. Conversely, when someone is content-oriented when a situation is experienced as an exchange of information or a search for truth. I believe that the concept of experiential attitudes can bridge the gap between seemingly unconnected theories and models from various fields of psychology and cognitive science, including Piaget's theory of cognitive development (1) and Baron Cohen's E-S theory (2).

Methodology

In order to examine the validity of my model I will first conduct a meta-analysis of the various theories that include something approximating a binary distinction - for example a distinction between two modes of thought, two types of understanding, two separate functions of a phenomenon etc in order to see if it can be said that the concept of experiential attitudes underpins a large amount of these theories. Baron Cohen's E-S theory is an excellent example. He proposes the existence of systemizers (people who tend toward working with objects and systems with well defined rules) and empathizers (people who tend toward working with people and excel in social situations, where the rules are less explicit) (2). When this is viewed through the lens of experiential attitudes, one might say the systemizers are content-oriented, whereas empathizers are relationship-oriented.

The second part of my research will include a two-stage phenomenological study, where I will first provide participants with a questionnaire that explores their understanding of experiential attitudes (the questions will be descriptions of a person experiencing a particular situation and the responses will be different interpretations of the person's experience). A small number of these participants will then be asked to participate in a series of phenomenological interviews, where I will try to validate the concept of experiential attitudes in practice.

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Analysis of Stress in Chess Players Through Physiological Responses

Matej Mencin, **Ivan Bratko**

University of Ljubljana

Introduction

The chess game was traditionally used as a cognitive model to study cognitive processes like problem-solving, decision making, memory, etc. [1,2]. However, there is not much research about stress in chess, even if stress can significantly affect a person's cognition and, consequently, the chess player's performance.

The purpose of this study is to explore the chess player's physiological response in stress situations resulting from time pressure, chessboard situation, mistakes, and other factors. With physiological and chess data we will build a stress detection model, using machine learning algorithms, that will successfully predict, whether or not a chess player is stressed. Besides that, we also aim to find out, if there is any effect of recorded stress on the quality of play.

Methods

In this study, we investigate 44 chess players (35 ± 16 years) playing 103 chess games. Subjects were subjectively healthy and were classified according to the ELO ranking system (2108 ± 154 ELO). The study was conducted in serious chess competition (1. League West) in Slovenia which lasts for nine competition days.

Through the duration of whole chess game (up to around 5 hours), we continuously recorded subjects' physiological data (heart rate, electrodermal activity, and skin temperature) using a wrist device, and chess positions/time using digital chessboard. At the end of each game, the subject filled up a questionnaire answering questions about his or her general mood and most stressful chess positions throughout the game.

For preprocessing physiological data, we will use a pipeline that was used in [3]. For the evaluation of the chess position, we will use a chess engine Stockfish 11. Later, in further analyses, we will inspect stress from physiological and chess data. For hypothesis testing and for building a stress detection model, we will use different statistical methods and machine learning algorithms.

Results

The study is still in the process of analyses; therefore no quantitative results are available. Qualitative changes in stress response are clearly visible at decisive stages of the games.

Significance

We could use these findings to develop tools or instruments to help players monitoring and learn about their stress, or to assist chess coaches in the preparation of chess training.

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Children's Attachment and Relationships in the Times of Social Distancing

Marjeta Merjasec, **Tina Bregant**

University of Ljubljana

Introduction

The attachment bond was first used to describe the relationship where the child explores the environment from and seeks comfort in the attachment figure (mother) [2]. The attachments can vary in quality as they depend on the care a child receives. They are thought to shape an individual's cognition and behaviour in relationships throughout life [2, 3]. Attachment figures change in the development of a child and may include peers, teachers and others [2]. There have been mixed reports in the literature regarding the stability and continuity of attachment quality [3]. Changes in the environment, such as negative experiences and stress, may result in a change in attachment security [3].

In the times of the Covid-19 pandemic the world is experiencing uncertainty, stress and anxiety. Moreover, the most effective and widely applied measure in fighting Covid-19 has been social distancing and isolation, which may bear multiple negative consequences [1]. While children are not the most vulnerable group in the pandemic, their environments have changed significantly. This study aspires to use this "natural laboratory" to investigate whether and how children's attachment and relationships change with the Covid-19 health precautions.

Methods

The study aims to gather data of one hundred primary school children. An online survey will be employed and interviews on the experience may be conducted. The participants will complete questionnaires on the child's attachment to parents and children-teacher relationships. Additionally, factors like socio-economic status and characteristics of the interactions during online schooling will be included in the survey. The data will be collected at two time-points, within the first month of the children being back to school and after 5 months.

Results

The research is still in its initial stage, hence, there are no results available yet. Nonetheless, it is predicted that certain changes in the attachments and relationships will be observed. Upon the normalisation of everyday life, reduction of stress and higher accessibility of attachment figures, it is expected that the quality of relationships will be better and that the attachments will have higher security-related traits.

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Categorisation and Three Kinds of Reasoning

Martyna Meyer

University of Vienna

Context

A comprehensive theory of categorisation is bound to account for the vast variety of categorisation scenarios we find in the world around us. The most prevalent theories rarely take under consideration the complexity of the categorisation processes; they depict it accurately in some scenarios but fail in others. On the other hand, theories that do account for a broader set of scenarios, seem not to tell us much about the process itself.

Purpose

After a careful review of accounts such as the classical theory, the exemplar theory, the prototype theory and the theory-theory as well as the neurological findings supporting them, we come to believe that (1) categorisation is a multi-level process, and (2) the only theory able to account for the vastness and the complexity of the categorisation scenarios is theory-theory—in a form that incorporates elements from other prevalent theories. The purpose of this project is to take this investigation one step further and examine the "layers" of the categorisation process.

Method

Theory-theory has two major interpretations: (1) the categories we learn are similar to specialised scientific theories; (2) humans posses a holistic "theory of the world", similar to a scientific theory. Some scientists combine the first and the second interpretation, claiming that humans posses a holistic theory of the world which additionally consists of smaller, specialised theories that correspond to different concepts [1]. The comparison between the process of categorisation and a scientific theory is central to our investigation. In order to establish further similarities, we refer to C.S. Peirce's account on the methodology of science: every scientific inquiry follows the abduction—deduction—induction pattern [2]. Through an analysis of the three kinds of reasoning in different categorisation scenarios, we examine their role in the categorisation process and their fitness to serve as the "layers" of categorisation. Furthermore, we analyse the usefulness of Peirce's framework as a prototype for the architecture of the categorisation process.

Results

We believe that Peirce's account of methodology of science offers many insights enriching our understanding of categorisation. Three kinds of reasoning: induction, deduction and abduction are easily detectable within all examined categorisation scenarios, leading us to confirm their relevance. Pierce's model of scientific inquiry offers many parallels to the categorisation process and adds to our account of categorisation as a dynamic and multi-level phenomenon.

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The Analysis of Neurophysiological Correlates of Spatial Working Memory and Filtering Ability

Barbora Michalková

Comenius University in Bratislava

Introduction

The contralateral delay activity (CDA) is an event-related potentials (ERP) waveform scanned by EEG over posterior areas of the brain that represents a well-known correlate of visuospatial working memory capacity [1]. It is defined as a sustained negative voltage over the hemisphere that is contralateral to the memorized hemifield, its amplitude increases significantly with the number of representations being held in the memory and reaches a limit at each individual's memory capacity [2]. To achieve maximum usage of working memory capacity possible, it is necessary to be able to filter out all irrelevant stimuli efficiently, which is a skill that can be improved by training [3]. We hypothesize that cognitive training in virtual reality (VR) can improve behavioral performance in working memory (tested offline in a different task outside VR) and that this effect will be visible on its neural correlate - the amplitude of CDA.

Methods

The experimental group played a shooting game in VR designed to train filtering ability for two weeks. Pre-, mid-, and post-training, their EEG was measured while performing a lateralized change detection task (CDT). In CDT, participants have to remember the orientation of target items on relevant hemifield and ignore distractors. CDA is calculated as a difference of the averaged contralateral activity (from the opposite side as relevant hemifield) and the averaged ipsilateral (from the same side as relevant hemifield). The control group was measured the same way excluding the training.

Results

This study is part of a bigger project. My part will focus on a fine analysis of recorded EEG in terms of final ERPs to extract the CDA waveforms with the emphasis on the punctual pre-processing of the data using Brain Vision Analyzer software. Preliminary results showed that the number of targets and distractors affected the behavioural performance, however, there was no improvement detected in time.

Discussion

This study examines the aspects of working memory performance that result in CDA amplitude modulations associated with the number of remembered items. We expect the precise method of ERPs will help to reveal subtle changes caused by training in VR.

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Exploring Cerebello-Cortico Functional Connectivity in Autism Spectrum Disorder

Alexandra Diana Mindu, **Christian Gold**, **Giorgia Silani**

University of Vienna

Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder typically characterised by social and communication difficulties, alongside repetitive behaviours and narrow interests, sensory hypersensitivity, and difficulties in coping with unexpected change [1]. Although the pathophysiology of ASD has received increased attention in the functional neuroimaging literature, one area of functional connectivity (FC) which remains fairly underexamined is cerebello-cortico FC. Given the cerebellum's role in motor processing, as well as cognition and affective responses, and its documented role in ASD neuropathology [2], dysconnectivity between the cerebellum and cortical structures might underlie social and non-social features of ASD. Using resting-state functional magnetic resonance imaging (rs-fMRI) data, the present study aims to investigate cortico-cerebellar FC in individuals with ASD, relative to typically developing controls (TDs).

Method

Our study uses data from the Autism Brain Imaging Data Exchange, an online, publicly available repository of 2226 rs-fMRI data sets acquired on 1060 participants with ASD and 1166 TDs. Screening and selection procedures such as exclusion of individuals with too much head motion or insufficient brain coverage will be employed to ensure that only good-quality rs-fMRI data will be included in the analyses.

Analysis and Expected Results

Seed-based correlation analysis will be used to estimate FC between cerebellar regions of interest and cortical areas. In addition, brain-behaviour relationships will be assessed by regressing FC measures with symptom severity derived from the Autism Diagnostic Observation Schedule and the Social Responsiveness Scale. Associations between the imaging phenotypes and demographic factors such as age and gender will also be explored. We expect to find that FC between sub-partitions of the cerebellum and cortical areas is disrupted in ASD. Furthermore, such FC differences might be predictive of symptom severity and may contribute to impaired social-communicative skill development in individuals with ASD.

Impact

Working towards a better understanding of the brain differences between autistic and neurotypical individuals facilitates the development of treatments and therapies that could help autistic individuals better navigate their lives and the world around them.

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Dialogical Self in Action: Can It Lead to a Change in Attitude?

Mustafa Mohammed

University of Vienna

Background

Inner speech, a tool at our disposal, is a way of accessing our thoughts. Many scholars agree that inner speech has a self-regulation and self-guidance function. Inner speech can be dialogical, according to the Self Dialogic Theory (DST) [1]. DST states that there is a multiplicity of positions, parts, or voices that have a dialogical relationship in the self. In this sense, the inner dialogue includes questions and answers, arguments and counterarguments, or assertions and negations among its parts. Inner speech is in the realm of the 'inner' experiences. One possibility to trigger and externalize the inner dialogue is through a game of acting the roles of the different positions with moderator or director to facilitate the process, as used in a one-to-one psychodrama session [2]. The role-play method acknowledges the situated, enactive, embodied view to cognition.

Objectives

My proposal is to explore the role of inner dialogue as a tool to negotiate a topic. According to DST and applications of psychodrama, the proposed intervention will lead to gain new perspectives, change of attitude, and maybe gain insight. The goal is to measure the effectiveness of the intervention in a case study. Nevertheless, the intervention will open the possibility for a wide range of applications.

Method

A quasi-experiment will be conducted between two samples (25 each). One sample will get the intervention while the control group gets no intervention. The Method is mixed, quantitative, and qualitative, what so-called embedded design. The quantitative part will be used with Likert-scale based questionnaires to measure -subjectively- the participants' attitude towards an issue. To operationalize this study, I choose a case study of the attitude towards human dominance over nature. The survey will be conducted pre and post-intervention for the experiment group and will be compared to the control group (with no intervention). The qualitative part will compare text-response-questions before and after the intervention. This part will show whether the intervention affects the learning outcome.

Intervention

Inspired by the psychodrama method (See [2]), a role-playing game will be used to trigger and simulate a dialogue among the different positions of the self, according to DST.

Expected Results

The pre to post self-assessment would show a more positive attitude change toward human-nature relationships. Otherwise, I expect at least a shift of attitude as a result of the intervention in comparison to the control group. Moreover, I expect the qualitative analysis between the text-response-question would show that the participants show more confidence response, gain additional knowledge, deepened understanding, change in perspective.

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Driving Simulator-based Assessment of Neurological Patients' Driving Abilities

Lenart Motnikar

University of Ljubljana

Introduction

The assessment of neurological patients' driving abilities is a complex and difficult task, limited by time and cost constraints on one side and methodological inadequacy on the other. In recent years, driving simulators have emerged as a possible alternative to existing assessment methods (e.g. behavioral, cognitive, functional, and on-road testing), as they offer the ability of a fast, standardized, and ecologically valid evaluation. Though the effects of neurological disorders have been studied in several driving-simulation studies, no study has so far compared patients deemed able and unable to drive as determined by some established standard.

To fill this gap in the literature, this research analyzes driving characteristics of neurological patients undergoing a standard driver's license renewal procedure at a competent rehabilitation facility.

Methods

The study included 91 patients with various neurological disorders who, based on a multidisciplinary evaluation procedure, were determined to be fit- (n=32), unfit- (n=31), or conditionally-fit-to-drive (n=28). The subjects drove through three independent driving scenarios, simulating rural, highway, and urban environments. The analyzed variables included reaction times and a variety of vehicular control, traffic rule compliance, and eye-tracking parameters. One-way ANOVA was used for group comparison, independently for each driving scenario, and the most discriminative parameters were combined in various machine-learning classifiers.

Results

Reaction times were the only variable where significant differences ($p0.01$) were observed in all scenarios. Regarding vehicular control and rule compliance parameters, significant differences ($p0.05$) were observed in signaling and steering on the highway and in lane position variability, speeding, and crash rates in the urban scenario. No significant differences ($p0.05$) in eye-tracking variables were observed, although some visible trends emerged. Post hoc analyses showed that the observed significant differences were mostly driven by discrepancies between the fit and the unfit group, whereas the conditional group only deviated from the fit group in some instances. The best-performing classifier (SVM), tested with 10-fold cross-validation, achieved a classification accuracy of 55%, which increased to 78% when the conditional subjects were excluded.

Conclusions

The results show that driving simulators can successfully capture differences in the driving abilities of neurological patients and have a potential role in future assessment protocols. Except for reaction times, no variable exhibited differences in more than one scenario, which suggests that environments should be carefully designed to best capture the desired measure. The apparent trends but lack of significance in eye-tracking parameters call for a more nuanced investigation of the patients' visual exploration.

Correlation Between Adverse Childhood Experiences (ACEs) and Empathy in Children in the First Triad of Primary Schools Including Children with Motor Impairment

Katja Peganc

University of Ljubljana

Context

Empathy refers to the process of individual's sharing and understanding another person's emotions, feelings, and thoughts. It plays an important role in communication and, interaction, and can be influenced by several factors such as gender, genetics, parenting style, relationships, traumatic brain injuries, personality, adverse childhood experience, etc. Empathy is develop by adulthood, however, one of the most important periods of its development is childhood. Little is known about how significant stressful or traumatic experiences before the age of 18, known as Adverse Childhood Experiences (ACEs) influence empathy, despite the fact that they have a dose-response relationship with numerous poor health outcomes [1]. Furthermore, there is a lack of research on empathy development in children with motor impairment, that is the the partial or total loss of function of a body part. Since they and their parents experienced additional stress, it is hypothesized this can affect their empathy.

Goal

An analysis of existing literature revealed that no studies have been published on empathy in children who experienced ACEs and have motor impairment. Thus, the goal of this study is to provide answers to the following questions. How does empathy develop in children between 7 and 10 years old (as empathy is robustly developed by the age of 7)? How many ACEs did children experience in the first triad of primary school? Does the number of ACEs influence the development of empathy? Are there any differences in empathy development and/or the number of experienced ACEs between children with motor impairment and those without?

Methods

In a sample of 80 children (20 with motor impairment, 60 without), empathy will be checked through story recapitulation, EmQue-CA questionnaire and EmQue questionnaire for parents. Both questionnaires will be translated to Slovenian, double-checked and sent to the author for approval. With a standardized ACE questionnaire, which was recently evaluated for Slovenian population, adverse childhood experiences will be tested. The questionnaire will be filled out by children and their parents.

Expected Results

I expect to confirm that physically challenged children show less empathy than children without physical handicap since they went through numerous stressful and painful procedures since early childhood. I also assume that those who score higher on ACE questionnaire will be less empathic.

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Verb Production and Comprehension in Patients with Chronic Aphasia

Grega Pignar, **Christina Manouilidou**

University of Ljubljana

Introduction

Aphasia is an acquired language disorder that is most often caused by a stroke or brain injury. Aphasic individuals exhibit different patterns of language deficits. There are two main types of aphasia: fluent and non-fluent. Patients with fluent aphasia usually have impaired comprehension and intact production of speech, while those with non-fluent type have poor and effortful speech production but relatively intact comprehension. Many studies [1], [2], [3] reported problems with verb production and comprehension in aphasic patients. These problems have been often attributed to properties of the verbs, such as argument structure. However, only few studies have been done for Slavic languages, which have some special properties that could reveal more about those problems [1].

The reason for investigating verbs is that they play a crucial role in sentence production and comprehension and it is therefore important for understanding sentence deficits in aphasic patients [2].

Method

Our study will include 15-20 patients with chronic (at least 6 months post-stroke) non-fluent aphasia with agrammatism and the same number of age-matched controls. All our participants will have to be monolingual native speakers of Slovene. We will assess participants' ability to name and understand verbs with two tests: verb naming test (VNT) and verb comprehension test (VCT). Both tests will be adapted into Slovene from The Northwestern Assessment of Verbs and Sentences (NAVS), which is a test battery designed to investigate syntactic deficits in aphasia [2]. Both VNT and VCT will include pictures used in NAVS and verbs of Slovene language that will differ by argument structure and the optionality of arguments. In our study, we will follow the standard procedure for NAVS [2]. In VNT, we will present an action picture and tell a participant to name the action on the picture. In VCT, we will show a picture with four actions and name one action for the participant to identify by pointing.

Expected results

Based on the previous findings [1] we expect to find that aphasic patients with agrammatism will perform worse than healthy controls in both VNT and VCT tests, although we predict they will perform better in VCT than in VNT. We also expect that aphasic participants will perform better when using one-argument unergative verbs (e.g. tekati – to run) compared to two-argument transitive verbs (e.g. rezati – to cut). We assume the aphasic patients will have most difficulties in naming three-argument verbs (e.g. pošiljati - to send).

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Experiencing the Decision-Making Process to Go Jogging

Maša Rebernik, **Toma Strle**

University of Ljubljana

Introduction

Decision making, usually understood as choosing between two or more options, has traditionally been studied as a behavioral process that exists separately from individual decision-makers. However, the third-person perspective on decision making does not give us a comprehensive insight into this cognitive process – it lacks the subjective account of the decision-maker. Similarly, in the field of sports and exercise psychology, where research mostly focuses on the psychological factors that influence physical activity performance [1], a first-person perspective is needed to better understand how we approach and perceive physical activity.

In my research, I aim to understand how my participants experience the process of deciding to go jogging. With that, I will study how they experience a decision-making process, as well as how they approach a form of exercise.

Methods

The study will involve 10 participants who jog recreatively (i.e., in their leisure time) and are interested in exploring their own experience. For one month, they will keep a journal documenting their experience during moments in which they thought about or decided to go jogging. The purpose of the journal is for the participants to memorize those moments more easily, as we will explore them in four interviews based on the micro-phenomenological method. Micro-phenomenology is a first-person qualitative method of studying an individual's lived experience, the aim of which is to obtain a description of the dimensions of experience in the researched experiential episode [2]. The interviews will be recorded for later analysis, the product of which will be experiential categories that will encompass the participants' experiences as they unfold through time.

Expected Results

It is difficult to predict the results as the study is exploratory in nature. Nevertheless, since research has shown that seemingly similar decision situations can be experienced differently by individuals [3], I expect that the participants will experience their deciding in different ways. Some might experience it as decision making, while others may experience it as something else entirely.

Implications

The study will prove useful in providing more insight into the first-person perspective in the areas of decision making as well as sports and exercise. More broadly, it might be able to uncover some experiential structures of the mind, adding to the growing knowledge base of understanding subjective experience.

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Comparing Four Versions of the Enactive Approach

Tess Roder

University of Vienna

The enactive approach (EA) is often portrayed as a single theory, whereas in fact, different thinkers of the EA adhere to different, sometimes even incompatible philosophical frameworks, which is reflected in how they conceive of consciousness, mind and cognition. Central to the EA is the antirepresentational view of cognition as embodied action, which straddles brain, body and environment. The original proposal of the EA by Varela, Thompson and Rosch in The Embodied Mind (TEM) [1] arose from a concern regarding cognitive science moving away from lived experience. They argued for closer collaboration between scientific and phenomenological study of the mind, and argued for a middle way between realism and idealism, in which neither mind nor world forms a ground, but in which the two are fundamentally interdependent. Some thinkers, building on this initial proposal, have largely neglected this concern or even opposed the broader epistemological and methodological claims made in TEM, whereas others remained more in line with the initial proposal. Thus, it remains important to keep in mind the diversity of the different versions of the EA.

In light of this, a comparison of four versions of the EA will be made, namely, the one proposed in the TEM [1], sensorimotor enactivism as put forth by Noë [2], the EA described by Gallagher, and radical enactivism presented by Hutto and Myin [3]. It must be noted that these are not the only versions of the EA circulating in the cognitive science community. However, including more versions is beyond the scope of this thesis. The thesis will discuss the philosophical frameworks in which these versions of the EA are embedded, as well as the role of lived experience in the different versions, whether they allow for any form of representation and how exactly central concepts, such as perception, action, cognition and structural coupling, are viewed. A more refined focus on a few of these aspects will be developed over time.

For now, the following can be said. Gallagher remains mostly in line with the original ideas from TEM and expands on what the EA has to say about more complex forms of cognition. Noë assumes direct realism [2], which contrasts sharply with the middle way of TEM. Hutto and Myin criticize other versions of the EA for still using some form of representationalism and put forth the idea that minds do not need to have content to function [3]. It is expected that a comprehensive overview of the differences and similarities of the EAs could inform current debates in 4E cognition, as well as prevent us from losing sight of the broader framework in which the EA was originally proposed and the concerns surrounding it.

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Post-Trauma Embodiment; Proposition of Upgraded Embodiment Model in a Context of Trauma

Matija Rupčić

Comenius University, Bratislava

Background

Embodiment, also referred to as embodied cognition, is one of the most important research areas in modern cognitive science due to the belief that cognitive processes are influenced by body morphology, emotions, and sensorimotor systems. The idea emerges from a notion about the dependence of cognition on the body and research on causal and physically constitutive roles the body plays in cognition [1].

Motivation

The body can be seen as a regulator of cognition in terms of a feedback-driven role in cognitive processing. Body structures information flow and creates data that solve environment interacting problems [3] by facilitating real-time execution of complex behaviors as a response to complex environmental problems. While embodiment theories deal with a general array of environmental problems, there is no perspective directed exclusively to the problem of disruptive nature such as trauma, any negative life event that occurs in a position of relative helplessness [2].

Goal

The aim is to extend the current perspective of embodiment in cognitive science research and to focus on how trauma affects the body in the long run and to focus on consequences for mental as well as medical health, and the interaction between the two.

Hypothesis

Through the exploration of the big corpus of research from various science fields, this theoretical research will try to discover if trauma causes disturbing somatic sensations, feeling of pain, chronic stress in a body, and other medical issues; if trauma causes disturbances in body awareness and sense of ownership, and finally if pain, chronic stress, and other medical health issues cause traumatic emotions and memory to trigger.

Prediction and Implication

Considering there trauma holds neurobiological consequences, it is expected that one of the crucial effects of trauma has on the body is inflammation - that being exposed to threatful and stressful triggers, the body will produce proteins that facilitate the body responds to it. There is a visible dysregulation of the immune system expected to be present in the case of trauma survivors. The main effect of trauma is expected to be severe discomfort followed by disturbing somatic sensations.

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The Impact of Culture on Social Understanding

Milagros Rocío Saldaña Tumbay

University of Vienna

The capacity of understanding other minds is a core component to studying social cognition because it allows the individual to maintain successful interactions in complex social environments. Developmental psychologists and philosophers of mind have extensively explained this capacity in terms of theory of mind, according to which social understanding is dependent on the individual's capacity to attribute mental states to others [1]. Likewise, enactive and embodied approaches of cognition have attempted to address this phenomenon as an interactive sense of others and the environment. Despite the efforts to explain social understanding, there is still no agreement regarding the cognitive mechanisms underlying it as well as lack of understanding of how cultural factors could shape it.

Theories of mind suggest that the capacity of understanding other minds depends on the development of a set of inferential abilities and the use of our own mental states to gain an understanding of others. In contrast to this perspective, enactive and embodied approaches to cognition argue that it is limited to conceiving of social understanding as a mere prediction of others' behavior through the attribution of mental states and as a primarily individual and internal cognitive process. These views approach social understanding as a dialogue and coordinated interaction between the agents and their environment by directly perceiving others' feelings, intentions, and bodily cues as well as situating their actions in a shared social environment that has been co-created through participatory sense-making [2].

A central claim of these approaches is that the environment from which the individuals make sense of is already full of information that affords certain possibilities for action and constrains the way we understand others' behavior. Following this perspective, I will do theoretical research in which I propose that cultural information of the environment afford different opportunities for action such as the strategies individuals use to understand others' behavior. For instance, in the context of social understanding, collectivist and individualist attitudes afford different strategies, apart from attributing mental states, to accomplish understanding others' behavior [3]. In this regard, I will explore further other cultural characteristics that might play a role in social understanding as well as how they impact different styles of interaction.

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Are Kea Parrots capable of understanding the Ephemeral-Reward Task?

Peter Seban

Comenius University

Introduction

We explore the cognitive abilities of New Zealand kea parrot (Nestor Notabilis). From the perspective of cognitive psychology, our research is focused on learning, inhibition of action, planning, and ability to generalize. These cognitive domains are considered from the perspective of cognitive biology. The emphasis on the ecological approach is elaborated from the perspective of enactivism, which introduces a complex understanding of the interaction of brain, body, and environment.

Methods

In the ephemeral-reward task, a subject has an option to choose between stimuli A and B. Each of them contains an identical reward (food). The subject can opt for the stimulus A which would result in obtaining the reward linked to A and the trial is finished (reward B is removed). The same applies when the subject opts for the stimulus B. It receives the reward linked to B. However, here the subject can get also a reward linked to A (reward A is not removed) [1,2]. Therefore, the ideal scenario for a subject is to select the stimulus B. In the experiment 1, we used a simple setting in which subjects were able to directly see the food rewards. The distance between the stimulus A (black colored squared plate) and the stimulus B (white colored squared plate) was set to be one body length of Kea. The setting of the experiment 2 did not allow the subject to directly see the rewards. Rewards were placed behind a wall-like structure. Here, the bird had to choose one of the sides (differentiated by the color of the squared plate – black or white) where to go first.

Discussion

Previous studies on primates showed this setting with not directly visible rewards was beneficial for the task comprehension [3]. We expect the same may apply for kea parrots. The main reason is the fact that the inability to directly see the rewards inhibits the perceptual power of the food reward and does not deplete entire cognitive capacity to gain the reward. Hence, it provides time for "thinking" and cognitive capacity can be utilized for assessing the task [1]. Thanks to these types of experiments, we can witness that remarkable cognitive abilities that previously were assigned exclusively to human beings are present in various only distantly related species.

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A Cross-Cultural Examination of Hedonic and Eudaimonic Components of Happiness

Lori Slivnik

University of Ljubljana

1. Introduction

With my MT I would like to answer the question whether people from different countries perceive, define and experience happiness differently. The aims of the study are: (1) to examine the psychological and contextual definitions of happiness described by an international sample of participants; (2) to explore the relationship between happiness definitions and demographic features; (3) to investigate the relationship between happiness definitions and country membership cultural dimensions.

2. Methods

I decided to use both qualitative and quantitative data collection methods, a so-called "mixed-method approach" with open-ended questions and scaled ratings being its main parts (Delle Fave 2011, 2016).

2.1 Participants

In contrast with previous research, I am interested in adults from countries not investigated before and from all continents (Antarctica excluded).

2.2 Measures

Participants will be asked to fill several questionnaires: (1) the Eudaimonic and Hedonic Happiness Investigation (EHHI; Delle Fave 2011), that explores various dimensions of well-being through Likert scales and open-ended questions. In my research, I will focus only on the open-ended questions, inviting participants to define happiness in their own words; (2) the Satisfaction With Life Scale (SWLS) which quantitatively assess the hedonic dimension of happiness; (3) a Socio-Demographic Questionnaire providing information on their gender, age, level of education etc. (4) Additionally, I will ask participants whether their mother tongue has specific words for happiness (so called »untranslatable words «) and if so, I will ask them to write them down.

3. Results

Qualitative data analysis method will be grounded theory. Based on the results from previous studies, happiness will be most frequently described by codes "family/social relations" and "harmony/balance". I expect some correlation and regression between meaningfulness (eudaimonia), life satisfaction (hedonia) and happiness. Additionally, I aniticipate some correlation between number of laguage specific expressions and level of happiness.

4. Conclusion

I find it important to conduct this type of research as cross-country differences and similarities in the evaluation of happiness represent a still rather underexplored area and because anthropology is often forgotten within cognitive-science research although it is its central pillar. Another strong point of the study is its interdisciplinarity, as it tries to link (positive) psychology, philosophy (phenomenology, pragmatism), anthropology and linguistics. One possible limitation might be the small sample size compared to previous research (Delle Fave 2016).

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Strange Dream: Experiencing Unnatural Narratives

Mariette Soulat

University of Vienna

Background

Contemporary narratology is divided into two main conceptual perspectives: the second-generation cognitive approach and the unnatural approach. The first strand is greatly influenced by cognitive paradigms such as embodiment and enactivism and puts the emphasis on the reader's body and its role in experiencing and making sense of literary narratives. Studies on the embodiment of language suggest that reading verbal cues evoke the activation of "experiential traces", derived from past engagement with the environment. Stories would cue readers to draw on their experiential traces to engage with and enact narratives by means of similar cognitive strategies used to engage with the world daily. These notions of enactment and embodiment reflect readers' quasi-physical presence in the fictional world [1].

However, proponents of unnatural narratology disagree with this view, disapproving of attempts to universalize reading experience which disregards the variety and richness of literary texts. They claim that unnatural narratives, defined as unsolvable riddles that go beyond human experience, seem to obstruct rather than cue embodiment [2]. Unnatural narratives are usually associated with defamiliarization and estrangement, where the attention of the reader is directed to the artificiality of the constructed world, emphasising the discontinuity between physical and storyworld. Cognitive theories are critizised for their mimetic bias and a propension to conceptualize the reader as a sense-making machine, undermining the complexity of engagement with artistic creation.

Aim

This project will be based on a case study of Henry Miller's "Into the nightlife" [3], a surrealist dream-like novel that fits the unnatural definition of narratives. The goal is to determine whether the hypotheses held by unnatural narratologists are necessary as a separate paradigm to explain readers' experiences while reading stories like "Into the nightlife".

Methods

Based on self-report of my own reading experience and the existing literature, I will explore the above-mentioned topics, in order to establish the claims, limitations and challenging aspects of the two theories and assess whether their differences are irreconcilable. I expect to identify the unnaturalist insights and methodology that would allow a cognitive reading of unnatural texts such as "Into the nightlife".

Conclusion

This project can help further investigation towards a better understanding of reading experiences and perhaps expanding cognitive narratology to unnatural narratives.

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How to Represent the Nonrepresentational: The Role of Affect in Documentary Film

Constanze Maria Springinsfeld

University of Vienna

Background

In the current context, the issue of representation is of twofold nature. Firstly, documentary film has been primarily defined in terms of audiovisual content that refers to ontologically prior entities or events [1]. Secondly, the cognitive sciences traditionally employ linguaform and, more recently, structural resemblance-based accounts of internal representations. Affect, however, might be best conceptualized as the qualitative experience of nonconceptual information [2]. Under this assumption, complex affective experiences such as trauma can be regarded nonrepresentational and, thus, cannot be optimally conveyed through documentary film if characterized by its representational functionalities.

The present study aims to identify ways in which the sensory properties of audiovisual content can be used to transact emotional experience rather than to communicate it through signs. Potential candidates include experimental stylistic strategies such as blurred figments of colour and movement, quick editing, grainy analogue film, excessive duration of takes and time-lapse. It will be empirically tested whether those and other stylistic elements are able to support classical narratives – defined by representational elements and cause-effect relationships amongst them – in conveying the nonrepresentational phenomenon of traumatic experience. Results will indicate if some experimental strategies enable the viewer to perceive the audiovisual content itself rather than primarily inferring meaning from it or categorizing and interpreting it with respect to something ontologically prior. The effects of experimental strategies on the viewers and on their perception of the wider narrative whole will be compared and related to the effects of conventional narration by itself.

Study Design

Participants will view two extracts from an experimental documentary film containing appropriate stylistic elements. The first extract will contain conventional narrative elements only, whereas the second extract will contain a combination of conventional narrative and experimental elements. Each participant will view both extracts with an interval of one week between sessions, where the order of the extracts will be reversed for one half of the subjects. Qualitative content analysis of post-viewing episodic interviews will disclose potential differences in the film viewing experience.

Results can be a directive for documentary filmmakers as they will show whether experimental techniques have the capacity to promote and deepen the viewer's comprehension of traditional narrative elements.

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Training and Protocol Design Effects on Contralateral Delay Activity Components and Behavioral Performance

Viera Štecková

Comenius University in Bratislava

Visual working memory (VWM) retains visual data in memory for a short time and allows manipulation with them. Grasp of the influence of VWM training on subjects' behavioral performance and neurophysiological response contributes to the understanding of VWM [1].

The protocol of contralateral delayed activity (CDA) is focused on the study of event-related potentials (ERPs) representing rapid sensory responses of the brain to a visual stimulus, as well as slower cognitive responses representing the neural mechanism of processing and storing the content of stimuli in VWM[1,2]. During the CDA protocol, the point of gaze is centered while the visual stimuli are shown in both hemifields and are perceived peripherally. The goal is to memorize only the cued hemifield and after the retention interval this memorizing ability is tested [2].

The first aim of the master's thesis is to analyze early and late ERP components as a factor of stimuli type and effects of subjects' training in the environment of mixed reality. We will study effects of different pre-processing methods applied to recorded electroencephalographic (EEG) data and analyzed ERPs. The findings will set the final protocol of extracting ERP components and representative endpoints of these components will be computed and statistically analyzed. These steps will be carried out using the MATLAB and SAS software.

Second, as a sub-task of evaluating the behavioral performance of the CDA task, we will study the effect of visual lateralization during the testing and response periods of each CDA trial. Following indirect measures of this effect, we hypothesize that if the memory period of CDA is followed by lateralized gaze on test stimuli the behavioral performance will not change. This would allow us to treat trials with eye-movements during the test and response period differently and not to exclude them from computed statistics. To test this hypothesis the participants will be instructed to change the point of gaze following the cued hemifield. In the first group of participants, the visual stimuli will be synchronized with eye-tracking recordings to validate the direction of gaze. With the aim of increasing the sample size, the second group of participants will use the modified CDA protocol without eye-tracking. This modified CDA protocol will be distributed to participants with the aim to carry out a series of tests at the home-based condition.

In summary, the contribution of this study is a better understanding of changes in selected ERP components associated with the training of VWM, as well as the gazing effects affecting the behavioral success of subjects.

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Modeling the Spatial Working Memory Employing the Simple Model of Spiking Neurons

Adam Štefunko

Comenius University

Context

In 2000, Compte and his colleagues [1] proposed a model of spatial working memory used to simulate an oculomotor delayed-response task [2].

In this task, a subject fixates a central point during a presentation of a peripheral stimulus for a period of .5 s and a delay period of 1-6 s. After the delay period, the subject does a saccadic eye movement and points on the spot where the stimulus was presented with their eyes. Location-tuned elevated activity was found in neurons in the dorsolateral prefrontal cortex (PFC) during the whole delay period [1].

The model [1] consisted of excitatory pyramidal cells and inhibitory interneurons, with pyramidal cells being 4 times more numerous than interneurons. Cells were spatially distributed according to their preferred cue angle. *Leaky integrate-and-fire* neurons were employed in the model. External excitatory inputs from other cortical areas were modeled as uncorrelated Poisson spikes. Excitatory inputs to the cells were received via AMPA and NMDA receptors and inhibitory inputs via GABAAR-mediated transmission.

The Simple Model of Spiking Neurons [3] is a system of ordinary differential equations with an after-spike reset. This model enables the representation of diverse types of neurons present in the mammalian cortex.

Purpose

This project aims to show that the model of spatial working memory [1] can be implemented using the Simple Model of Spiking Neurons [3] instead of leaky integrate-and-fire units without major adjustments to the working memory model [1]. We implement this model and employ the simulation protocol used by Compte and his colleagues [1].

Results

Our results show elevated activity in stimulated neurons which persists during the delay period. This activity accounts for memorizing the location of the presented cue [1]. We show how we had to adjust the implementation of the model [1] to make it work with the Simple Model of Spiking Neurons [3].

Conclusion

There are multiple computational models of neurons, which can be used to form larger neural networks. Although these models can simulate the behavior of various types of neurons in the mammalian cortex, it might not be straightforward to use them interchangeably to form these larger networks. We try to investigate how a larger neural network model has to be adapted in order to work properly when a different neuron model is employed.

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How Are You Feeling? Enhancing Empathic Interaction by Auxiliary Emotional Cues in Computer-mediated Communication

Dinara Talypova

University of Vienna

For the last decades, cognitive science is moving away from representational mind toward a dynamic cooperative system. However, most works concentrate on cognition and do not focus on emotional aspects. Affective interaction approach is one of the ways to fill this gap. The interactional approach seeks to help people make sense of each other's emotional expressions in open-ended ways, that might be ambiguous and sensitive to context [1].

This research is based on the assumption that emotions are dynamic, socially constructed, and constituted through interactions. Additionally, I apply Gärdenfors' cognitive model of conceptual spaces [2]. That is, quality dimensions of emotions can be represented in the particular coordinates within a conceptual space. A system of coordinates has 2D valence-arousal (v-s) space according to Russell's Circumplex model of emotions [3]. Here, I define empathy based on the simulation theory, i.e. understanding partner's emotions by experiencing them oneself.

In the experiment, I try to measure the empathic interaction between two participants mediated by technology. I ask partners to communicate through audio headset. During the conversation, each of them uses a display of a smartphone to manipulate the screen with two sliders on the v-a scale. Each point maps to an image that reflects "emotional state" in real-time. According to my hypothesis, emotional states (coordinate points in the v-a scale) of participants that share emotional signal (the image) to their partners in interactive way will approach closer to each other than in the control group (audio conversation without extra interactive signal). Hereby, I assume that auxiliary emotional cues will help to enhance empathic interaction between users. V-a scale was created especially for this research. It is based on the answers of 320 respondents that rated images using a 7-point Likert scale for either the valence or the arousal dimension.

The research combines quantitative and qualitative methods of studying subjective experience: statistical analysis of coordinates in the scale and satisfactory reports. This coupling makes the research so aspiring – without applying conceptual spaces concept it was quite challenging to measure empathic interactions since they are viewed as the relational processes of collective dynamics.

This work is an opportunity to better understand emotional processes by applying a new way of measurement. In case of success, it would also serve as an additional argument in favor of affective interaction approach.

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The Role of Executive Attention in Controlled Semantic Cognition

Danijela Topic Vizcaya

Comenius University in Bratislava

Semantic retrieval, necessary for the comprehension of various properties in different circumstances, is enabled by two interacting neural systems, that are referred to as the controlled semantic cognition (CSC) [1]. The first system, in charge of creating and storing concepts in complex semantic networks, is automatic and the second system of control supports and coordinates the first system. Recent findings suggest that the executive attention system may play a crucial role in semantic retrieval. To clarify this functional interaction, the dual-task paradigm was used loading the executive attention during continuous retrieval. We hypothesized that simultaneous load on attention would inhibit the processing and retrieval supported by the semantic control system.

Methods

We recruited 45 healthy students (f=26, mean age= 22,68 years), all native Slovak speakers. We used a recently developed Associative Chain Test (ACT), engaging automatic and controlled lexical-semantic processing [2]. The ACT task consisted of two conditions: associative and dissociative semantic retrieval. To see whether semantic retrieval engages executive functions we introduced a secondary task, the continuous performance task (CPT) with two conditions – the monitoring load (concurrent with the ACT) and switching load (switching ACT conditions). Participants also solved two entry tasks on cognitive interference (Stroop task and Response Inhibition task).

Results

For the analysis of the main task we used the linear mixed effects model (LMEM). The reaction times (RTs) for the dissociative responses were higher in all conditions than for the associative ones. The concurrent monitoring load had a similar negative effect on both retrieval conditions (i.e. inhibiting both associative and dissociative similarly). Both retrieval conditions were also significantly affected by the switching load, but the controlled (dissociative) processing was more impaired than the automatic (associative) processing. Neither of the two control measures (Stroop and response inhibition task) were correlated with the retrieval performance.

Discussion

These findings can be seen as a novel indication proposing that executive attention plays an important role in semantic retrieval. However, further research is necessary for pinpointing the exact contribution of different attentional functions.

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Offline Reactivation of Hippocampal Place Cell Assemblies: Changes in Trajectory Replay and Oscillations Caused by Learning

Rebecca Varga, **Jozsef Csicsvari**

University of Vienna

Introduction

Navigation plays a role in living creatures' everyday lives. O'Keefe and Dostrovsky discovered in 1971 that particular cells [place cells] in the hippocampus fire when a rat is at a specific location [1]. After this discovery, several studies focused on place cells. Findings suggest that place cells in the hippocampus encode a cognitive map, which is unique for each environment that has been explored. Sequential activations of these place cells can encode entire trajectories. However, place cells also fire during offline periods [i.e. sleep]. This trajectory replay has dual roles. During pausing, trajectory replay plays a role in decision making [2]. During sleep, it contributes to memory consolidation. However, in addition to task-specific memory recall, it may also be involved in wider processes, such as stabilizing place neuronal representations, strengthening the association of hippocampal representation to cortex, or schema learning.

Problem

Several studies aimed to uncover how place cell firings and trajectory replay in rats contribute to task-performance. However, as far as I know, there have not been direct studies so far of hippocampal reactivation during sleep with a change in the configuration in spatial learning tasks involving complex mazes. In this thesis, I attempt to investigate how learning and task-performance affect trajectory replay and oscillations which occur during sleep.

Method

An already existing dataset will be analyzed, which contains data about hippocampal place cell firings of rats during sleep after a goal-directed spatial learning task in an eight-arm maze. First, assembly activity-based probability maps are generated using a Bayes decoding method. Then, information about replayed trajectories is extracted from the probability maps. The information about the replayed trajectory and the oscillations will be utilized to identify the changes that have occurred due to learning.

Outcome

The results of the data analysis are expected to show that the reactivation of place cell assemblies during sleep is modulated by the learning performance and predicts subsequent recall. Moreover, spatial learning is expected to lead to altered oscillations in subsequent sleep. The thesis aims to further the knowledge about trajectory replay and its function.

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The Art of Enaction: Between Enactivism and the Philosophical Anthropology of Helmuth Plessner

Primoz Vidovic

Faculty of Education, University of Ljubljana

Introduction

While the explanatory gap between the neurobiological and experiential levels of cognition has already been acknowledged, with a number of approaches trying to reconcile them, there is a similar disconnect between the individual and cultural dimensions of cognition. The tacit assumption seems to be that once we have figured out the former, the nature of the latter will reveal itself also. However, in the literature anthropology's position within cognitive science remains detached and cultural treatments of cognition rather rudimentary, limited for the most part to basic social interaction.

Connecting the enactivist paradigm with the philosophical anthropology of Helmuth Plessner may get us a promising alliance to bridge this gap. They share a dynamic understanding of organisms as entities that define their boundaries, sustain themselves, and build their own realms of meaning in relation to their environment. Enactivism provides a robust framework for the study of cognition grounded in contemporary science [1]. Plessner, on the other hand, takes a step further, and elaborates on the unique, excentric position humans assume, resulting in a natural artificiality that serves as the kernel of culture [2]. The purpose of this research project is to compare these theories and find their similarities and discrepancies.

Methods

The nature of the project being mainly philosophical, the primary methods used will be conceptual and comparative analysis of the theories of enactivism and philosophical anthropology. Following a literature review on the status quo, the key ideas of both theories will be presented, first separately and then in comparison, concluding with a synthesis.

Expected Results

It is expected there will be a substantial overlap between the two theories, with similarities both on a methodological and conceptual level. Most likely they will balance and complete each other, opening up new avenues of research.

Discussion

Putting the aforementioned theories together, it is hoped a framework may be constructed that could be useful both in a more cognitive approach to culture, and a more cultural approach to cognition. Future research could make use of it to connect it to the wider field of philosophical anthropology and its implications for the study of religion, art, history, and other areas [3].

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Psychological Support for Hemodialysis Patients: One in the Field but Without Shield

Viktoriia Vinokurova

University of Vienna

Persons with End-Stage Renal Disease undergoing hemodialysis (HD) tend to face unique psychological difficulties, management of which remains insufficient. [2] Preliminary literature review and personal communication with HD patients (pts) suggest two major issues in research and medical practices that led to this problem.

Firstly, the majority of research works are focused on statistical representation of pts' data, such as suicide rates – 2,4 times higher than in the general population [1], – or rates of prevalence of affective disorders/depression – 39,3%-62,3% [3]. While these numbers provide clear evidence to assert the existence and severity of the problem, they potentially indicate that the HD pts are mainly seen as subjectswhose experiences are expressed statistically.

Secondly, review of studies of the past ten years suggests that a considerable amount of conclusions drawn from the interpretation of the collected data is suboptimal at best: the offered solutions patch up the leak instead of fixing it. E.g. in one study, after establishing that the most popular method of suicide among the pts was cutting HD vascular access, the researchers concluded that pts should be advised on a different dialysis modality instead of suggesting ways to help them with psychological problems that led to a decision to commit suicide in the first place. [1]

With this theoretical research I expect to make the first step towards bestowing pts with the voice, and the opportunity to stop their dehumanization. Pts are not just medical subjects. These are people who, like anybody else, have problems, experience and feelings. HD simply magnifies a lot of already existing problems. The existing research tends to neglect their significance to individuals, potentially marginalizing them. This project's aim is to break the habit of giving an impartial researchers' advice; to change the existing practices of interpreting patients' words for the sake of statistical interpretation; and to substitute the latter with transformation of patients' words into recommendations and solutions for medical professionals.

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The Role of Precedence in Coordination Games

Liubov Voronina, **Christophe Heintz**

University of Ljubljana

In pure coordination games, two anonymous players are presented with a set of equally attractive choice options. They both win if they choose an identical option. Otherwise, they both lose. Even in the absence of communication, players tend to concentrate their answers around some of the options at a rate significantly higher than chance [1,2,3].

Heads or tails? Heads, obviously.

It is not, however, obvious at all, what exactly makes "heads" stand out as a choice of strong preference for the vast majority of respondents [1,2]. Such recognizable prominence of one alternative over another, that results in a stable solution, is called focal point or salience.

There are two major theories that aim to explain the phenomenon of saliency [3]. Cognitive hierarchy theory differentiates between primary ("what appeals to me" or just picking) and secondary salience ("what I believe you are most likely to pick" or guessing).

In contrast, Schelling salience suggests that people look for such selection rule among many, that can single out a successful coordination strategy. This approach was originally proposed by Schelling [1] and is currently represented by the theory of team reasoning ("what should we do?" or coordinating). Both theories keep getting mixed results and look toward a unified account to yield more robust predictions [3].

In our project we would like to study one way to achieve Schelling salience, namely precedence. To our best knowledge, it has not yet been empirically tested. The goal of our experiment is to show how the history of their previous interactions is being used by the participants to determine the rule of coordination. We hypothesize that the strategy that has led to successful coordination in the past will itself become a focal point for further interactions.

To test our hypothesis we have developed a mobile application with a set of coordination games to be played by randomly assigned partners online. We predict that the joint history of play will facilitate accurate mutual expectations and enhance players' performance. Moreover, the solutions they will converge on will be congruent with their successful strategies from the past.

Coordination, as seamless as it appears in everyday life, easily evades formal analysis yet remains the main stabilizing factor of social interactions. By investigating the way joint history shapes future outcomes we hope to contribute some valuable empirical evidence to the game theoretical perspective on the emergence of social norms.

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Semi-automatic Extraction of Image Schemas from Natural Language

Lennart Wachowiak

University of Vienna

Background

Image schemas were introduced by Johnson [1] and Lakoff [2] in 1987 and received attention from various disciplines of the cognitive sciences, e.g. cognitive linguistics, developmental psychology, or neuroscience. They describe cognitive building blocks, often called spatio-temporal relations, which are learned during infancy through physical interactions with the environment. These building blocks not only help us generalize to new and unseen situations but are also hypothesized to shape our abstract thinking and reasoning, as well as the language through which we express it.

Problem

Automatically extracting image schemas from natural language is still an unsolved problem. Gromann and Hedblom [3] propose a semi-automated method which identifies verb-preposition occurrences which serve as indicators for spatio-temporal structures in language. The extracted verb-preposition pairs are then grouped by a cluster analysis based on their coocurrring nouns. This way, spatial and non-spatial structures are divided, while text based on the same image schemas is clustered together, e.g. "continue along road" should be clustered with other instances of the image schema source-path-goal. The goal of the present study is to contribute to the enhancement of this method.

Method

In this research, we build on the approach proposed by Gromann and Hedblom [3] and aim to improve it by making use of recent advancements made in natural language processing. This includes using deep learning methods, e.g. learned word embeddings, which can be used to provide features to the clustering method that carry semantic meaning.

Outcome

The outcome of this research will be an evaluation of the improved methodology regarding its effectiveness in extracting image schemas. In addition, a repository of image schemas extracted from a domain specific corpus will be provided.

Impact

A procedure for extracting image schemas easily and accurately from large text corpora would help researchers to further investigate how they shape our language and provide the means to analyze the contexts in which image schemas occur in different languages.

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Learning Music: Does Observing an Expert Affect How We Play?

Elisa Gabrielle Wiedemann

University of Vienna

Evidence has shown that we modulate the kinematics of our actions to convey our intentions. For instance, when demonstrating a new action for a child or naïve observer to learn, we slow down our movements and exaggerate their height or punctuality. Such kinematic modulations, or cues, are also used to discriminate other people's intentions from their actions [1].

These findings are particularly relevant for understanding the process of social learning, that is, "learning that is facilitated by observation of, or interaction with, another individual or its products" [2]. There has been an ongoing debate as to how social learning is to be understood. Some see it as a process of high-fidelity copying, whereas others emphasize reconstruction and take it to be a transformative process, in which relevant aspects are abstracted.

In response to this debate, researchers have started to develop empirical frameworks to test predictions derived from these accounts. In one such experiment, researchers found that novices' behavior when learning a piece of music matched the predictions of reconstruction accounts better than ones that emphasize high-fidelity copying [3].

Following up on this research, the present study investigates the role of kinematic cues in social learning. To do so, a conceptual replication of [3] was implemented in an online environment. This online experiment aimed to test how the observation of an expert demonstrator's actions affects novices' learning of a short piece of music.

Participants were non-musicians with no formal musical training. Their task was to learn to play a short piece of music (12 beats) on a virtual instrument (a 'drum set' that produced four different tones on a pentatonic scale). One group learned to play the piece by watching a video of an expert musician demonstrating it (as in [3]). The other group learned to play it by listening to a soundtrack of the musician demonstrating the piece (taken from the same recording). The central manipulation of this experiment was that only one group had (visual) access to the demonstrator's movements.

Participants' taps were recorded as they learned to play the piece. Their timing and the number of errors made are the main dependent variables for analysis. Preliminary results show that participants who learned from the video (N=32) made significantly fewer mistakes ($t(50.58)=4.66$, $p0.001$, Cohen's $d=1.15$) than audio learners (N=33). Analysis of timing is under way.

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Workshops

Ethics of Intelligent Technologies

Martin Takáč

Comenius University in Bratislava,
Bratislava, Slovakia

The workshop supplements the lecture "Intelligent technologies and society: risks and opportunities" by Martin Takáč for those who want to go deeper into selected topics. The participants can choose between:

1. Ethical values for developing intelligent virtual assistants - exploration of your own values and a practical task of creating an ethical policy document for a fictional company developing intelligent visual assistants

2. Fair use of predictive algorithms in justice - discussion about issues, biases and fairness in predictive algorithms with a practical tasks of creating guidelines for fair and unbiased use of such algorithms in justice (a fictional government policy).

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