

**11th**

**CRACOW  
COGNITIVE  
SCIENCE  
CONFERENCE**

**MEMORY**

**ATTENTION &**

**BOOK OF ABSTRACTS**

# 11th Cracow Cognitive Science Conference - Attention and Memory

May 11-12th 2019, Cracow, Poland

## ENGLISH

Cracow Cognitive Science Conference is an annual event that has its origins in 2007. After a one-year break in 2013 the event was resumed by Jagiellonian University's Cognitive Science Student Association. Since then, every edition has its focus on a different main topic. The conference creates an opportunity for students from all over the Europe to discuss ideas from all branches of cognitive science. 11th Cracow Cognitive Science Conference – Attention and Memory took place on May 11th-12th 2019. Besides hearing talks given by almost thirty participants, three special guests were invited. First of them was prof. Juan Lupiáñez from the University of Granada with the talk on semantic incongruity and attention. A speech titled: "The Dynamic Attentional Workspace Account" was given by prof. Rob Van der Lubbe from the University of Twente. And last, but not least, during the conference there was a possibility to hear a lecture on "Cell Assemblies and Hippocampal Cortical Interactions" by prof. Francesco Battaglia from the Radboud University Nijmegen. What is more, almost forty participants presented their posters. During two sessions they were introducing their researches to passive participants. The conference was accompanied by workshops led by special guests, students and scientific workers of Jagiellonian University. Representatives of EFPSA - Journal of European Psychology Students hosted a workshop that focused on the rules of Registered Reports and scientific writing in practice. 11th Cracow Cognitive Science Conference was organized under the honorary patronage of the Rector of Jagiellonian University. What is more, it was proudly supported by Jagiellonian University's Psychology Student Association, Institute of Psychology, Institute of Philosophy, Copernicus Center, neuropsychologia.org, magazine and internet portal Filozofuj, mojapsychologia.pl, Polish Psychological Society and RKN UJ.

## POLSKI

Krakowska Konferencja Kognitywistyczna jest corocznym wydarzeniem, które ma swoje korzenie w roku 2007. Po rocznej przerwie w 2013 wydarzenie zostało wznowione przez Koło Naukowe Studentów Kognitywistyki Uniwersytetu Jagiellońskiego. Od tej pory, każda edycja skupiała się na innym temacie przewodnim. Konferencja stwarza możliwość dyskusji pomysłów ze wszystkich dziedzin kognitywistyki dla studentów z całej Europy. XI Krakowska Konferencja Kognitywistyczna, z tematem przewodnim „Uwaga i pamięć”, odbyła się 11-12 maja 2019 roku. Poza usłyszeniem wystąpień, których udzieliło prawie trzydziestu czynnych uczestników, mogliśmy usłyszeć wykłady trzech gości specjalnych. Pierwszy z nich wygłosił prof. Juan Lupiáñez z Uniwersytetu w Grenadzie. Podczas wystąpienia skupił się na związkach niespójności semantycznej i uwagi. Wykład o tytule: "The Dynamic Attentional Workspace Account" został wygłoszony przez prof. Rob Van der Lubbe z Uniwersytetu w Twente. Wreszcie, uczestnicy mieli okazję do wysłuchania trzeciego gościa specjalnego, prof. Francesco Battaglia, który opowiadał o „Cell Assemblies and Hippocampal Cortical Interactions”. Co więcej, prawie czterdziestu uczestników zaprezentowało swoje postery. Podczas dwóch sesji opowiadali licznie przybyłym uczestnikom biernym o swoich pracach badawczych. Konferencji towarzyszyły warsztaty praktyczne i teoretyczne prowadzone przez gości specjalnych, studentów i pracowników naukowych Uniwersytetu Jagiellońskiego. Reprezentanci EFPSA – Journal of European Psychology Students prowadzili warsztat skupiający się na zasadach pisania prac zgodnych z ustaleniami dotyczącymi Registered Reports i poszerzaniu praktycznych umiejętności. XI Krakowska Konferencja Kognitywistyczna została zorganizowana pod Honorowym Patronatem Rektora Uniwersytetu Jagiellońskiego. Ponadto, wsparcia udzielili jej: Koło Naukowe Studentów Psychologii UJ, Instytut Filozofii, Instytut Psychologii, Centrum Kopernika, neuropsychologia.org, magazyn i portal internetowy Filozofuj, mojapsychologia.pl, Polskie Towarzystwo Psychologiczne oraz Rada Kół Naukowych UJ.

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# Antecedent descriptions modulate attention to arousing pictures a fMRI study of implicit emotion regulation

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## Abstract

It is well-established that emotions can be regulated in a wide variety of ways. However, until recently, the great majority of studies have focused on conscious, deliberative, and resource-demanding processes of emotion regulation, almost completely neglecting mechanisms that may operate at unconscious, automatic level [1], [2]. Cognitive reappraisal strategy is regarded as one of the most effective means to regulate ones emotions. It involves changing the meaning of an unpleasant stimulus to attenuate its emotional impact. While majority of neuroimaging studies have explored the neural mechanisms of deliberate and intentional reappraisal [3], little is known about the neural correlates of reappraisal that occurs outside of one's awareness. The aim of the present study was to investigate neural markers of implicit reappraisal strategy with the use of functional magnetic resonance (fMRI) imaging technique. In order to hide emotion regulation goal, we designed a paradigm utilizing the Scrambled Sentence Test priming technique [4]. 20 healthy female participants took part in our study. They were instructed to construct eight grammatically correct sentences from word jumbles that were followed by the presentation of eight unpleasant or neutral images derived from the IAPS database. In the implicit reappraisal condition, half of all sentences conveyed regulatory message, i.e. suggesting that the oncoming negative images will display fictional events (e.g. Scenes are derived from a movie), while the other half had neutral meaning that was unrelated to the pictures content (e.g. She has just tied her shoe). In the control condition, all preceding sentences had neutral and unrelated meaning. Unscrambling sentences with regulatory meaning exerted robust effects, attenuating the neural processing in: lingual gyrus, fusiform gyrus, cuneus and superior temporal gyrus, and increasing activity in: right superior frontal gyrus, middle frontal gyrus and left medial frontal gyrus/dorsal anterior cingulate cortex. These results imply that implicit emotion regulation modulated early perceptual and attentional stages of unpleasant stimuli processing, and that these modulatory effects originated from executive attention/cognitive control areas of the brain that have been previously associated with conscious, deliberate and resource-demanding forms of emotion regulation. Thus, our study provides novel evidence indicating that even a subtle and hidden manipulation of the stimulus meaning may influence perception of and attention to the oncoming sensory stimulation and that reappraisal may also operate at an automatic, unconscious, and resource-free level. These findings highlight the importance of implicit forms of emotion regulation for facilitating emotional control in everyday life, and have implications for the current models of emotion regulation.

**Keywords**— implicit emotion regulation, cognitive reappraisal, fMRI

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# Testing a Priming Account of the Contingent-Capture Effect

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## Abstract

In the contingent-capture protocol, singleton cues (e.g., a green cue presented among red non-singleton stimuli) having a targets searched-for feature capture attention, but equally salient singleton cues not having the targets searched-for feature do not, a result labelled the contingent-capture effect [1]. The contingent-capture effect is usually regarded as evidence for the observers ability to establish search settings for certain non-spatial features in a top-down manner in working memory. For example, when searching for red object, participants could use a working-memory representation for red to search for the targets, with the consequence that a red cue captures attention, even if this cue is entirely unpredictable of the most target position, but a green does not. However, in recent years, it has become increasingly clear that other forms of memory are also powerful mediators of attentional capture. In this vein, it was suggested that contingent-capture effects could emerge as a result of (inter-trial) priming: The idea is that features that have been encountered previously in the target are primed so that cues having these features automatically capture attention in a subsequent encounter. For example, attending to a red target in trial n-1 could prime the capture of attention by a red cue, but not by a green cue, in the immediately following trial n. Here, we tested a strong version of the priming account of the contingent-capture effect. We wanted to know whether cues having target features would capture attention when the corresponding features were not part of the instructions (i.e., when the corresponding features were task-irrelevant). For example, does a red target in trial n-1 boost capture by a red cue in an immediately following trial, even where participants search for the shape of the target. Results suggested that a strong version of the priming account of contingent capture is not supported. In five experiments, we found little evidence that the contingent-capture effect could be explained by (inter-trial) priming of task-irrelevant features alone. Experiments 1 and 2 showed no capture through shape priming when participants searched for color targets. Experiment 3 demonstrated no evidence of capture through color priming during search for shape targets (i.e., with reversed roles of color and shape). The final two experiments used two colors per target, one relevant and to-be searched-for, and one irrelevant but also consistently marking the targets. Again, there was no evidence of capture through priming by the irrelevant target colors, although in this experiment the very same feature dimension color was used for the task-relevant and the task-irrelevant target features. These results show that processes beyond priming through task-irrelevant features are critical for contingent-capture effects. In turn, these results support the conclusion that top-down contingent capture is mediated by templates of relevant target features held in working-memory.

**Keywords**— contingent capture, working memory, inter-trial priming, attention

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# *In Medio Stat Virtus*: Intermediate levels of Attention improve Episodic Memory Encoding in a naturalistic setting

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## Abstract

**Background and objectives:** Episodic memory encoding (the ability to encode both an element and its spatio-temporal context<sup>1</sup>) is highly influenced by the availability of attentional resources. For instance, previous experiments have shown that divided attention during encoding decreases subsequent memory performances<sup>2</sup>. However, few studies have tested the link between attention and memory in ecological conditions. The goal of the present work was to investigate the influence of spontaneous attentional fluctuations (mind wandering) on episodic memory encoding during a walk in a virtual reality environment. **Method:** Fifty-four participants (mean age:  $21 \pm 2.5$  years, 87% women) attended to our study. They were asked to navigate in a virtual environment by following indication panels and were explicitly told to pay attention to their surroundings. During the walk, they were regularly probed about their cognitive state using a scale ranging from *Im totally focused on my thoughts* to *Im totally focused on the environment*. Each probe, unbeknownst to the participants, was triggered by a scene in the environment (e.g., a woman petting a cat, a man taking a picture of a statue, etc.). Ten minutes after the end of the encoding phase, they were submitted to a surprise recognition task. Participants were presented with snapshots of encountered scenes alongside with distractors. We employed a Remember-Know-Guess (RKG) paradigm in order to assess recollection or familiarity-based recognition. **Results:** We didn't find a significant relationship between the probability of recognizing an item and the attentional level at encoding. However, when analyzing the items recognized by our participants, we found a quadratic reversed U-shaped relationship between the attentional level reported at encoding and the probability of giving either a Remember or a Know response. The nearer to the medium value the level of mind wandering was, the higher was the probability to have a recollection-based strategy. **Discussion and conclusion:** Our result indicate that in a complex environment, the relationship between attention and episodic memory encoding may not be as straightforward as it seems. Indeed, the highest probability of remembering a scene would be when participants present a medium attentional level: neither distracted by inner thoughts nor too focused on the environment. This can be explained by the fact that focusing too much on the task at hand can lead to a narrowing of the attentional focus, thus limiting the amount of attentional resources allocated to the global perception of the environment. Further studies are needed to explore this result in both virtual reality and with classical laboratory material.

**Keywords**— Mind wandering, Episodic memory, Attention, Virtual reality

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# Where is your attention?

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## Abstract

Are we perceiving the world around us evenly in all directions from where we place our focus or does our attention have a specific shape? When experimenters want to display objects to participants, the circular array is often employed: Displaying a central fixation (typically cross or dot) surrounded by objects arranged in a circular manner on a screen is a setup that can likely be found in hundreds of papers, especially within memory and perception research. However, several published papers indicate differences in accuracy (and speed) depending on where the object was displayed [1,2,4]. Specifically, it seems that objects presented on the horizontal axis (parallel to your eyes) yield higher accuracy (and faster response time) than objects presented on the vertical axis (parallel to your nose). It is important to remember that in all cases, the objects have the same distance from the centre.

Despite these publications, it seems that most researchers nonetheless work with the (tacit) assumption that all positions should yield the same accuracy and speed. If there truly is a difference in how attention is located, this difference should inform how we design our experiments, and even display information in real life situations (such as a pilot's head-up display). In this talk, I give a brief overview of the literature (from human behaviour studies to single cell recordings in mice) [1,2,3,4] which indicates that there may be physical reasons for the uneven distribution of our attention. As a next step, I present corroborating evidence that I have collected. Not only, have I replicated the position effect on accuracy, I have also further investigated how people subjectively experience the objects at different positions. My results show that participants report weaker experiences on the vertical axis. In other words, people feel that they do not experience objects with the same clarity depending where on a circular array those objects are presented.

Then, I present a novel experimental paradigm, that seeks to alleviate the differences of attention so that all objects are perceived more evenly. The design is data-driven (rather than based preconceptions from my own previous results or the literature) allowing a staircase procedure to individually tweak the position of a total of 16 objects - aiming to yield the same accuracy for each position. The paradigm has been employed on 31 participants displaying them figures that represent natural objects. The results indicated that the shape of attention is approximated by an ellipse. This approximation seems congruent with previously published neuro and behavioural research. I demonstrate that these results are statistically robust and provide general guidelines on how you can present information either as stimuli in future experiments or speculatively even in user interfaces.

As final steps, I review what is still to be researched, for instance, it would be interesting to see if the same results will be obtained by other stimuli types (for instance simple figures) and to investigate how much an ellipsoid display will reduce the variance in accuracy, response time and visual experience.

**Keywords**— Attention, Vision

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# ERP correlates of consciousness and attention during perception of self-related stimuli.

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## Abstract

### Introduction

Perception of a stimulus evokes brain activity reflecting both, access of a stimulus to consciousness and simultaneous cognitive processing. Therefore, dissociating neuronal mechanisms of these two processes remains one of the main challenges of consciousness science [1]. It has been proposed that the P3b event-related potential (ERP) - a relatively late brain response observed over centro-parietal electrodes - is an important candidate for the Neural Correlate of Consciousness (NCC) [2]. However, recent studies challenge this idea by showing that, firstly, P3b might be related to attentional processing rather than conscious access per se and, secondly, that a late subcomponent of the P3b can be evoked by unconscious stimuli when these stimuli are salient or important [3]. The aim of the present study was to further investigate the P3b mechanism. Specifically, we tested a hypothesis that stimuli related to "self", which are extremely salient [4] and evoke P3b when presented consciously [5], will generate the P3b component also when presented unconsciously.

### Methods

In the conducted experiment we used 3 types of stimuli: each subject's own name, other name matched by gender and length, or blank (empty) screen. Stimuli were presented for 33 ms, font and case size of names varied across trials (in order to vary the sensory input while keeping the meaning). We used a block design - our procedure consists of blocks which differed by task and visibility of presented words. In the first block stimuli were followed by a backward mask, which interferes with visual processing resulting in subliminal (unconscious) processing. Participants ( $n=30$ ) performed the subjective evaluation task - within each trial they were asked to rate the quality of their subjective experience using a Perception Awareness Scale [6]. In the second block stimuli were also masked, but participants performed a forced choice identification task. In the third and fourth blocks no mask was used, which allowed conscious perception (supraliminal condition) and subjects performed respectively, the subjective evaluation task and identification task. EEG was recorded throughout the experiment.

### Results

An average proportion of trials in which PAS ratings indicate lack of conscious identification was 0.97 in the subliminal condition, and 0.03 in the supraliminal condition. Based on the identification task data the  $d'$  index was calculated. It indicates that perception was highly degraded in the masked ( $M = 0.26$ ), but not in the unmasked trials ( $M = 4.04$ ). Analysis of the P3b component (time window: 350-550 ms; electrodes: CPz, CP1, and CP2) showed that, in contrast to other names, unconscious perception of the self name was related to greater P3b in the identification task ( $Z = 3.28$ ,  $p = 0.03$ ), but not during the subjective evaluation task ( $t(29) = 0.97$ ,  $p = 0.17$ ). Preferential processing of consciously presented self name resulted in higher amplitude of P3b in both, the identification task ( $Z = 3.78$ ,  $p < 0.001$ ) and the subjective evaluation task ( $t(29) = 3.45$ ,  $p < 0.001$ ).

### Discussion

The present study demonstrates that P3b can be evoked by an unconscious stimulus, provided it is task relevant and salient. It shows that attentional processes related to automatic preference of subjects for their own name can affect the amplitude of P3b. More generally, by showing that unconscious stimuli can cause spatially widespread and temporally delayed brain activations our finding falsify P3b component as NCC, and confirms its association with initiation of cognitive processing.

**Keywords**— P3b, attention, consciousness, Self, visual masking

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# The importance of focal and ambient mode of visual processing among experts and non-experts: the EFRP study

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## Abstract

In general, it is considered that top-down attention control is more expressed in the case of experts than in non-experts [4]. In the top-down mode, information selection is under supervision according to the observers goals and knowledge, so that is associated strongly with the activation of working memory [3]. In the bottom-up attention control, the properties of the image guide information selection. Various combinations of the duration of eye fixation and the size of saccadic eye movements may indicate different modes of visual processing [7-10]. Combination of long eye fixations and short saccades is considered to indicate the focal mode of visual processing, which - being related to top-down attention control - served visual object identification. Combination of short eye fixations and long saccades is considered to indicate the ambient mode of visual processing, which - being related to bottom-up attention control - served process of exploring the spatial organization of the visual scene. Our study aimed to test predictions that: 1. there would be more focal eye fixations among experts than non-experts, 2. cortical brain activity would be enhanced during focal eye fixations in experts group than in non-experts group. Thirty experts with formal training in visual arts and thirty-two non-experts freely viewed 150 figurative paintings presented for 20 s, each. After seeing the picture, the participant answered the question: Is this painting beautiful? We recorded synchronized event-related potentials (ERPs), and eye tracking data, using eye fixation-related potential (EFRP) method [1; 2; 6]. EFRP enables analysis of brain activity during eye fixation [6]. This method goes far beyond the traditional ERP approach giving the opportunity to analyze the way the visual scene is processed in different fixation-saccade sequences [5] that are related to different modes of visual processing during free viewing [7-10]. We used an eye tracker (SMI iView X Hi-Speed) synchronized with an electroencephalograph with a high-input impedance amplifier (200 MOhms, EGI Inc., Model: GES 300), using an active electrode system (Brain Products 64-channel actiCAP). There was no main effect of expertise in case of the number of focal eye fixations. However, it occurred that only in experts group, there were more and longer focal eye fixations on beautiful than on not beautiful paintings. Moreover, differences were found between the group of experts and non-experts due to the amplitude of eye-fixation related potentials (EFRPs) in focal mode. Focal eye fixations of experts had a higher amplitude of the parietal P2 wave recorded from the right electrode (P4) than non-experts. These results are discussed in the light of the results of studies on the effect of visual art expertise on event-related potentials (ERPs), studies on ERPs during aesthetic judgment task, and the knowledge of different modes of visual processing and EFRPs. Acknowledgments: This research was funded by the National Science Center (Poland), UMO-2013/11/B/HS6/01816, Psychological and neurophysiological determinants of aesthetic judgments. Part of the results reported here was published in [11].

**Keywords**— top-down attention control, expertise, eye fixation related potentials

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# Memory enhancement during police line-up - can cognitive warm-up help eyewitnesses?

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## Abstract

**Introduction:** Cognitive warm-up is relatively new concept that contradicts the well known theory of ego depletion. It predicts an increased effectiveness of cognitive system that can be triggered by undertaken cognitive activity, which meets specific conditions: 1) it lasts no shorter than 10 minutes and no longer than 20 minutes; 2) the intensity of cognitive effort is high 3) it is considered as challenging, but within the personal limitations. In discussed experiment, cognitive warm-up was used to test the hypothesis that it can improve the effectiveness of recognition memory in context of eyewitness testimony. The experiment was designed to imitate the police line-up, a common procedure by which a crime victim or witness's putative identification of a suspect is confirmed to a level that can count as evidence at a trial. It involves a comparison of the present stimulus with its internal representation. Laboratory tests as well as actual criminal cases analyses indicate that the recognition memory is prone to errors and distortions, often results in false identification and in case of real police investigation it can have a serious procedural consequences. **Method:** Groups of volunteers ( $N = 106$ ) were randomly assigned to a control ( $N = 71$ ) and experimental ( $N=35$ ) conditions. In the first step both conditions watched a 3-minute video presenting an emotionally neutral scene in a cafe with two characters: a woman and a man. In the second step, a week later, subjects had to identify six objects (two faces, four items) from a lineups. In the experimental condition a cognitive warm-up in the form of arithmetical and logical tasks was applied before lineups. **Results:** The results of the study indicate that the effect of cognitive warming can modulate the ability to identify inanimate objects ( $U = 1664.00$ ,  $p = 0.006$ ) by increasing the accuracy, but it has a limited effect on the ability on both male (chi-square (1,  $N = 106$ ) = 1.766,  $p = 0.18$ ) and female faces (chi-square (1,  $N = 106$ ) = 0.42,  $p = 0.51$ ) identification. **Discussion:** Improved effectiveness of object recognition after a warm-up can be connected with specificity of processing of visual stimuli, that is an analytical, featured-based process. It is interpreted that the specific warm-up method used in experiment could prepare recognition memory to more effective performance of its function by allocation of attention resources. At the same time, the face recognition, using configural, holistic processing and based on automatic processes does not benefit of analytical, logical activity. It was also observed that despite the large difference in the number, there were less subjects in experimental condition that performed poorly, correctly identifying less than 2 lineups. It suggests that cognitive warm-up could affect those subjects, whose recognition memory is especially prone to errors.

**Keywords**— cognitive warm-up, recognition memory, police line-up, face identification

# Are video games capable of expanding ones awareness? The impact of training in RTS video game on the attentional blink phenomenon.

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## Abstract

As human brain is severely limited in its capacity to consciously process information, cognitive mechanisms - such as attention - are needed to distinguish between relevant and irrelevant data and consequently select the former. One of the central questions in the attention research is to define the amount of time an object that is to be identified continues to occupy attentional capacity and thus the rate at which stimuli can be encoded into consciously accessible representations. The phenomenon which can be considered as particularly informative in this context, and which has come to particular prominence in the attention literature, is attentional blink (AB) [1]. The AB phenomenon is defined as a transitory impairment of attention that occurs if multiple targets have to be processed in close temporal proximity. It is demonstrated by the inability of subjects to report on the second target when it is presented between 200-500 ms after the first one. In the light of current investigations, however, it seems that targets presented during the attentional blink period can indeed reach working memory, which is reflected at the neurophysiological level in the modulation of the P3 component [2]. What is more, some studies suggest that there are some experiences - such as for example playing in action video games - which can significantly diminish the scope of this phenomenon [3].

The aim of the present study was to examine whether the training in Real-Time Strategy (RTS) game, precisely, Starcraft II can influence the detection of the targets presented during attentional blink period and whether such impact would be reflected on the neurophysiological level as well. Given its excellent temporal resolution, the Event Related Potential (ERP) method was used in the study. Forty-four healthy participants with no particular experience with action video games were recruited to the experiment. Twenty-one subjects were assigned to the control group that trained Starcraft II in static version and twenty-three subjects to the experimental group that trained the dynamic version of the same game. The training itself lasted for three weeks (30 hours of playing video game). The EEG recording sessions were performed before the beginning of the training and right after its end. During those sessions participants were solving the rapid serial visual presentation (RSVP) consisting of a series of stimuli of which two were defined as targets. In a single task control condition only one of the targets appeared in the stream of stimuli. In a dual task the second target (T2) was presented at three various time lags following the first target (T1). After each stream of stimuli participants reported whether or not they observed T1 and T2.

Both behavioural performance (understood as accuracy in reporting the appearance of targets) and neurophysiological (with particular focus on the P3 component) responses of the participants were subsequently analysed.

The results indicate that the experimental group after training improved their performance in the RSVP task, detecting significantly more T2 stimuli than did control group. What is more, following the training, the difference in the modulation of P3 component in response to the targets presented during attentional blink period was observed between control and experimental group.

Our results are in line with existing research showing the impact of action video games on performance.

**Keywords**— attentional blink, cognitive trainings, RTS video games, ERPs

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# Brain networks behind temporoparietal junction activity - object-based attentional updating

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## Abstract

Studies of visual attention commonly describe two large-scale brain networks involved in task execution: dorsal attention network (DAN) for directing and maintaining focus of attention and ventral attentional network (VAN) for attentional updating. The involvement of ventral attention network is most often inferred from increased BOLD activity in the vicinity of temporoparietal junction (TPJ) when incoming stimulus violates expectations. The engagement of temporoparietal junction and ventral attention network was demonstrated in tasks which required reorienting of attention after invalid spatial cue in Posner paradigm (Corbetta and Shulman, 2002). Results obtained in other tasks suggested that TPJ was also responsible for non-spatial reorienting of attention i.e. updating the attributes/identity of objects in the focus of attention (e.g. Dombert et al. 2016, Geng and Vossel 2013, Macaluso and Doricchi, 2013). These conclusions were, however, poorly justified. I aimed to verify the hypothesis that TPJ region is activated at the appearance of behaviourally relevant, unexpected object, and to establish the engagement of large-scale neural networks behind the observed activations.

For this purpose, I modified original Posner scheme to encompass the expectations towards categories of the objects, instead of their locations. The cue (word) represented the likely category (face/house) of the upcoming target and the task consisted in detecting pictures from these pre-defined categories within the 'rapid serial visual presentation' (RSVP) of item pictures, serving as a search background. The task also included trials without target ('search only trials'), which allowed for the assessment of the processing of cue information alone. Twenty-five healthy adults participated in an fMRI study, BOLD signal was acquired during resting state and task performance. Task-evoked activations were evaluated with reference to the main large-scale brain networks as defined by Yeo et al., 2011 and recreated in resting-state activity of individuals. To this end, seed-voxel correlation maps for seeds defined in task contrasts and network maps (based on multiple seeds that most reliably belonged to a network, estimated by Yeo et al., 2011) were spatially correlated to each other. The obtained results allowed for identification of several disparate processes engaged by attention, differently affected by the time spent on task execution.

Importantly, update-related activity included temporoparietal junctions with loci matching those reported by other object-based attention studies. However, tests of network affiliation of this region of interest showed that this activity was attributable to the default-mode (DMN) and fronto-parietal (FPN) networks. Engagement of FPN reflected greater importance assigned to cues, marked especially at the beginning of the study. Concurrent activity of DMN was presumably related to the necessity of evaluating the meaning of incoming stimuli and disengaging from task-irrelevant information. These results allow for new interpretation of a number of studies, by acknowledging the role of FPN and DMN in object-based attentional updating.

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**Keywords**— attention, fMRI, networks

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# Frequency analysis of the electroencephalogram from the scalp and midbrain in consciousness and anesthesia: case report

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## Abstract

It is beyond argument that the consciousness is a product of the brain with a key role of the cortex, nevertheless, the role of midbrain in consciousness is still discussed. The point of view that the brainstem is crucial to the consciousness was developed by Merker [2]. He supposed that a basic level of consciousness is possible to observe in children with anencephaly. The present study aimed to carry out frequency analysis between cortex and midbrain area (periaqueductal grey) in the process of consciousness recovery.

The study included the patient with tumor of the pineal region who underwent tumor removal by anterior interhemispheric approach. After removal of the tumor at the final stage of the operation a specially developed external ventricular drainage was installed for 24 hours for the purpose of draining cerebrospinal fluid and preventing possible cerebrospinal fluid circulation disorders. The multi-perforated distal end of the drainage was inserted into the lumen of the aqueduct to the upper sections of the fourth ventricle. The electrodes were mounted at this end of the drainage which were wired inside the drainage tube and connected to the recording device. The diameter of the drainage (2.5 mm) in the aqueduct ensured close contact of the electrodes with the internal surface of the aqueduct in close proximity to periaqueductal grey. More information about the operation technique is available in the study [3,4]. The electrode placement was determined on the basis of computer tomography imaging. Scalp brain potentials were recorded from electrodes located by the 10-20Brain activity recording started in the intensive care department and lasted for 24 hours after operation. It included the following states of consciousness: deep propofol anesthesia (near to isoline in the cortex), propofol anesthesia, dexdor anesthesia, obnubilation and clear consciousness. Brain signals were analyzed with matlab Brainstorm toolbox. There were periods of attenuation of cortical activity and bursts of alpha rhythm in deep propofol anesthesia. In the first case the cortical activity tends to line but the midbrain activity was in general more than two times higher than cortical activity. During bursts of alpha rhythm the amplitude of signal from occipital and parietal sensors were higher than midbrain amplitude in the range from 5 to 25 hertz. The peak at 12 hertz was particularly prominent in both types of sensors: scalp and deep electrodes. In the process of consciousness restoration the amplitude signals from the scalp and midbrain increased but the rate of this growth was different. As a result, the amplitude of cortex signal had become much higher than amplitude of brainstem signal in the entire frequency range in state of clear consciousness. Also in state of clear consciousness, the form of deep activity was close to the cortical waves. The data obtained in the study are discussed in connection with midbrain-cortex functional connectivities in disorders of consciousness. The study was supported by RFFI 18-013-00967a.

**Keywords**— consciousness, anesthesia, EEG, frequency, amplitude, midbrain, cortex

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# Suggestibility and observation inflation

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## Abstract

Eyewitness testimonies play an important role they are one of the strongest pieces of evidence used in the court system (Graham, 2003). As Vollen and Eggers (2005) note, the courts are right in convicting a suspect 99.5 of the time. Despite its significance, eyewitness testimony is unreliable by nature since it depends on human memory and perception, which are imperfect (Wonsowicz, 2012). Huff, Rattner and Sagarin (1996) imply that the most common reason behind convicting innocent people were - as a matter of fact - false and unreliable eyewitness testimonies. According to Elizabeth Loftus (1996), when people describe a suspect or an event, they usually compromise between what they really saw and what they were told, as people often are not sure about their own judgement, especially if it differs from others point of view. Therefore, using combination of GSS and OL paradigms, we decided to research the impact of suggestibility on observation inflation.

Some of the remembrances may have serious consequences, for example a false memory of taking medication - since imagining of taking a pill might lead to a scenario where person misremembers if he or she truly took it. Imagining performing an action could easily create false memories of having actually performed the action and this effect is referred to as the imagination inflation (Thomas, Bulevich, Loftus, 2003). The aim of the study was to investigate the relationships between interrogation suggestibility (tendency to change the answer given and yielding to leading questions), feedback and inflation of observations.

Interrogative suggestibility has been defined as "the extent to which, within a closed social interaction, people come to accept messages communicated during formal questioning, as the result of which their subsequent behavioral response is affected" (Gudjonsson Clark, 1986). Gudjonsson Suggestibility Scale (GSS) measures two aspects of suggestibility: the extent to which the subjects can be misled by suggestive questions about a story that they have heard previously and the frequency with which the subjects will change their answer after negative feedback regarding their previous answers (Gudjonsson, 1983; Gudjonsson, 1984).

62 people ( $M = 26.34$ ) participated in the experiment. The research procedure of the observations inflation effect designed by Lindner, Echterhoff, Davidson, and Brand (2010) was used. Participants observed actions performed on the film and got perform instruction to some of these activities. After a 50-minute break they took a source-memory test and filled self-esteem measure. Then perform a memory test with leading questions, and, depending on the group, received positive or negative feedback on the result of this test and had the opportunity to change their answers.

Findings show that subject who received negative feedback were significantly more likely to change their answers compared to those who received positive feedback. There was no correlation between subjection to inflation of observations and yielding to leading questions. A negative correlation between inflation observation and self-esteem was found.

**Keywords**— memory, observation inflation, suggestibility

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# The interaction between temporal orienting of attention and visual working memory: a dense-array EEG study

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## Abstract

As all living organisms, human beings must cope with the essential fact that their behaviour in the world is unavoidably constrained by two physical dimensions: space and time. We cannot thoroughly process at once information coming from physically distant sides of our visual field. In addition, we cannot spread our attention over a long temporal interval without losing our readiness to promptly respond to a relevant event. That is why, in the complex sensory world in which we all live, the prioritizing of environmental information that is relevant to our goals is an essential cognitive mechanism for regulating our behaviour proactively. Remarkably, the possibility to use predictive information allowing to selectively orient our attention in the spatial dimension translates into the optimizing of cognitive performance at multiple levels, including motor preparation, perceptual accuracy and executive control. In this regard it has been consistently shown that the maintenance of sensory information in visual short-term memory (VSTM) can be facilitated by spatial attentional orienting. However, while the mechanisms underlying the interplay between spatial orienting of attention and VSTM have been reliably investigated in both adults and children, the mutual relationship between temporal attention and VSTM is still a relatively unexplored topic. This issue is of pivotal importance, given the domain-general role of temporal attention as a gating mechanism to select information for further computational processing, including perception, action, learning, memory and executive control. In the present study, thirty-five adults were asked to memorize a three-item visual array while undergoing a high spatial resolution EEG recording. After a variable inter-stimulus interval (ISI), a central, single probe was presented. Participants had to judge whether this was present or not in the memory array. Crucially, a visual cue delivered before the array provided temporally valid or neutral information about the maintenance interval (1- or 3-sec). Behavioural results showed that TO improved VSTM performance for short ISI. At the neural level, this effect was mainly supported by 1) increasing amplitude of the cue-locked CNV component, an effect localized to the right occipito-temporal cortex and 2) increasing amplitude of both memory array- and probe-locked P3 amplitude, which was supported by a bilateral activation of superior parietal cortex. By contrast, the TO effect on VSTM was reversed in long-ISI trials, with participants scoring lower in temporal than neutral trials. This reversed effect was supported by reduced amplitude of the sustained, memory array-locked ERP activity. Our findings suggest an interaction between top-down temporal attentional control and task difficulty. Specifically, performance is enhanced when the cue predicts short maintenance intervals, whereas it is disrupted when the cue predicts long maintenance intervals. One possible explanation is that the prediction of a long maintenance interval induced the implementation of verbal rehearsal strategies that nevertheless interfered with performance. From a theoretical point of view, these findings support the account that TO is a flexible and strategic attentional mechanism.

**Keywords**— Temporal Orienting, Visual Short-term Memory, Contingent Negative Variation, Brain Source Analysis

# Effects of multiple object tracking on pointing movements precision

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## Abstract

Multiple object tracking (MOT) requires visual attending to dynamically moving targets and distractors. As visual attention is associated with cortical areas that are also involved in motor control it was demonstrated that visual attention processing affects motor performance. Moreover, research showed that cognitive load influences motor actions and that MOT affects perceptual precision. In our previous study we demonstrated that attentional load in MOT task influences precision of pointing movements. However, because of the employed procedure - participants pointed at the targets after they stopped moving at the end of the tracking period - it was not possible to determine if this effect was a result of visual attention (actual tracking) or working memory (retrieving from the memory which objects are targets). The present study aimed to answer this question. Forty participants (twenty women and twenty men) took part in the experiment. Participants engaged in a MOT task using a touchscreen device. Participants tracked on the screen moving targets of different colors among moving distractors that shared the same colors with the targets; all objects were circles of the same size. There were four levels of attentional load: two targets and four distractors, two targets and six distractors, four targets and eight distractors, and four targets with twelve distractors. After a period of ten seconds participants heard via headphones the name of the color of the to-be-indicated target. The task of the participant was to point on the touchscreen with their index finger at the target of a color specified by the program. Importantly, the pointing movements were performed while all the targets and distractors were still in motion. The participants were instructed to attempt to aim the pointing movements at the center of the target (this is to the central point of the circle). The precision of pointing movements was measured as the distance between the center of the target and the point at which the participant touched the target (in pixels). It was predicted that higher number of targets and distractors in the MOT task (this is the higher attentional load) will lead to lower precision of pointing movements (i.e. larger distance between the pointing spot and the center of the target). The results confirmed the hypothesis - the pointing movement precision decreased as the attentional load of MOT task increased. Importantly, as the pointing movements were performed during the object motion, the results indicate that it is the actual tracking in a MOT task and not the working memory, that influences motor actions performance. Potential factors underlying this influence are discussed. Additionally, gathered data allows to add arguments to the debate between resource theories and space interference theories - the accounts that attempt to explain mechanisms underlying multiple object tracking phenomena.

**Keywords**— multiple object tracking, attention, pointing movement precision, motor performance

# Electrophysiological signatures of stimulus selection and conflict resolution in the flanker task

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## Abstract

Attention may be described as a set of control mechanisms regulating the functioning of other brain systems. On the one hand, attention regulates perceptual processes by selecting and prioritizing those of sensory or mental events that are important in a given moment, and suppressing sensory interferences caused by irrelevant stimuli. On the other hand, focused attention enables executive control of our behavior by inhibiting impulsive reactions, resolving conflicts between alternative actions or competing response programs, and avoiding errors. In the present study, we aimed to investigate how attentional selection and conflict resolution are implemented in the human brain.

Thirty participants performed the flanker task, in which the target (up or down arrow) was surrounded either by congruent flankers: arrows pointing in the same direction as the target, or incongruent flankers: arrows pointing in the direction opposite to the target arrow thus activating an incorrect response program. The target-flanker incongruity elicits perceptual interference and response conflict, which increase response time and error rate, hence the processes of visuospatial selection and conflict resolution need to be involved. Recent behavioral studies suggest that these two aspects of attention contribute independently to the overall target-flanker incongruity effect. To identify electrophysiological signatures of these processes, we employed the Morlet wavelet decomposition method of the EEG data to identify the dominant time-frequency electrophysiological response. As the marker of visuospatial attentional selection, we calculated lateralized (contralateral-ipsilateral) power spectra (LPS) index for alpha frequency range ( 8-12Hz). As the marker of the oscillatory mechanism of conflict processing, we calculated the power of conflict-related (incongruent-congruent) mid-frontal theta frequency range ( 4-8Hz).

The results showed the typical behavioral effect of an increase of response time and error rate in conflict trials, compared to the no-conflict trials. The alpha LPS index showed that the occipito-parietal alpha activity was decreased over the contralateral hemisphere, which presumably reflects attentional modulations of visual processing at the relevant/attended visual field. This suggests that modulations of alpha oscillations within visual processing may be a crucial part of the processes of target selection and inhibition of the interference caused by the incongruent flankers. In other words, these processes seem to be underlain by a negative bias in alpha oscillations. Further, the theta power results showed the expected enhancement of midfrontal theta activity in the conflict trials, occurring about 300-600 ms after target onset. This oscillation dynamics in the theta power over medial frontal cortex is thought to reflect the involvement of executive attention in conflict detection and resolution. More precisely, this robust conflict-related theta power increase may indicate an active role of theta oscillations in behavior adjustments during conflict resolution and in ab overall coordination of processing within sensorimotor pathways. Plausible mechanisms of the interactions between these two levels of implementations of attentional mechanisms will also be discussed, as well as possible theoretical implications of the obtained results.

**Keywords**— attention, executive control, EEG time-frequency

# Egocentric spatial awareness from the perspective of predictive processing

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## Abstract

Historically speaking, the issues related with the human ability to perceive space have received an uneven treatment from philosophers, cognitive scientists and psychologists alike. This ability in humans (as well as in rodents and primates) is driven by two distinct, immensely complex neural systems: one responsible for the allocentric and the other for the egocentric space representation. While currently the hippocampal system of allocentric space representation is well understood (see Moser et al. 2008), the systems of egocentric space representation were much less studied and remain mysterious, including the attention mechanisms related to this frame of reference.

In the talk I take up Rick Grush's skill theory v2.0 (2007, 2009), an account of the mechanism explaining the appearance of what Grush calls spatial purport of perceptual experience, namely the phenomenology associated with egocentric space perception. Grush offered an elegant and precise account, but left out some of important aspects of egocentric space perception, such as e.g. the object motions or spatial attention. Following Grush's work, I wish to present a process model of egocentric spatial representation compatible with the theory of predictive processing (Clark 2016; Hohwy 2013; Wiese and Metzinger 2017). Predictive processing is a rapidly developing theory of mind, offering a view of cognition as a dominantly top-down, prediction-driven process of enactive and embodied hypothesis testing.

My model, called Predictive and Hierarchical Skill Theory (PHiST), unifies Grush's work with the active inference framework and predictive processing, and develops it further to cover topics such as perception of object motions within the egocentric space and spatial attention. It does so by rebuilding Grush's model to include insights from Kaplan and Friston's (2018) research on allocentric space perception from the perspective of predictive processing. The result is a plausible description of egocentric spatial representation that includes all important features of a PP model (Wiese and Metzinger 2017), and possibly that explains the emergence of spatial purport of perception.

What's more, the proposed model enables us to reconsider the understanding of the role of spatial attention related to egocentric spatial representations. Predictive processing has offered a very specific theory of attention (see, e.g., Hohwy 2013). It explains the attention as a process of optimization of precision weighing of the bottom-up prediction error messages that inform the mind about where its predictions failed. In predictive processing, expectations about how precise the incoming signal is modulate the system's focus, determining which signals are given preponderance. Taking the role of spatial attention to be prioritizing regions of space for perceptual processing (Jiang et al. 2013), I will show how it is realized according to PHiST.

**Keywords**— space awareness, predictive processing, active inference, egocentric space

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# Faster attentional selection as a result of implicit spatial and temporal expectancies in visual search. An ERP study

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## Abstract

People are relatively good at predicting future events based on their previous experiences. Sometimes they are even unaware of such a predictive value of the knowledge that has been acquired unintentionally. This is what we call implicit learning [1]. It has been widely investigated in linguistics and with regard to some more abstract structures (e.g. colors, letters) [2]. However, is it possible to implicitly learn spatio-temporal structures and to use this knowledge to predict the location and/or time of a future event? Our study aimed at investigating whether the implicit knowledge about the spatio-temporal structure of stimuli exposure leads to a speeded perceptual processing in a similar manner as other attention-guiding dimensions do [3]. Based on the assumptions of the Neural Theory of Visual Attention [4] and the Dimensional Weighting Account [5], we hypothesised that reduced uncertainty about a specific place and/or time of stimuli occurrence should result in a more efficient attentional allocation. We analysed the N2pc component as an electrophysiological index of attentional selection [6].

Sixteen people (9 women, aged 21–29) performed a localisation and a discrimination task in the visual search ERP paradigm. Each task comprised 3 predictable blocks, in which targets (1) location, (2) onset time, (3) location and onset time were (implicitly) predictable. The forth block of random targets exposition served as a control condition.

Reaction times in both tasks were significantly shorter for targets predictable in the double spatio-temporal dimension (compared to randomly exposed targets). Additionally, unidimensional spatial predictability allowed for faster reactions only in the localisation task. Interestingly, N2pc peak latency mirrored the RTs pattern observed in both tasks, i.e. shorter latency for spatially and spatio-temporally predictable targets. Therefore, our results suggest that space and time can be regarded as top-down biases that might be attentionally weighted, thereby enabling faster target selection in a specific place and time-interval. In other words, by limiting the scope of focal attention and the time of heightened alertness, spatio-temporal orienting prevents the neural system from an unnecessary waste of energy. Most importantly, such a facilitation may occur even unintentionally, as a result of implicit learning [cf. 7].

**Keywords**— attentional selection, N2pc peak latency, spatio-temporal predictability, implicit learning, attentional weighting

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# Why do angry people like rewards and dislike threats? Uncovering multifaceted associations between anger and selective bias towards rewarding and threatening stimuli

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## Abstract

For decades psychologists has followed valence-based approach that defines valence of emotion as the main determinant of people's cognition. Positive and negative emotions were often linked to approach and avoidance motivation, respectively. However, this view seems to be oversimplified in the light of recent findings. A good example of emotion that do not fit these categories is anger. Anger, characterized as negatively valenced emotion with high approach motivation, was shown to manifest cognitive consequences previously reserved only for emotions with positive valence. For example, recent studies revealed that anger, similarly to desire, narrows cognitive scope or focuses visual attention on rewards (as excitement). Although past work revealed some preliminary consequences of above-mentioned characteristics of anger, it still remains to be established whether emotion's aspects other than valence (eg. arousal) also impact anger's cognitive outcomes and how personality contributes to this relation. To address this concern current research aimed to explore the relation between trait anger and selective bias towards rewards and threats with regard to selected personality traits. Two online studies were conducted ( $N_1 = 124$ ,  $N_2 = 224$ ). In the first step, participants were asked to evaluate set of rewarding and threatening words on positivity-negativity dimension. Two lists of verbal affective stimuli different in terms of valence were selected from *Nencki Affective Word List*. Within each group of words two subgroups of the high and low arousal were distinguished. In the second step, individuals' task was to fill out a set self-reported measures. Trait anger was assessed with anger subscale from the *Aggression Questionnaire* and subscale derived from the *State-Trait Anger Expression Inventory-2*. Hedonistic orientation - a strong component of reward seeking - was measured with *Present Hedonism* subscale of *Zimbardo Time Perspective Inventory*. Approach motivation dimensions were measured with *BIS/BAS* scales (ie. *Reward Responsiveness*, *Fun Seeking* and *Drive*). Results showed that anger was positively connected to selective bias towards rewarding stimuli, and this relation was significantly stronger in case of highly arousing positive words. Surprisingly, negative link between anger and evaluation of all threatening words was observed, similar with those of high and low arousal. Both hedonistic attitude and tendency to experience positive feeling after task's completion (ie. high reward responsiveness) significantly explained these relations. However, analysis revealed that reward responsiveness factor may play more important role in anger-related favourization of rewarding cues and disliking of threats. Summing up, current research replicated previous findings on anger's preference for rewarding cues. Moreover, it went one step further showing that arousal of reward may also impact these judgements. It also revealed that dispositional need for immediate reward and reward-sensitivity may significantly contribute to presented phenomena. Last, but not least, it provides a new insight into anger-threats relation, suggesting that negative ratings of threatening cues may be, to some extent, manifestation of threats avoidance by individuals scoring high on trait anger's measures.

**Keywords**— anger, cognitive consequences, selective bias towards rewards

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# Unconscious detection of one's own image

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## Abstract

### Introduction

Multiple previous studies demonstrated that self-related information, for instance self-name or self-face, is processed preferentially [1]. In our recent study we showed that a self-face automatically attracts attention, even when it is presented as a distractor that subjects are asked to ignore [2]. Therefore, in the present study we tested a hypothesis that the automatic attention shift to the self-face occurs even when the self-face is processed without awareness (subliminally).

### Methods

Eighteen participants (10 female; age between 19 and 32) completed the experiment. We employed a dot-probe task, which is a classic paradigm to investigate exogenous attention shifts. Images of a self-face and other-face were presented simultaneously for 32 ms on both sides of the fixation cross. Presentation side of the self-face (left, right) was counterbalanced within subjects. Faces were followed either by masks (subliminal condition) or by a blank screen (supraliminal condition). Next a target dot was presented on one side and the subjects sole task was to indicate, with a button press, the dot presentation side. Therefore, faces were treated as task-irrelevant distractors in the dot-probe task.

To evaluate efficiency of the masking procedure subjects performed an identification task. Using the same trial structure (except the dot was not presented) they were asked to report whether a self-face was presented on a given trial (half-of the trials comprised a self-face, the other half two other-faces). The d sensitivity measure was used to evaluate subjects performance.

EEG was recorded throughout the dot-probe task. We analyzed the N2pc component, by comparing the ERP waveform contralateral to the self-face to the waveform ipsilateral to the self-face. Electrodes PO7/PO8 and a temporal window between 200 and 300 ms after faces onset were used for the statistical analysis. More negative amplitude contralateral to a given stimulus is a well-established indicator of covert attention shifts [3].

### Results

Analysis of the d sensitivity measure indicates that subjects easily identified their own face in the supraliminal task (95 perc. CI = [0.73, 2.51];  $t(17) = 3.85$ ,  $p = 0.001$ ; BF = 24), but performed at chance level in the subliminal (masked) condition (95 perc. CI = [-0.07, 0.50];  $t(17) = 1.57$ ,  $p = 0.13$ ; BF = 0.68). Further, we found a significant N2pc component in both the supraliminal dot-probe task ( $t(17) = 2.91$ ,  $p = 0.01$ ; BF = 10) and the subliminal dot-probe task ( $t(17) = 2.34$ ,  $p = 0.031$ ; BF = 4.07). This indicates that in both conditions subjects covertly shifted attention to their own-face.

### Discussion

By showing that the self-face attracts attention without consciousness we revealed that self-related information might be boosted already at a very early (preconscious) processing stage. Further, our results are relevant to the debate on unconscious integration and unconscious processing of complex stimuli [4]. Face is a stimulus comprising many elements and our study shows such complex stimuli might be in principle processed subliminally. Finally, our study provides another example of dissociation between attention and consciousness [5].

**Keywords**— attention, consciousness, self-face, n2pc

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# Ethical implications of modifying memory with the use of optogenetics

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## Abstract

In recent years, there has been a growing interest in technologies that could enable manipulating human memories. One such technology is optogenetics – an invasive neuromodulation technique that involves the use of light to control activity of individual brain cells. Optogenetics has recently shown the potential to erase, enhance and alter specific long-term memories. Although, this novel intervention holds promise for those who might suffer from persistent, traumatic and painful memories, the very idea of interfering with human memory often encounters fierce resistance expressed by philosophers and scholars working in various fields and disciplines. In this presentation, we will investigate what are the reasons for this ambiguous attitude towards memory modifying technologies by presenting some ethical concerns that revolve around the possibility of the future use of optogenetics to modify human memories. In particular, we will explore what new possibilities optogenetics offers compared with already existing memory modifying technologies (e.g. Deep Brain Stimulation, memory modifying drugs) and provide re-evaluation of the previously raised concerns regarding safety issues, the duty to remember, selfhood and personal identity in the light of optogenetics. Finally, we will argue that due to its high specificity and ability to manipulate the content of individual memories instead of just diminishing their emotional overtone as it often is the case with alternative memory modifying techniques optogenetics provides novel insights on the nature and the inner workings of the human memory.

**Keywords**— memory modifying technologies, optogenetics, ethics, gene therapy

# Mirror neuron system, motor performance and working memory

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## Abstract

Stroke is the primary cause of adult disability. The most common site of stroke is the middle cerebral artery that supplies a range of areas involved in both language and motor function. Cortex and cortical function can be regarded as modular, with separate areas involved in processing sensory information and the initiation of motor movement. The blood supply supporting cortex is, like the brain itself, modular. Disruption in blood flow leads to a multiplicity of dysfunctions like the frequent co-occurrence of aphasia and right upper limb hemiparesis. 80 percent of stroke patients suffer of right upper limb hemiparesis, while 21-38 percent suffer of aphasia. Yet, the literature on both impairments together is very rare due to the overspecialization in research and trials. Some studies confirmed the existence of overlapping networks for arm movements and speech. This explains the possible concomitance of the two deficits. Patients with Brocas aphasia show slower and poorer motor recovery of right arm compared to non-aphasic ones. Different causes were summoned to explain the difference in recovery. Our theory, contrary to other conclusions, is that patients with Brocas aphasia have very often a damage to BA44, which is a multisensory area. Experiments on tone-deaf or stutters, radiological tools like fMRI and DWI, studies of the neuro-ontogeny and development in babies, findings of genetic, epigenetic and embryology, all point to BA44 playing a central role in visuo-motor integration. The presence of mirror neurons in BA44, enables the use of visual input to improve motor performance. Therefore, either watching professional top sport players or videos of them playing, will engage the mirror neurons and working memory are both located in BA44, which is part of a wider network, could also explain the role of that area in re-learning and motor recovery after brain injury. This theory can help in the choice for the best rehabilitation therapy depending on the network damaged.

**Keywords**— mirror neuron system, memory, stroke, rehabilitation

# Learning of the environmental geometry in house cricket (*Acheta domesticus*)

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## Abstract

Due to the dynamism of processes occurring in natural environments perceived features of objects may be highly variable over time. Aromatic compounds constituting olfactory cues evaporate, the perception of visible traits depend on lighting conditions and texture of objects undergo alterations in the processes of degradation and growth. However, the arrangement of objects tend to be much more stable than object properties. Thus the geometry of given space could provide relatively stable cues for navigation. Spatial navigation of insects is a highly prolific field of scientific endeavor providing a novel, comparative insights on how navigation could be accomplished with neural architecture widely differing from vertebrate one. In the presented study we attempt to test whether cricket is able to locate the center of the arena without cues other than its shape. In order to perform this test, we implemented a variant of Morris water maze test dedicated for testing spatial memory in insects (Tennessee Williams paradigm). The experimental setup consisted of set heated arenas of different shapes (circular, rectangular, triangular) with cool located centrally. Arenas were devoid of olfactory cues, conducted in an acoustically isolated environment under the red (invisible to crickets) light. During the consecutive trials, crickets were released on the arena and tracked with object-tracking software. Thereafter, acquired tracks were analyzed and the time spent on cool spot counted.

**Keywords**— house cricket, spatial orientation, geometry, spatial learning

# The effects of the attention on the performance in Random Sequence Generation tasks

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## Abstract

Random Sequences Generation is a popular task in experimental psychology. Initially, it was designed for experiments on humans capability for truly random behaviour.. However, early research showed that series of responses produced by humans are usually biased (e.g. Wagenaar, 1972). Therefore, the direction of the research shifted to investigating the mechanisms behind random sequences generation. Barbasz, Stettner, Wierzchon, Piotrowski and Barbasz (2008) proposed a model in which the process of randomness generation involves constant reassessment of series randomness. During the process people store in the working memory only last few elements that has been produced. The subsequence is then compared to the random sequence prototype and basing on the result the next element is selected.. The new element is appended to the sequence, while the first one is removed. Therefore, the capacity of the working memory defines the length of the sliding window in which the comparisons are being made. This assumption have been partially corroborated by Warren, Gostoli, El-Deredy, Farmer, and Hahn (2018), who reported that there is no significant difference in terms of randomness between subsequences of working memory length and an unbiased random process. According to the model the randomness of a subsequence is assessed constantly during Random Sequences Generation tasks. This is an energy consuming process which involves high level cognitive functions such as sustained attention and inhibition of repeating patterns (e.g. Towse, 1998). Therefore, we hypothesised that the level of randomness of human-generated series decreases over time. Moreover, the definition of the task itself might also has an effect since previous research showed that some instructions affect the degree of randomness of a series (e.g. Brugger, 1997).

We present results on a study of degree of randomness generated during Random Sequence Generation tasks. In the experiment, 183 subjects were tested individually in sessions that lasted about 10 minutes. Their task was to generate 300 digits long binary series in three between subjects conditions (1. sequence generation with no particular instruction; 2. instruction to imagine a coin-tossing experiment; 3. instruction to imagine ups and downs on a stock market). We use the measure of algorithmic complexity to properly assess randomness levels (Li & Vitanyi, 2008; Gauvrit, Zenil, Delahaye, & Soler-Toscano, 2014). It corresponds to the length of the shortest computer program (in a predetermined language) that generates given sequence. As such it is a good measure of true randomness, since a truly random string can not be compressed by any means, neither statistically or algorithmically, while probability based measures capture only statistical patterns. It has been already used successfully in experimental psychology for analysis of short binary sequences (Gauvrit, Zenil, Soler-Toscano, Delahaye, & Brugger, 2017). In our research we use a novel method that that allows for approximation of algorithmic complexity for arbitrarily long strings based on Block Decomposition Method (Zenil, Hernandez-Orozco, Kiani, Soler-Toscano, & Tegnér, 2018).

The results show that the level of randomness of a sequence decreases over time in all experimental conditions and that there is a significant negative effect of the condition with no instruction. We account these results to decreasing level of attention due to energy consumption and cognitive load related to the Random Sequence Generation task.

**Keywords**— Random Sequences Generation tasks, attention, algorithmic complexity

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# Time-of-day effects on false memories formation in short-term memory - an fMRI study

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## Abstract

The circadian rhythm influences extensively human behavior. Borbély's two-process model indicated that circadian process and homeostatic sleep pressure modulate our functioning along 24 hours. Many previous studies have shown that performance of cognitive tasks can change according to the time of day. False memories are understood in terms of mistakenly recalling or recognizing stimuli, that were not presented during the memorizing phase of the task and can occur either in long-term or in short-term memory. The effects of time-of-day on the memory distortions were investigated using functional magnetic resonance imaging (fMRI) approach. Forty-six young and healthy participants (20 males, age: 24.8, SD: 3.39 y.o.) selected with the Chronotype Questionnaire, sleep quality scales (Epworth Sleepiness Scale, Pittsburgh Sleep Quality Index) and polymorphism in the circadian clock gene Per3 (genotyping) were performed the memory task based on the DRM (Deese-Roediger-McDermott) paradigm during the morning (1 hour after wake-up) and evening (10 hours after wake-up) session. The task was adapted to the short-term memory conditions and used perceptually-related objects. After the standard preprocessing steps the functional connectivity analysis using innovative method - the non-linear correlation were implemented. The results have shown differences in fronto-parietal and visual networks between sessions, so that the correlations were higher in the morning compared to the evening session for positive and lure stimuli, what might explain divergent stimuli processing and memory functioning according to the time of day. This research was supported by grant 2013/08/M/HS6/00042 of National Science Centre of Poland.

**Keywords**— false memories, short-term memory, time-of-day, fMRI

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# Counting changes in complex acoustic environments.

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## Abstract

Natural auditory textures, e.g. wind or rain, could be only characterized on statistical level and despite the highly variable spectrotemporal profile, easily classified by human. Our previous studies demonstrated that the classification of a texture improves with the time the texture can be sampled and this to be mirrored by the magnitude of the parieto-occipital potential at the scalp.

In this study, we recorded EEG from 12 subjects, listening to natural auditory textures. The half of stimuli (i.e. 120/240) changed their statistics at the random time (0.75s, 1.6s or 3.0s). All stimuli were randomly presented in 4 equinumerous blocks. Participants were asked to count the number of changes and report it to the experimentator after each block. For further analysis, we subselect the blocks containing only correct responses.

We observed that the integration of statistical information is followed by the formation of parieto-occipital potential and interestingly, the amplitude of this potential reversely scales with the time the texture was sampled. We suggest the increase in cognitive load and the time of rote rehearsal could cause the attenuation of the response for the longest change times. Moreover, subject could form expectation of maximal sound duration and consequently expect more the change that occur later than sooner.

Summing up, variations in the parameters of the change detection signal formed for different change times, indicates its possible dependence of the current cognitive load and expectations that modify the observed process of evidence integration.

**Keywords**— evidence integration, acoustic textures, cognitive load

# Learning ability in white-eyed and wild type House cricket (*Acheta domesticus*)

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## Abstract

Cognitive abilities of insects has been under intensive study in recent years. For a long time people underestimated these animals potency, but now research shows that there is much more to discover in this area. One of the things, which was observed was utilizing visual cues during area exploration in *Gryllus bimaculatus*. However there is still little information about its internal spatial representation and because of that further experiments are needed. Spatial representation must be learnt by a cricket and that is why recent studies focus on this internalization process. What is interesting is the fact that white-eyed fruit fly (*Drosophila melanogaster*) is first identified mutant in history. This mutation is linked to lowered serotonin and dopamine levels, which makes them an interesting animal model. In this work, learning ability of two strains of house cricket (*Acheta domesticus*) was put to the test. White-eyed color mutant, which is hypothesized to have similar mutation to this observed in *Drosophila*, was compared with wild type in task that consisted of finding cold spot on circular area without visual or olfactory clue. Findings show that crickets learnt location of the spot between consecutive trials, which could stand for internalizing spatial map of the area and could easily go back when leaving it. Further study using paradigm could bring new insight in processing more complex information by House cricket and about learning process itself.

**Keywords**— *acheta domesticus*, learning ability, spatial representation, mutants, cognition, insect learning

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# On the contribution of anterior cingulate cortex in visual working memory: a high density EEG study

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## Abstract

Previous electrophysiological studies of lateralized Visual Working Memory (VWM) identified an ERP component, defined as Contralateral Delay Activity (CDA), directly modulated by the number of items held in memory. One of the main candidate as the cortical source of this ERP component is the Inferior Intraparietal Sulcus (IPS). Moreover, previous neuroimaging studies put forth evidence for the presence of a distributed VWM network involving also prefrontal areas and in particular the Anterior Cingulate Cortex (ACC). Nonetheless, the understanding of the functional role of ACC is still debated. We recorded the high spatial resolution EEG in 20 healthy participants undergoing a VWM and a control task. Explorative cluster-based permutation statistics confirmed the posterior memory load dependent CDA modulation, but also identified an additional anterior cluster of electrodes whose amplitude was modulated by memory load. The source reconstruction revealed a memory load dependent activation in the IPS but also a parametrical modulation in the ACC, suggesting that these two areas might be nodes of a fronto-parietal circuit underlying VWM maintenance. Crucially, parietal and prefrontal areas showed a temporal dissociation, since IPS was more engaged in the early phase of visual information storage while the ACC was more active during the late phase. This pattern suggests a functional dissociation between the parietal cortex, which is involved in encoding and storage of information, and prefrontal areas, subserving cognitive control processes, including the boosting and protection of information from decay. Remarkably, the connection strength between IPS and ACC predicted the individual number of items held in memory. These findings are discussed within the theoretical account of a neural distributed model of VWM.

**Keywords**— memory capacity, functional connectivity, ACC, HD-EEG

# Impact of emotional intelligence and cognitive intelligence on radio presenter's attention in All India Radio, Kolkata of India

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## Abstract

This research Paper aims at investigating the impact of emotional intelligence and cognitive intelligence on radio presenter's attention in the All India Radio, Kolkata (Indias public service broadcaster). Attention plays an important role in our performances and productivity. The ancient concept of productivity is the ratio of what is produced to what is required to produce it. But, father of modern management Peter F. Drucker (1909-2005) defined productivity of knowledge work and knowledge workers in a new form (Ramirez and Nembhard, 2004). Asia Productivity Organizations (APO) defines the productivity as: Productivity = Efficiency + Effectiveness = “Doing things right” + “Doing the right things” (Organization A.P. In-country training program for productivity and quality practitioners In IRAN 2008) Both Efficiency and Effectiveness associated with attention.

In the other hand, the concept of Emotional Intelligence (EI) originated back in 1920s when Thorndike (1920) for the first time proposed the emotional intelligence into three dimensions, i.e. abstract intelligence, mechanical intelligence, and social intelligence. The contribution of Salovey and Mayer (1990) is substantive, as they proposed a model for emotional intelligence by defining EI as part of the social intelligence, which take measures the ability of an individual to regulate his/her personal and other's emotions and feeling. Cognitive intelligence illustrates the specialization of general intelligence in the domain of cognition in ways that possess experience and learning about cognitive processes such as memory (Schaie, 2001; Brody, 2004).

The outcomes of past research on emotional intelligence shows that emotional intelligence has a positive effect on social- mental factors of human resource (Hakkak, Nazarpoori, Mousavi and Ghodsi, 2015); positive effects of emotional intelligence on leaders and followers in terms of performance, results, work, satisfaction (Ioan Pastor, 2014); Emotionalintelligence has a positive and significant relationship with the teachers job performance (Asrar al-Haq, Anwar and Hassan, 2017).

In this paper, we make a conceptual framework based on theories of emotional intelligence proposed by Salovey and Mayer (1989-1990) and a compensatory model of emotional intelligence, Cognitive intelligence, and job performance proposed by Stephen Cote and Christopher T.H.Miners(2006). For investigating the impact of emotional intelligence and cognitive intelligence on radio presenters attention, Sample size consists 59 radio presenters (considering gender, academic qualification, Instructional mood, age group etc.) from All India Radio, Kolkata station. Questionnaires prepared based on cognitive (Hence force called C based and represented by C1, C2,.., C5) as well as emotional intelligence (Hence force called E based and represented by E1, E2,.., E20). This were sent to around 59 respondents (Presenters) for getting their responses. Attention in performance were collected from the report of Program executive of All India Radio, Kolkata. The linear regression has been carried out using all the E-based and C-based variables as the predictor variables. The possible problem of autocorrelation has been tested by having the Durbinson-Watson (DW) Statistic. Values of this statistic, if within the range of 1.80 –2.20, indicates absence of any significant problem of autocorrelation. The possible problem of multicollinearity has been tested by having the variable Inflation Factor (VIF) value. Values of this statistic, if within 2, indicates absence of any significant problem of multicollinearity. It is inferred that the Attention Scores can be statistically regressed linearly on the E-based and C-based scores which can explain 74.50% of the variations in the Attention Scores.

**Keywords**— Attention, Productivity, Emotional Intelligence, Cognitive Intelligence.

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# The Neural Correlates of Self-Relevant Information: An Autism Family Study

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## Abstract

Autism spectrum disorder (ASD) is a genetically-based neurodevelopmental disorder characterized by social communication deficits, as well as restricted and repetitive behaviors [1]. The causes of ASD are poorly understood, but are thought to be a complex combination of genetic and environmental influences. Some parents of individuals with ASD display subclinical traits of ASD; this is known as the broad autism phenotype (BAP) and is thought to indicate genetic liability to ASD [2].

Past research explored how individuals with ASD process social information related to other people, but there is a gap in research regarding the processing of self-related information. It is important to fill this gap because individuals with ASD may have deficits in self-referential cognition; an impaired ability to coordinate representation of the self and other could influence deficits characteristic of ASD, such as difficulties in social interactions and understanding perspective (Theory of Mind). Cygan et al. 2014 found that the P300 signal for individuals with ASD was elevated for pictures of both their own and close-other faces compared to pictures of famous and unfamiliar faces [3]. This contrasted with findings from the control group, which only had an elevated P300 signal for pictures of their own face compared to pictures of close-other, famous, and unfamiliar faces. The P300 has been used as an index of maintaining attention to a stimulus. Additionally, stimuli that are more emotionally charged produce higher P300 peaks than neutral stimuli, and emotion influences motivation and regulation of attention. Cygan et al. 2014's results support a self preference effect in individuals with ASD; they could be motivated to allocate equal amounts of attention to self and close-other faces since they both are related to ones self. These self-referential deficits may be present to a lesser extent in family members of individuals with ASD, further characterizing the BAP.

In our study, we plan to test 20 individuals with ASD, 40 biological parents of individuals with ASD ( $n = 20$  parents with the BAP;  $n = 20$  parents without the BAP), and typically developing controls for both groups ( $n = 20$  ASD controls;  $n = 40$  parent controls). Participants will be presented pictures of faces from four categories (self, close-other, famous, and unfamiliar) while event-related potentials are recorded from 64 electrodes. We hope to replicate Cygan et al. 2014's findings: we hypothesize that while individuals with ASD will have a greater P300 response to both their own and close-other faces compared to famous and unfamiliar faces, matched controls will only have a heightened P300 in response to their own faces compared to close-other, famous, and unfamiliar faces. We have three additional hypotheses: first, parents with the BAP will have an elevated P300 signal for own and close other faces compared to famous and unfamiliar faces; second, this elevation will be to a lesser extent than that of individuals with ASD; and third, parents of typically developing individuals will only show elevated P300 responses to own faces compared to other faces.

**Keywords**— autism spectrum disorder, broad autism phenotype, endophenotype, self-referential processing, EEG

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# Reinforcement learning task without time constraints

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## Abstract

Reinforcement learning causes rewarded actions to become more likely to be repeated in the future. In the natural environment the outcomes of actions are often uncertain and potential rewards associated with them may vary over time, thus to maximize benefits it becomes necessary to balance exploration of possibilities with exploiting the one with assumed best reward potential. Here we introduce a novel method to study reinforcement learning in mice, which overcomes two major limitations of previous models: strict limits on decision timing and the need for food or water deprivation.

We used the IntelliCage system, where a group of C57BL/6J mice performed a probabilistic reversal learning task. Animals were offered a choice between two alternatives to access a sweetened water (saccharin 0.1%w/v), and the probability of a given alternative being rewarded was reversed every two days. The procedure lasted 20 day, and animals performed on average 1260 choices, with 67% preference of selecting the alternative with higher reward probability.

As expected, when a choice was rewarded, the probability of repeating the same decision increased. Additionally, we observed that chance of selecting the same alternative increased at longer intervals between choice, irrespective of outcomes. Accordingly, when reinforcement learning models were fitted to the observed behaviour, best results were obtained when simplest reward prediction error update was paired with a policy that included an interval-dependent component. Our results reveal that intervals between choices affect the decision-making process.

**Keywords**— reinforcement learning, saccharin

# Influence of Working Memory training on cognitive functioning of elderly people.

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## Abstract

Ageing processes deteriorate cognitive functions and have an impact on life quality and behavior of humans [1]. Elders often report memory and learning problems and reduced general cognitive effectiveness. It may be clearly seen in tasks requiring high cognitive involvement and may indicate deficits in modulating the activity of neurons in response to the growing demands of the task [3]. Working memory (WM) has been shown to determine efficiency in learning new skills and there is some evidence indicating that WM training could be an effective tool to prevent or slowing cognitive deterioration.

The aim of the study presented here was to check whether the WM training would improve performance of a number of cognitive tasks such as WM updating, attention and reasoning efficiency. During a reasoning task we additionally recorded the changes at the neurophysiological level in the theta band of EEG signal the rhythm related to attention and multitasking abilities [2]. 55 elderly people ( $M = 66,76$ ,  $SD = 6,35$ ) participated in one-month training. Experimental group ( $N = 28$ ) practiced dual n-back task and the control group ( $N = 27$ ) general knowledge quiz. First and second measurements sessions were organized right before and after training.

The results did not show group differences. The analysis, however, revealed that the better the performance of the training tasks, the higher the correctness in the cognitive tasks (reasoning task, inhibition task) in post-training measurement. What is more, the reduction in theta power is associated with post-training increase in cognitive tasks performance.

**Keywords**— working memory, cognitive trainings, reasoning, theta

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# When Brain Ages Ahead of Its Time. Computerized Cognitive Training as Promising Solution for Prevention and Treatment of Memory and Attention Deficits in HIV-Associated Neurocognitive Disorders

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## Abstract

As the achievements in the field of Antiretroviral Therapy continue to progress, it is widely assumed there will be consecutively more people aging and living with HIV and AIDS[1]. Longitudinal observations of seropositive people led to specification and research on HIV - associated neurocognitive disorders (HAND)[2]. HAND is characterized by specific symptoms, such as deficits in memory and attention.

Pharmacological cognitive interventions have been used with minor effects, or none, and can lead to adverse side effects[3]. Computerized cognitive training interventions, on the other hand, have been shown to improve or maintain cognitive functioning in targeted domains without similar side effects[4].

This paper aimed to: a) introduce the most common problems with memory and attention amongst people with HAND; b) present and compare 6 studies describing successfully conducted computerized cognitive training programs that led to better functioning in two cognitive domains: memory and attention.

All presented studies on computerized cognitive training (CCT) were conducted on seropositive adult people with a diagnosis of HAND. 3 training protocols targeted memory[5][6][7], 2 targeted speed of processing, but resulted in additional improvement on memory and attention[8][9] and one aimed to improve in those cognitive domains in which deficits occurred[10]. Authors reported medium effect sizes[11].

Greater evidence is needed to provide proper treatment guidelines. However, results of presented CCT interventions suggest that they might be a promising solution for people with HAND, that can improve cognitive functioning, which positively affects daily activities and enhances mood, thus leading to better quality of life.

**Keywords**— HIV- associated neurocognitive disorders, memory impairments in HAND, attention impairments in HAND, computerized cognitive training, cognitive aging, HIV/AIDS

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# Cognitive control and metacognition. The influence of response conflict on decision and confidence.

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## Abstract

What is the relationship between cognitive control and metacognition? In this study we investigated whether the results of performance monitoring inform metacognitive judgments. Participants were asked to decide which of two boxes presented on the screen, left or right, contained more dots and to rate their choice confidence. However, first, immediately after stimulus presentation and before stimulus-related response (SR), participants were asked to respond to a motor cue that was irrelevant to the decision task but could be congruent or incongruent with the correct SR. We created two types of motor congruency: fully congruent or incongruent response used the same response set as for SR (the same left or right response) while partially congruent or incongruent response required different response keys (left and right but below SR keys). We expected that confidence level would be affected by the strength of motor conflict, that is it would be lowest in fully incongruent and highest in fully congruent trials. However, data analyses showed that participants were more confident in their decisions in fully congruent and incongruent trials compared to partially congruent and incongruent trials. The results suggest that motor response overlapping with potential response to the stimulus provides substitute information about the characteristics of decisional and motor processes. This supports the view that metacognitive judgments can be based on the results of performance monitoring, such as response time or error detection. We interpret the results in the context of the relations between metacognition and cognitive control, and discuss alternative interpretations (eg. attentional load).

**Keywords**— cognitive control, metacognition, performance monitoring, motor conflict, confidence

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# Electrophysiological correlates of physiological déjà vu phenomenon

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## Abstract

Déjà vu is the subjective experience of familiarity combined with the knowledge that this experience is false[1]. In healthy subjects, déjà vu is thought to be triggered by the dissociation of explicit and implicit memory (episodic recall vs. familiarity)[2]. Pathological form of this phenomenon is frequent in patients with temporal lobe epilepsy, which is characterized by cortical hyperexcitability and decreased volumes of temporal lobe structures. Similarly decreased volumes of medial temporal structures were observed in healthy subjects experiencing non-pathological déjà vu[3,4]. Another link was suggested between cortical excitability and frequency of other anomalous behavioural experiences. However, the role of cortical excitability in the genesis of déjà vu has not been directly examined.

In the proposed study we explore a relationship of cortical excitability to déjà vu genesis in healthy subjects. We hypothesize that healthy subjects with a higher frequency of déjà vu experience express increased cortical excitability compared to subjects with no déjà vu experience. Cortical excitability is measured using behavioural Pattern glare task, EEG power spectral analysis, MR spectroscopy (neurotransmitter concentration), and amplitude of transcranial evoked potentials (TEPs). Psychological questionnaires are used to assess the subjects' personality traits. This multi-method approach will allow us to evaluate the accuracy of different methods for measuring excitability in healthy population as well. The design of the ongoing study will be presented in this poster.

**Keywords**— dejavu, excitability, electrophysiology, memory

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# What do the measures of mental content activation tell us about? Searching for a tool measuring the effectiveness of thought suppression

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## Abstract

There are direct and indirect measures of the effectiveness of thought suppression. As far as direct measures are concerned, we simply ask participants to signal, when suppressed content appears in their consciousness. Unfortunately, the results of such procedure may be influenced by participants' desire for a positive self-presentation and their limited meta-awareness of unwanted thoughts. Indirect measures are considered to be able to resolve those problems. They are designed to enable evaluation of person's functioning without introspective reports. These methods (such as lexical decision task or Stroop task) allow us to estimate the activation of avoided content. Higher activation is interpreted as inferior suppression. However, there are reasons to be cautious with comprehending the increase of activation in terms of the increase of conscious thought frequency (indeed the latter is equivalent to the failure of suppression). There are studies indicating that greater activation is not always associated with the ability to consciously recall the target content. It is possible that mental content is activated due to its importance in controlling mental processes. Yet, the cognitive and behavioral control does not have to be conscious. As regards the specific case of thought suppression, the constant awareness of a goal (e.g. 'do not think about X') is simply undesirable because it implies a failure in its implementation (thinking about X). It seems that greater activation of avoided content does not necessarily mean that suppression has failed. An alternative interpretation is proposed, according to which the target content remains outside of consciousness while the content's activation is increased because of its impact on regulation of cognitive processes according to the goal of not thinking about it.

**Keywords**— thought suppression, activation, direct measures, indirect measures

# Effects of speed-accuracy tradeoff on attention

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## Abstract

Performance in perceptual tasks depends on the time spent on stimulus processing - the longer it is, the more reliable (based on more evidence) is final decision. Higher accuracy can be obtained at the expense of longer response times - phenomenon known as speed-accuracy tradeoff (SAT). In recent years, the number of neurophysiological studies investigating SAT increases, but they are largely contributing to a single research area - neurobiology of decision making. At the same time, the potential impact of SAT on higher cognitive functions, remains poorly understood. Available results indicate that SAT impairs bottom-up attention (in speed promoting variant; Pasttter et al., 2012) and interacts with executive attention (impairs it under speed pressure and enhances under accuracy requirement; van Veen, 2006). To our knowledge, the impact of SAT on top-down attention has not been yet studied.

Healthy adults ( $n = 55$ , mean age 23.22 years) performed visual experiment comprising periods of cue presentation, anticipation and task execution. In control trials cue preceded simple task, in attention trials cue preceded demanding singleton search task. We compared performance and brain activity (EEG and fMRI) in two groups of individuals: "SAT-group" - trying to respond as fast as possible and "no-SAT" - with response postponed after stimulus offset, thus devoiced of SAT. Active anticipation in both groups was confirmed by improvement of performance with increasing cue duration.

Speed-accuracy tradeoff disrupted top-down attention, which was evidenced by lower activation of dorsal attention network in SAT than in no-SAT group. We observed also influence of SAT on the activity in right supramarginal gyrus (R SMG), a node of ventral attention network. R SMG was deactivated during anticipation period only in the presence of SAT suggesting deactivation of the ventral attention network as a probable mechanism counteracting tendency to commit impulsive errors in situations requiring fast responses. Despite fMRI results indicating interference of SAT with top-down attention, decrease of alpha power (commonly proposed as electrophysiological index of top-down attention) did not depend on SAT, but slight alteration of alpha spatio-temporal map characteristics was observed in SAT/no-SAT comparison. Simultaneously, we recorded lower alpha activity from frontal and central sites in SAT than in no-SAT group. This effect was independent on the engagement of top-down attention (present in both attention and control trials).

In summary, the analyses demonstrated that SAT may indirectly influence the stage of stimulus perception interfering with attention processes (disrupting activity of dorsal and ventral attention network). In consequence, worse performance of SAT-group than non-SAT group, might result not only from the quantitative differences (less information about the stimulus) but also from qualitative ones (lower attention activity). The impact exerted by SAT on top-down attention processes as demonstrated in our study points to the need for efficient control of SAT-related effects in the research of higher cognitive functions.

**Keywords**— anticipatory attention, speed-accuracy tradeoff, fMRI, EEG

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# A cognitive analysis of selected verses of a poem by H. H. Sheikh Mohammad ben Rashid al-Maktum entitled The path is clear

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## Abstract

The aim of the speech is to present a method of cognitive analysis in the approach to innovative(for European researchers) poetry of Arabian Peninsula - the Nabati poetry. I will describe the main cognitive tools used by me to analyze poems, which will be based primarily on the achievements of the German professor of linguistics G. Radden. I will point to the essence of basic cognitive principles that depend on such determinants as human experience, selectivity in perception and cultural preferences. I will refer to the concept of metaphor in G. Lakoffs model, which relies on the relationship of mapping between two domains: the source and target domains. One of the European metaphors is the metaphor of the mind. Can it be translated into Arabic as well? This is one of the most interesting questions, and the answer may give the impulse to discover the Orient from a new-cognitive - perspective. The metaphor in the model by Lakoff and Johnson relies on a relationship of reproduction between two domains: the source and the target. Among the typical European source domains, there are light and darkness, and forces (e.g. Causality is Force). The popular target domains in both European and Arab culture include morality, society/nation, interpersonal relations and family. According to Lakoff, the conceptual metaphor has neurological foundations which explains the fact that the reference point for the Bedouins was higher virtues guaranteeing them a sense of safety in harsh desert conditions. The cognitive analysis framework includes the aspect of a political discourse which gives rise to deeper considerations in the orbit of related issues,i.e. power, supremacy or legitimization of the two mentioned. The poem, to which I am willing to refer to, contains many references listed by Radden and Kvecses, such as the idealized cognitive model of power. There is a procedure of subordination to the one exercising power. It connects with cultural preferences according to which what is central is closer and more important than the peripheral, and our values are the values of the entire group. This is an orientation metaphor -centre periphery which is present in many Nabati poems. I will also draw attention to the algorithm of subjectivity in Arabic poetry, which in this particular type of poetry is extremely unambiguous. I will prove the specificity of Nabati poetry, in which there is a logical tunnel, which thanks to the repetitiveness of subjects, forms and applied language and stylistic techniques, has allowed to standardize the scheme of creating a poem. Among others this is what determines the uniqueness of Arabic poetry, which has preserved the unity of form and style for hundreds of years. Also, it is an area for research in the field of using the algorithm of subjectivity in contact with a dedicated cognitive environment. I will try to prove that looking at poetry Nabati as a multiple subjective message, using cognitive tools, may prove to be a breakthrough in the field of research into Arab culture in its broad sense. By referring to amalgams and notional patterns of immutable de facto for centuries in Arab consciousness, one can discover the actual tool of work of a modern diplomat. This is a more reliable source than literature- and poetry in particular - plays a key role in the Arab society and is an integral part of the Arabs life.

**Keywords**— Nabati, poetry, cognitive, analysis, linguistics

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# Age-related changes in the efficiency of attention processes in ADHD in comparison to healthy controls

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## Abstract

Attention deficit hyperactivity disorder (ADHD) is a behavioural diagnosis based on the presence of developmentally inappropriate levels of inattentiveness, overactivity and impulsivity[1]. Some results suggest that ADHD may be connected to altered communication in attentional networks[2,4]. The main purpose of this study was to investigate the developmental patterns in attentional processes of the ADHD group compared to healthy controls. Multi-aspect measurement of attention processes was applied through the application of various tasks such as the classic paradigm examining the attention network (ANT)[3], the task involving sustained attention and inhibitory processes (SART)[6], and clinical battery: Test of Everyday Attention for Children (TEA-Ch)[5]. The experiment was conducted on a large group of children and adolescents (N = 150) with a wide range of age (9-16 years). The control group (N = 76) was age- and sex-matched to the clinical group (N = 74) with a confirmed ADHD diagnosis. Analysis of tasks involving attention processes has shown numerous deficits in attention in the ADHD group. Patients showed deficits within the executive control of attention processes, sustained attention and attention switching. The analysis showed that the patients with the diagnosis of ADHD are characterized by top-down processing deficits, while they have no problems with bottom-up attention processes. Regression analysis showed a significant development trend in both groups and a significant difference between the groups. In the examined period (9-16 years), the ADHD group does not achieve the same level of performance as the healthy control group.

**Keywords**— ADHD, Attention, ANT, SART, TEA-Ch, Regression analysis

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# How anxiety and depression may affect our memory and attention

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## Abstract

Anxiety and depression has became one of the biggest problems in modern society, especially when it comes to younger generations. So asking how exactly they affect everyday activities is quite significant. Memory and attention are one of the most important things in our cognition, therefore if something worsens them, it probably also worsens someone's life. Research shows that anxiety actually biases attention and memory capability. Depression on the other hand does not seem to correlate with attention problems, but it may cause memory issues. Although these findings may seem like a final answer we must not forget that these two disorders often come together. What is interesting and really important is that new data points out the fact that each case should be considered separately, because they may represent different results. One of the factors which may also play important role in this problem is age. Teenagers and adolescents go through mental disorders in a way that usually differs from the way elderly people does. This work presents different cases, where patients suffer from anxiety and depression, which changes their ability to memorize things and paying attention. It also elaborates newest findings in this area, compares it to knowledge that has been noted earlier and shows new theories related to finding causes of these two mental illnesses. At last it focuses on the influence of drugs used in patients' treatment.

**Keywords**— anxiety, depression, attention deficits, memory impairment, age, drugs

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# The effect of working memory load on automatic shifts of attention to consciously and unconsciously processed stimuli

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## Streszczenie

A large body of evidence indicates that self-related information, like self-face and self-name, is processed preferentially [1]. Indeed, in our previous study we have shown that a self-face image automatically attracts attention, even when it is task-irrelevant and presented subliminally (unconsciously) [2]. Interestingly, another line of evidence suggests that working memory is necessary to filter-out such task-irrelevant perceptual distractors, and thus that interference from perceptual distractors is greater under high working-memory (i.e. they attract attention more) [3].

The primary measure used in our study is the negative posterior-contralateral component (N2pc), which is a robust marker of covert attention shifts [4]. We set out to test the following hypotheses. First, a self-face will attract attention in both supra- and sub-liminal conditions, which will be indicated by a presence of the N2pc component. Second, in both supra- and sub-liminal conditions the attention capture will be more efficient in the high-load condition, which will be indicated by higher amplitude of the N2pc component.

To test these hypotheses we used a dot-probe paradigm (similar as in [2]) and a working memory-task. First subjects were asked to memorize 5 digits (from 1 to 10), presented either an ordered sequence (low load) or as a random sequence (high load). Faces were presented laterally for 32 ms and followed either by a blank (supraliminal) or by a mask (subliminal). After the dot-probe task subjects were presented with an identification task, to evaluate efficiency of the masking procedure. EEG signal was recorded throughout the experiment.

The present project is ongoing and data are currently being collected. At the conference results from 20 subjects will be presented.

**Keywords**— attention, consciousness, load, working memory, self-face, N2pc

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# Attention in the context of using the Internet

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## Abstract

The world of the Internet and new media has changed the way millions of people work in the world. A minor study aims is to check the mutual relationship of attention with the way people use the Internet. Both in the context of conscious mindfulness or detection of early cognitive dysfunctions. Modern technologies change not only our behavior and the environment we surround ourselves with, but also our cognitive processes. One of them is the attention, the changes of which can have a significant impact on the functioning of people in society. The aspect of using the Internet will be analyzed in two ways: possible expectations that the use of the network brings and possible negative effects, for example, Problematic Internet Use. This is particularly important due to the variety of activities offered by the Internet. Whether a person will expect an escape from negative emotions or positive experiences will be manifested in activities that he will take on the web. Problematic Using the Internet takes on other important aspects, such as preferring on-line social contacts more than offline ones, leaving real life activity to those on the Internet or lack of self-control in the amount of time devoted to technologies. Apart from checking the mutual relations of distinguished variables, the research is also aimed at checking possible demographic differences, both due to the age, sex or place of residence of the respondents. The distinction between groups of subjects in terms of the above-mentioned variables is confirmed in the research. It is indicated that both the amount of time spent on the Internet and the age at which regular use of the network began is of particular importance in the case of cognitive processes, including attention. In addition, the type of activity that is preferred in the network may be relevant, because different activities require different cognitive engagement of people who use them. Paying attention to the phenomenon of mutual relations of attention and using the Internet seems to be particularly important due to the possible long-term effects of such dependence. First of all, it can contribute to the construction of hygiene in the use of the Internet and the creation of pro-health programs whose task will be to prevent negative phenomena of changes that can occur in the cognitive processes of people using the Internet excessively. Secondly, it will allow you to see which network activities may have a higher degree of risk and which have a lower degree of risk. The final aspect, however important, is to check whether the type of activity or the Internet user's expectations are an advantage in the context of changes in the attention process. Research will be carried out on people aged 18-30, both students and employees. Particular attention will be paid to the nature of the profession or profession being practiced (technical, social, humanistic).

**Keywords**— attention, internet use, internet expectancies, problematic internet use

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# Level of expertise guides the attention when viewing extremist multimodal texts

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## Abstract

Multimodal (or polycode) texts containing images and verbal expressions have become one of the most common formats for Internet communication in recent years. They are also actively used in extremist discourse, promoting intolerance, neo-nazism and xenophobia. Extremist propaganda is punishable by law so forensic experts need the scientifically-based framework to analyse such texts.

To develop such a framework first we need to assess the perception and understanding of multimodal texts and possible biases. The aim of our study is a comparison of visual and subjective perception of extremist texts by subjects uninvolved in the extremist discourse and forensic experts. We suppose that working as an expert may shift the attentional focus and make an impact on subsequent cognitive evaluation of a text and this may have a negative impact on the forensic analysis. We need to find the exact differences introduced by the expertise to document and correct them.

We have performed an eye tracking study of multimodal texts (combination of image and verbal expression) from Russian internet communities that either contained extremist messages, were borderline or neutral. Subjects were professional forensic experts or completely uninvolved in the extremist discourse. They had to examine and read the texts and then describe the overall messages, the key elements of the texts (visual and verbal), tell if the text was extremist.

Experts have demonstrated a viewing strategy biased towards specific markers (symbols, words etc). They read the texts in full after these examinations. This attentional bias may introduce a negative perceptual frame and lead to false positive assessments.

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**Keywords**— multimodal text, eye tracking, extremism, visual attention, forensics

# Acquired (ontogenetic) memory and voluntary attention as aspect of processing information in the brain: the freedom in action

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## Abstract

The aim of this investigation is functional (causal) 'including' mental phenomena in processing of information in neuronal networks of the brain and showing the fundamental function of the phenomenon of freedom during this process in the framework of functional role of such phenomena as voluntary attention and acquired memory.

As mental phenomena, we investigate, first, mental image, which is a form of actualizing of subjectively significant information (memory fixing in the brain) in neuronal network (NN) for informational causation of one NN by another during the process of integrating of acquired memory. Second, we investigate voluntary attention, which is the mental aspect of selection and actualizing of needed information fixed in the brain. Attention carried out on the basis subjective evaluation of information in the conditions of uncertainty[1].

The human brain can be considered as an extremely complicated network of synaptically connected neurons providing direction of transmission of the controlling electrical signals mostly from the sensory structures toward the motor ones for forming motor acts, based on their subjective significance and integrated memory [2]. But it is unclear in what way 'totally' physical neuronal networks(NNs) carry out biologically and/or socially expedient informational operations. Actually, physical phenomena, by themselves, due to the nature of their causality, cannot realize biologically and/or socially expedient causal (informational) actions (except for those that are accidentally carried out or in the case of unconditioned reflex in the brain). So, the functions of voluntary attention and mental image are understood as aspects of integrating information by means of mutual informational exchange between NNs in the condition of impossibility of such integration through the classical physical causality. In our concept bottom-up flows of information in the brain for forming of 'competency' of control NNs (which localizes in frontal cortex) on the basis of integration of acquired memory by means of mental phenomena occur. We interpret the phenomenon of mental image as a structure, which cumulates subjectively significant information describing one or more (having the same characteristics) objects. Through such structure mutual information regulation of NNs by means of causation of function states of their synapses occur. For occurring of this bottom-up information flows by means of voluntary attention and mental images we must assume availability of the phenomenon of freedom (subjective choice) as aspect of selection of needed sensory and memory fragments on the continuum of corresponding NNs for elimination uncertainty, and, by such a way, for forming expedient structure of motor acts.

So, voluntary attention is an aspect of operation information in the brain, which carry out searching and free choice of information for its integration on the continuum of personal memory manifesting through mental image.

**Keywords** – neuronal networks, acquired memory, voluntary attention, image, freedom

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# Phenomenon of brain-computer interface (BCI) illiteracy and its association to user's attention

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## Abstract

Brain-computer interface (BCI) is a technological solution, which translates brain's activity to the control signal of external devices, such as computer software or prostheses. Because of its independence from one's muscular activity, it is applicable as a communication tool for the patients diagnosed with neuromuscular diseases, e.g. amyotrophic lateral sclerosis or brain stem injuries. BCI has a valuable potential not only in relation to healthcare, but also for commercial issues – in particular computer games market or art. Among the noninvasive BCI approaches, subgroup based on electroencephalographic (EEG) recordings is the most popular.

Although the performance of BCI systems progressed through the last years, particularly because of classifiers' and EEG signal processing methods optimization, there are many users in the total population, who cannot use some – or even all – of proposed BCI solutions. This phenomenon – as observed experimentally – is currently known as BCI illiteracy. It is estimated that, depending on the BCI variant, 15-30% of users participating in the studies cannot properly use BCIs and the reasons for such outcome are still not known [1-3]. The term of BCI illiteracy is not well parameterized yet, and because of that there are difficulties while comparing the results from various trials. In recent years, studies were conducted in order to characterize, predict and propose solutions of that problem. Unfortunately, they were focused on only one type of BCI and were co-recorded only with the demographic data.

During the presentation I would like to discuss the notion of attention involvement within the BCI paradigm. My goal is to propose a claim that worsening of attention affects the user's BCI performance and may be responsible for the explanation of at least some of the variance of total users' performance and ability to use BCI. In order to support such statement I will provide the results of few studies conducted in the context of BCI illiteracy, involving user's attention [4,5].

**Keywords**— brain-computer interface, EEG, attention

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# Does attention training induce any changes in the level of the selected cognitive processes in handball players? a pilot study

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## Abstract

The goal of the paper is to analyse the changes in the level of attention, peripheral perception and sensorimotor coordination in male and female handball players following neurofeedback-EEG trainings. Handball involves direct fight with the opponent, which requires proper mental preparation. The discipline is becoming more and more dynamic, thus the player needs to make quick decisions based on sudden events and their own psychomotor abilities. The study involved 18 athletes (9 women 1st league, 9 men 2nd league) AZS AWF Warsaw in handball. The Vienna Test System was applied: a test to measure attention (COG), peripheral perception (PP-R) and sensorimotor coordination (SMK). Measurements were performed before and after 20 neurofeedback-EEG trainings (training took place twice a week), in the course of which beta1 (1320 Hz), SMR (1215 Hz) frequency was increased and theta (47 Hz) and beta2 (2035 Hz) were decreased. Each 30-minute training (8 rounds, 3 minutes each with a 30-second break following every round). The differences between the first and second measurement indicate that the male and female handball players subject to the analysis improved their general attention level. The subjects performed a task more precisely in the course of the second measurement. Significant differences were also noted in the level of sensorimotor coordination. The subjects improved eyehandleg coordination. In the case of peripheral perception, significant differences were observed only in the group of men. The neurofeedback-EEG training improved the attention and sensorimotor coordination of male and female handball players as well as peripheral perception in male handball players.

**Keywords**— neurofeedback, attention, peripheral perception, sensorimotor coordination, team sports

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# Mnemonic Brain

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## Abstract

Mnemonic devices are strategies for organizing information to enhance the encoding and later recall of information (Bellezza, 1979). It can be done by associating in memory units of information that at first appear unrelated (organizational mnemonics), or by transforming abstract information to more memorable forms, like images (encoding mnemonics) (Bellezza, 1979). Examples of mnemonic strategies are: peg-word mnemonic, method of loci, link mnemonic, digit-image mnemonic, or Winckelman's mnemonic (Bellezza, 1979).

Although many behavioral studies have shown how the usage of mnemonic strategies can improve memory (Bellezza, 1979; Wilding, Valentine, 1997), less is known about how they influence brain functioning. In the last two decades, several studies attempted to answer this question, using various neuroimaging methods (eg. EEG, fMRI). Different approaches also have been made: comparing superior mnemonists' brain to control people's brains, training naive subjects in some mnemonic and monitoring changes in their brain functioning and structure, or looking for differences in brain functioning of people with mild cognitive impairment and healthy people while using mnemonics. In this poster, I will review and summarize the results of studies on mnemonic devices conducted in cognitive neuroscience domain.

Research on mnemonic strategies and the changes in brain functioning they induce will give us insight on mechanisms by which we can enhance memory performance. It could be applied for treatment of people with memory impairment, or for designing training methods for people who want to improve their learning strategy.

**Keywords**— mnemonic devices, brain functioning, fMRI, EEG, neuroimaging, review

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# Valence or motivation which emotion aspect impacts our attention the most? The case of anger

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## Abstract

Over past few decades research exploring emotions effect on attention have focused mainly on valence as its determinant. Approach and avoidance motivation (another emotions aspects) were often ignored by ascribing them to positive and negative affect, respectively. Current review aims to present the synthesis of existing findings that address the concern whether only valence or also motivation (approach vs. avoidance) is responsible for attentional biases by presenting recent findings on anger-attention relation in comparison to other discrete emotions. A growing number of studies suggests that anger - negatively valenced emotion with high approach motivation may impact our attention in the same way as other emotions with the same direction and intensity of motivation but different in terms of valence. Studies revealed that angers induction narrows cognitive scope similarly to desire and determination (positive valence, high approach motivation) but oppositely to amusement (positive valence, low approach motivation). Moreover, anger was found to direct visual attention on rewarding stimuli similarly to excitement or determination (both positively valenced with high approach motivation) but oppositely to fear (negatively valenced with high avoidance motivation) or sadness (negatively valenced with low avoidance motivation). Another evidence show that duration of staring at angry faces is positively related to time spent on looking at determined faces, contrary to faces expressing joy (positive valence, low approach motivation). Therefore, exploration of angers attentional consequences may lead to conclusion that direction and intensity of motivation, rather than valence, influences our attention the most. Disentangling abovementioned uncertainties may be helpful in understanding the complexity of specific attentional biases characteristic for individuals with different emotional disorders.

**Keywords**— attentional bias, anger, motivation, valence

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# Visual awareness judgments are sensitive to the outcome of performance monitoring.

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## Abstract

The best way to improve any skill is to learn from one's own mistakes, but can we improve our visual awareness? The aim of the presented study was to answer the question whether stimulus awareness can be affected by accuracy feedback about stimulus-related action. The existence of post-error slowing phenomenon (people's tendency to respond more cautious after making a mistake) suggests, that there are systems specialised in monitoring and regulating task-related behaviour and they detect difficulties and errors in order to adjust the level of top-down attention. In order to investigate whether stimulus-awareness is sensitive to the results of the on-line performance monitoring we used perceptual discrimination task in which participants also reported their stimulus awareness. In half of the blocks participants received explicit performance feedback at the end of a trial. The results showed that participants reported lower stimulus awareness after incorrect discrimination response following the correct one, but also lower awareness in correct trials preceded by incorrect responses, compared to correct trials preceded by correct responses. This difference was significantly stronger when participants received external accuracy feedback. Moreover, in Feedback conditions we observed "post-error slowing" for both discrimination responses and awareness reports: reaction times were longer for correct trials preceded by errors compared to the trials preceded by correct responses. The results suggest that awareness judgements are sensitive to the evaluation of one's performance, both internal and external. We interpret the results in the context of relation between cognitive control and perceptual awareness.

**Keywords**— metacognition, awarness, consciousness, perception, feedback, cognitive control

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# Nie-pamięć traumy: wspomnienia wyparte czy odzyskane? Alternatywne wyjaśnienie ”utraty” traumatycznych wspomnień

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## Streszczenie

W swoim wystąpieniu przybliże dyskusje teoretyczna nad mechanizmami zaburzeń pamięci oraz fenomenem zaniku wspomnień występujących u osób, które mają traumatyzujące doświadczenia. W szczególności, przedstawie koncepcje alternatywna wobec teorii wyparcia oraz teorii fałszywych wspomnień, które są dominującymi i najlepiej znanymi sposobami tłumaczenia fenomenów post-traumatycznych zaników pamięciowych. Skupie się na badaniach i teorii Richarda McNally’ego, badającego mechanizmy poznawcze, emocjonalne i pamięciowe osób dotkniętych trauma.

W toku badań nad funkcjonowaniem poznawczym osób z PTSD Richard McNally opisał m.in. pewne szczególne przypadki osób twierdzących, że straciły wspomnienia traumatycznych doświadczeń, oraz osoby które przypominały sobie o doświadczoną w dzieciństwie traumie (molestowanie seksualne) już w wieku dorosłym. Przypadki te, zgodnie z poglądem badacza nie pasowały do dominujących dotąd teorii wyparcia, ani fałszywych wspomnień.

Teoria wyparcia sugeruje, że doświadczenie to było zbyt traumatyczne, by psychika dziecka mogła sobie z nim poradzić (co nie dotyczy jednak wszystkich dziecięcych ofiar przemocy i molestowania seksualnego) i dlatego ich wspomnienie zostało usuniête z pamięci do czasu, gdy psychika była w stanie uporać się z doświadczeniem. Teoria ta wsparta jest badaniami ukazującymi jak patologiczne wysokie stężenie hormonów stresu zaburza procesy pamięciowe oraz na zalożeniu mechanizmu dysocjacji efektywnych i sensorycznych aspektów zapamietywanych doświadczeń.

Przeciwnie do teorii wyparcia, teoria fałszywych wspomnień zakłada, że odzyskane wspomnienia sa de facto zaindukowanymi w procesie terapeutycznym fałszywymi wspomnieniami. Teoria fałszywych wspomnień wniosła znaczny wkład do rozumienia pamięci, zwłaszcza w kontekście zeznań świadków naocznych. Posłużyła również do zdyskredytowania tzw. ruchu odzyskanych wspomnień (molestowania seksualnego) sugerując, że wydobyte w toku terapii ”wspomnienia”, na których prawdziwość nie ma dowodów sa de facto fałszywe.

Tymczasem McNally sugeruje, że dla pamięci istotna jest kategoryzacja wspomnień. W konsekwencji swoich badań dochodzi do wniosku, że o ile doświadczenie molestowania seksualnego nie było brutalne i fizycznie krzywdzące dla dziecka, to mogło ono nie umieć zinterpretować go jako traumatyczne. Dopiero z wiekiem, po nabyciu koncepcji molestowania seksualnego możliwa staje się rekategoryzacja istniejącego wspomnienia, które wraz z nia nabiera traumatyzującego charakteru. Zgodnie z ta interpretacja, wspomnienia te nigdy nie zostały utracone, jednak dopiero wraz z nabyciem koncepcji molestowania seksualnego stały się źródłem emocjonalnej traumy.

Teoria ta podkreśla wpływ oceny poznawczej sytuacji dla reakcji emocjonalnej z nia związaną. Nie znajduje się ”pomiędzy” dotyczącymi teoriami, lecz jest dla nich oryginalna alternatywa. Równocześnie poszerza zbiór wyjaśnień nietypowych przypadków przebiegu PTSD. Warto jednak pamiętać, że stosuje się ona zwłaszcza do przypadków, w których doszło do opóźnionego wystąpienia symptomów traumy. Jednak w szerszej perspektywie wnosi istotny głos w dyskusji nad funkcjonowaniem pamięci jako takiej ukazując jej zależność od zdolności poznawania, rozumienia i interpretacji zjawisk otaczających podmiot. Jej prezentacja może pogłębić świadomość teoretyczną uczestników konferencji.

**Keywords**— trauma, fałszywe wspomnienia, odzyskane wspomnienia, wyparcie, molestowanie seksualne, McNally

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# Wpływ zakażenia HIV na funkcjonowanie poznawcze oraz istotę białej mózgowia u mężczyzn żyjących z HIV, skutecznie leczonych antyretrowirusowo

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## Streszczenie

Celem badania było ustalenie, czy u osób zakażonych HIV, skutecznie leczonych antyretrowirusowo, infekcja i wiek wpływają na funkcjonowanie poznawcze oraz strukturę istoty białej mózgowia. Pomiar funkcji poznawczych przeprowadzono baterią wystandardyzowanych testów neuropsychologicznych. Badanie istoty białej przeprowadzono za pomocą obrazowania techniką tensora dyfuzji rezonansu magnetycznego (DTI). W badaniu wzięło udział 56 mężczyzn zakażonych (HIV+) i 62 zdrowych niezakażonych mężczyzn (HIV-). Grupę HIV+ stanowili pacjenci leczeni w Poradni Profilaktyczno – Leczniczej Wojewódzkiego Szpitala Zakaźnego, zakażeni HIV w wyniku kontaktów seksualnych. Grupy nie różniły się pod względem wieku (HIV+ M = 41,5 lat, SD = 12; HIV- M = 43,3 lata, SD = 12,1) i wykształcenia (HIV+ M = 16 lat, SD = 2,7; HIV- M = 16,6 lat, SD = 2,9). Chorzy byli zakażeni od średnio 5 lat (SD = 5) i byli leczeni kombinowaną terapią antyretrowirusową (cART) od średnio 5 lat (SD = 5,14). W okresie badania wartość wiremii HIV-1 RNA u wszystkich osób oscylowała na poziomie niewykrywalności laboratoryjnej (poniżej 60 kopii/ml surowicy krwi). Najniższa liczba limfocytów T CD4 (nadir) wynosiła więcej niż 200 komorek/ml krwi. W analizie czynnikowej wyników neuropsychologicznych wyodrębniono czynniki: uwagi i pamięci operacyjnej (Test Corsiego wprost i wspak, Powtarzanie Cyfr z WAIS-R (PL) wprost i wspak, Test Płynności Figuralnej Ruffa liczba unikalnych wzorów), uczenia się (Kalifornijski Test Uczenia się Językowego Lista A zadania 1-5, Swobodne Odtwarzanie po Krótkim Odroczeniu, Swobodne Odtwarzanie po Długim Odroczeniu, Test Płynności Figuralnej Ruffa liczba unikalnych wzorów), sprawności ruchowej (Test Wkładania Kołeczków ręka dominująca i ręka niedominująca) i funkcji wykonawczych (Test Sortowania Kart z Wisconsin procent błędów perseweracyjnych, Test Płynności Figuralnej Ruffa liczba perseweracji). Wyniki badania pokazały, że grupa HIV+ miała słabsze zdolności poznawcze niż grupa HIV-, głównie w sferze uwagi i pamięci operacyjnej ( $d$ -Cohena = 8,17), a także sprawności ruchowej ( $d$ -Cohena = 0,28). Struktura istoty białej, mierzona współczynnikiem anizotropii frakcjonowanej (FA), miała u przebadanych osób jednak związek tylko z wiekiem, nie z zakażeniem. Zaobserwowano, że im starsza osoba, tym niższe były wartości FA w następujących regionach istoty białej mózgu: kolano, trzon i płat ciała modzelowatego, sklepienie, konar mózgu prawy i lewy, torebka wewnętrzna przednia prawa i lewa, torebka wewnętrzna tylna prawa i lewa, torebka wewnętrzna zasoczewkowa prawa i lewa, wieniec przedni prawy i lewy, wieniec górnego prawa i lewy, wieniec tylny prawy i lewy, promienistość tylna wzgórza wraz z promienistością wzrokową prawa i lewa, torebka zewnętrzna lewa, pęczek obręczy lewy, pęczek podłużny górnego prawa, górnego pęczek czołowo-potyliczny prawy i lewy, obicie prawe i lewe. Nie stwierdzono istotnych zależności pomiędzy strukturą istoty białej oraz czasem od zakażenia, czasem na leczeniu antyretrowirusowym, ani z T CD4 nadir. Nie stwierdzono też istotnych powiązań pomiędzy strukturą istoty białej i funkcjonowaniem w domenach uwagi i pamięci operacyjnej, uczenia się, sprawności ruchowej i funkcji wykonawczych. Dane te wskazują na immunologiczną i wirusologiczną skuteczność leczenia antyretrowirusowego i dobry stan zdrowotny uczestników badania (por. Gawron i in. 2018). Są spójne z innymi doniesieniami, gdzie obniżenie współczynnika FA,

wskazujące na uszkodzenie istoty białej, stwierdzono jedynie u nieleczonych osób HIV+ oraz u osób z rozpoznaniem zaburzeń poznawczych w przebiegu infekcji HIV.

**Keywords:** *HIV, starzenie, funkcje poznawcze, istota biala mozgowa, DTI*

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# Kiedy rozmowy o przeszłości pomagają a kiedy szkodzą? Pozytywne skutki konformizmu pamięciowego.

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## Streszczenie

Konformizm pamięciowy jest zjawiskiem polegającym na zmianie relacji pamięciowej na dany temat pod wpływem informacji pochodzących od innych. Może on mieć zarówno pozytywne jak i negatywne konsekwencje. Do tych pierwszych należy uzupełnianie własnych wspomnień poprawnymi informacjami, natomiast negatywnym efektem jest przejmowanie fałszywych informacji. Podstawowym celem badań było oszacowanie potencjału zjawiska. Sprawdzaliśmy, jak wierne są informacje, które są nowe dla jednej ze stron w trakcie dyskusji. Następnie zbadaliśmy, jaki wpływ na dalsza relacje pamięciowa badanych mają pojawiające się w trakcie dyskusji poprawne i niepoprawne informacje. Ostatecznie, zbadaliśmy jakie warunki mogą skłonić badanych do przejmowania w większym stopniu prawdziwych informacji a odrzucania fałszywych.

Metoda. W Eksperymencie 1 efekt konformizmu pamięciowego był wynikiem bezpośredniej interakcji z drugą osobą. Badanym zaprezentowane zostały zdjęcia pomieszczeń np. kuchni, klasy, warzywniaka. Bezpośrednio po prezentacji zdjęć i krótkiej przerwie, uczestnicy byli proszeni o wypisanie jak największej liczby przedmiotów znajdujących się na zdjęciach. W grupie eksperymentalnej badani zostali także poproszeni, aby oceniać w jakim stopniu są pewni, że dany element rzeczywiście znajdował się na zdjęciu, w skali od 1 do 10. Następnie badani w parach dyskutowali na temat przyomnianych przez siebie elementów. Ostatecznie, na końcu sesji eksperymentalnej, badani ponownie zostali proszeni o przypomnienie sobie przedmiotów ze zdjęć. W Eksperymencie 2, zamiast dyskusji w parach, osoby badane otrzymywały kartkę z odpowiedziami rzekomo pochodząymi od poprzedniego uczestnika badań. Umożliwiło to większą kontrolę badacza nad ilością przekazywanych osobom badanym poprawnych i niepoprawnych informacji.

Wyniki. Generalnie, w testach pamięci osoby wypisywały głównie poprawne informacje, a podczas dyskusji uczestnikom były eksponowane głównie poprawne odpowiedzi. Częściej też osoby uzupełniały swoje relacje pamięciowe poprawnymi szczegółami po dyskusji, czy czytaniu odpowiedzi innych. Z tego powodu raporty pamięciowe osób były bardziej poprawne po interakcji. Niemniej dość często osoby przejmowały wzajemnie w małej ilości fałszywe informacje. W Eksperymencie 1 osoby badane były też bardzo pewne udzielanych przez siebie odpowiedzi, dlatego w trakcie dyskusji pewności nie pomagała w ocenie czy dana informacja jest prawdziwa czy fałszywa.

Konformizm pamięciowy jest zjawiskiem powszechnie występującym w naszym życiu codziennym i nie sposób go uniknąć. Dzielenie się wspomnieniami z przeszłości ma ważna funkcje społeczna (pogłębia relacje), tożsamościowa oraz informacyjna. Nasze badania wskazują w dużej mierze na pozytywne aspekty tego zjawiska. Osoby w większym stopniu wzbogacają swoje relacje pamięciowe o poprawne informacje. Niemniej, pomimo tej pozytywnej tendencji, transmisji błędów trudno jest zapobiec. W niektórych kontekstach, tego rodzaju włączanie błędnych informacji do relacji pamięciowej może mieć poważne konsekwencje: zeznania świadków przestępstw, sytuacje egzaminacyjne, decyzje polityczne. Dlatego zaprezentowany w naszych badaniach kompleksowy sposób oceny potencjału zjawiska może w przyszłości prowadzić do opracowania metod, które zminimalizują negatywne skutki konformizmu pamięciowego.

**Keywords**— konformizm pamięciowy, pewność odpowiedzi, swobodne przypominanie

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# Czy mózg lubi ”siedzieć” na Facebooku?

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## Streszczenie

Główną problematyką wystąpienia będzie sposób w jaki media społecznościowe oddziałują na pamięć i uwagę. Autorka oprze analizę zagadnienia na przykładzie Facebook'a jako flagowego przykładu obecnego medium społecznościowego. Całe wystąpienie rozpocznie od krótkiego wstępu, w którym podejmie próbę zdefiniowania i wyjaśnienia jakimi definicjami słowa „uwaga” oraz „pamięć” będzie operować. Spróbuję scharakteryzować wygląd dzisiejszych mediów społecznościowych pod kątem odpowiedzi na pytanie: dlaczego Facebook i inne mu podobne portale społecznościowe badane są pod kątem wpływu na wyżej wymienione procesy? Stanowi to punkt wyjścia do dalszej prezentacji. Następnie przejdzie ona do głównego zagadnienia wystąpienia i podzieli je na dwie części. Pierwsza będzie obejmowała analizę procesu uwagi. Przedstawi ten proces na dwóch płaszczyznach: po pierwsze opisze sposoby sterowania uwagą czytelników przez twórców stron internetowych. Sterowanie uwagą odbiorców odbywa się poprzez odpowiednie ułożenie danych na stronie, używanie określonej kolorystyki oraz form obrazkowych. Wywód ten będzie poparty analizą wpływu poszczególnych elementów na struktury umysłowe odpowiedzialne za widzenie, analizę danych oraz samą uwagę. Po drugie zaś przytoczy przykłady zachowania samych użytkowników portali społecznościowych wykazując ich szkodliwe działanie na umiejętność skupienia się np. poprzez korzystanie z kilku portali na raz, co powoduje silne narażanie się na różnorodne dystraktory, a w konsekwencji zaburza pracę procesu uwagi. W drugiej części wystąpienia autorka poruszy temat oddziaływania social mediów na pamięć. W tej części wystąpienia, dla wzbogacenia i uatrakcyjnienia wystąpienia przytoczy różnorodne badania eksperymentalne. Zacznie od scharakteryzowania rodzajów pamięci i próby odpowiedzenia na pytanie które rodzaje pamięci są najbardziej podatne na oddziaływanie. Przywoła badania, mające miejsce w Bazylei, które wykazują negatywny wpływ działania pola elektromagnetycznego na procesy poznawcze, w tym na samą pamięć. Następnie wykaże ile przeciętny użytkownik Facebooka jest w stanie zapamiętać z codziennego użytkowania biorąc pod uwagę umiejętność koncentracji czy ilość dostarczanych dystraktorów. Autorka przytoczy także badanie, które podjęło próbę zanalizowania problemu jakim jest nastawienie do zapamiętywania treści dostępnych na portalach społecznościowych do faktycznej zdolności ich zapamiętywania. Jego twórczynie, tj. prof. Daniela Wegnera i prof. Betsy Sparrow z Columbia University dowiodły, iż nasza świadomość dotycząca przechowywania użytecznych informacji przez bazy danych obniża motywację, a w rezultacie sam fakt ilości zapamiętywanych informacji. W końcowej części autorka wspomni jeszcze po krótce o innych obszarach, poza pamięcią i uwagą, na jakie wpływają portale społecznościowe. Przedstawi ich negatywny wpływ na samoocenę i poczucie sensu oraz, podając przykład eksperymentu przeprowadzonego na Harvard University, udowodni jak bardzo zaburzają one obraz samego siebie i własnych umiejętności. Badanie to wykazało, iż osoby mogące korzystać z wiedzy dostępnej w Internecie są przekonane, iż mają większe zdolności poznawcze i umiejętności merytoryczne niż osoby bazujące jedynie na swojej wiedzy. Podsumowując całość wystąpienia, które oparte będzie w większości na krytyce i wzbudzaniu nieufności do portali typu Facebook, autorka nada nieco pozytywny wydźwięk całości prezentowanych treści poprzez odwołanie się do ogólnie występującej tendencji do nieufności przed nowymi mediami. .

**Słowa kluczowe** — pamięć, uwaga, Facebook, social media

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# Elementy skupiające uwagę w tweetach

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## Streszczenie

Celem prezentacji jest przedstawienie elementów skupiających uwagę w wiadomościach publikowanych na portalu Twitter. Zostanie to zrobione przy wsparciu samodzielnie zebranego i przeanalizowanego materiału, w oparciu o wiedzę z zakresu psychologii poznawczej, semiotyki oraz językoznawstwa kognitywnego.

Zanim przystąpi się do analiz samych wiadomości, warto spróbować opisać relację pomiędzy autorem a odbiorcą komunikatu na portalu Twitter, czyli tweetu. Chcąc nawiązać interakcję, czy też po prostu zaznaczyć swoją obecność w dyskusji, autor komunikatu publikowanego w mediach społecznościowych musi tak opracować swój post, by ściągnąć uwagę innych użytkowników i zachęcić do reakcji. Musi on liczyć się z krótkim czasem ekspozycji odbiorców na komunikat, niechęcią internautów do przyswajania długich tekstów i do intensywnej pracy interpretacyjnej, oraz z trudnościami w dotarciu do grupy docelowej. Zatem, autor nie koncentruje się na samej treści, ale zwraca też uwagę na takie sformułowanie komunikatu, by móc tę treść w pełni przekazać w sposób wystarczająco interesujący dla innych użytkowników.

Na konstrukcję i grupę odbiorców komunikatu wpływają też, a może raczej - przede wszystkim, ograniczenia, jakie stawia Twitter. Platforma ta narzuca limity znaków na poszczególny tweet, pozwala korzystać tylko ze ścisłe określonej budowy posta, wprowadza niechronologiczną kolejność pojawiania się tweetów na stronie głównej oraz inne zabiegi personalizujące pojawiające się treści. Wymusza to nie tylko kondensację przekazu, ale też stosowanie kreatywnych rozwiązań przy jednoczesnym użyciu powtarzanego, narzuconego schematu. Nadawcy korzystają więc z różnorakich metod ściągania uwagi przeglądających zasoby Twittera użytkowników, które pozwalają ich krótkim wiadomościom nie zagubić się w gąszczu innych. Autorzy komunikatów mogą skorzystać z możliwości zamieszczania znaków specjalnych, emotikon, zdjęć i wideo, przyciągając uwagę i kierując interpretację towarzyszącego tekstu.

Poza tym, każdy z użytkowników połączony jest z innymi poprzez relację obserwowania się. Oszczędny w specyficzny środowisku społecznym w ramach platformy, nadawca komunikatu wytwarza kulturowe zakotwiczenia, ściągając na siebie uwagę nie tylko przy pomocy manipulacji elementami, jakie można zatrzymać w poście - można by rzec, przy pomocy manipulacji elementami na poziomie syntaktycznym w ramach bogatego i niejednolitego zjawiska, jakim jest język Internetu - ale też wykorzystując odpowiednio znaczenia używanych przez siebie środków. Autor wzbudza więc zainteresowanie, pisząc humorystycznie, sarkastycznie, stosując gry słów, zachęcając tym samym odbiorcę do wejścia w interakcję. Ponadto, dzięki środkom perswazji i technikom wykorzystania heurystyk poznawczych, autor, prawdopodobnie często nieświadomie, stara się wywołać wpływ na odbiorców.

Korzystając z metod badań folkloru internetowego, czyli wykorzystując materiał zastany przy jednoczesnym uwzględnieniu zarówno pozatekstowego kontekstu społeczno-kulturowego, jak i pozatekstowego kontekstu technologicznego, analizuję konkretne posty, szukając w nich elementów ogniskujących i nakierowujących uwagę. Na przykładzie tweetów publikowanych w roku 2018 oraz 2019 w języku angielskim ukazuję, jakie metody wypracowali użytkownicy i jak wykorzystują, znane między innymi z badań reklam, zabiegi ogniskowania uwagi.

Przedstawienie analizy komunikatów pod kątem tego, co skupia uwagę odbiorcy, ma za zadanie wskazanie wagi relacji pomiędzy platformą, nadawcą i odbiorcą, oraz jest próbą usystematyzowania postów i zrozumienia języka internautów.

Nowe media wciąż się formują i przekształcają, a komunikacja na platformach społecznych i mikroblogowych jest bardzo ciekawym zjawiskiem, pełnym, jak się wydaje, zupełnie nowych elementów. Jej zrozumienie jest bez wątpienia pomocne w zrozumieniu bardziej elementarnych procesów poznawczych. Przedstawiona problematyka może stanowić interesujące pole do dyskusji i podłożę do przeprowadzenia dalszych analiz.

**Keywords**— media społecznościowe, uwaga, Twitter

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# Nauka podstaw matematyki na tablecie – efektywność treningu poznawczego przy użyciu gry „Numbala”.

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## Streszczenie

Wyniki badań wskazują na istnienie wyraźnej zależności miedzy umysłowymi reprezentacjami liczb i przestrzeni, zaś umiejętność szacowania miejsca liczb na osi jest predyktorem umiejętności arytmetycznych. Problemy w zakresie wykonania takiego zadania to jeden z objawów deficytu definiowanego jako dyskalkulia. Nowoczesne formy terapii tego zaburzenia, ale też edukacja matematyczna mogą wykorzystywać wspierane komputerowo metody. Wyniki badań wskazują bowiem na korzyści płynące ze stosowania treningów poznawczych przy użyciu gier komputerowych. Celem badania było przetestowanie skuteczności mobilnej aplikacji w postaci gry matematycznej „Numbala” w kształtowaniu umiejętności z zakresu: porównywania liczb prezentowanych w różnych formatach (cyfry arabskie, zbiory kropek), szacowania liczebności, uwagi wykonawczej oraz szacowania miejsca liczb na osi liczbowej. W badaniach wzięło udział 49 dzieci, uczniów klas 1-3 szkoły podstawowej, z których część (25) odbyła trening poznawczy z gry, zaś część (24) stanowiła grupę kontrolną (bez treningu). Dzieci z wykorzystaniem tabletów odbyły trening z gry „Numbala”, polegającą na wskazywaniu na osi liczbowej miejsca wyświetlanych liczb i wykonywaniu prostych działań arytmetycznych (dodawanie i odejmowanie). W trakcie gry dziecko trenuje także uwagę i szybkość reakcji, aby omijać przeszkody, zdobywać punkty i dodatkowe nagrody. Trening trwał 5 godzin i był podzielony na 10 ok. półgodzinnych sesji odbywających się codziennie lub co 2-3 dni. Przed nim (pre-testy) oraz po nim (post-testy) zmierzono u dzieci, przy użyciu zadań z testu komputerowego „Prokalkulia 6-9”, poziom podstawowych umiejętności matematycznych. Obejmowały one porównywanie liczb, szacowanie liczebności, Stroop numeryczny i szacowanie lokalizacji liczb na osi. Analizowano wpływ treningu gra uwzględniając wyniki obu pomiarów testem w obu grupach. Dzieci z grupy kontrolnej nie były poddawane działaniu treningu - wykonywały tylko dwukrotnie test komputerowy „Prokalkulia 6-9” w odstępie czasu podobnym do tego, w którym odbywała się seria treningów. Przedstawione wyniki są pewna część większego złożonego projektu, więc korelacje były liczone tylko dla części próby badanych. Wskazują one, że trening z wykorzystaniem gry „Numbala” nie przynosi istotnych korzyści w zadaniach z porównywaniem liczb i szacowaniem liczebności zbiorów. Dzieci podczas drugiego pomiaru odpowidały istotnie szybciej, ale efekt ten miał miejsce w obu grupach, więc nie wynika on z treningu, ale z ponownego wykonywania tych samych zadań. Dodatkowo w trakcie drugiego pomiaru nie zaobserwowano poprawy z zakresie procentu poprawnych odpowiedzi. W przypadku jednego zadania poprawność nawet się pogorszyła, co można tłumaczyć tym, że dzieci za drugim razem chciały jak najszybciej zakończyć test. Korzystne efekty widać natomiast w zadaniach z szacowaniem miejsca liczb na osi. Lepsze wyniki w grupie trenującej względem grupy kontrolnej zaobserwowano w przypadku dokładności szacowania miejsca na osi liczby w formacie symbolicznym (cyfry) oraz średniego wychylenia szacowanego miejsca w lewo (niedoszacowania lokalizacji liczby). Wydaje się zatem, że gra „Numbala” może być cennym narzędziem - nie tylko edukacyjnym, ale także terapeutycznym w przypadku problemów z nauką matematyki, ponieważ wspiera kształtowanie umiejętności operowania mentalną osią liczbową.

**Keywords**— dyskalkulia, edukacja, gry komputerowe, trening poznawczy

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# Inteligencja a umiejętności matematyczne i ich samoocena.

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## Streszczenie

Dyskalkulia to specyficzne trudności w zakresie nauki matematyki, a dokładniej w nabywaniu podstawowych umiejętności arytmetycznych, szacowania liczebności zbiorów czy porównywania liczb. Badania nad mózgowym podłożem kompetencji matematycznych wskazują na kluczową rolę sieci czołowo-ciemienniowych w kształtowaniu się umysłowych reprezentacji liczb. Deficyty właśnie w tych obszarach są przyczyną zaburzeń w powstawaniu wspomnianych reprezentacji, co skutkuje brakami w zakresie umiejętności matematycznych, stanowiącymi objawy dyskalkulii. Obecnie bardzo często panuje przekonanie o ścisłym związku umiejętności matematycznych z inteligencją ogólną. Pomimo wielu badań z tego zakresu, związek ten wciąż nie jest oczywisty. Klasyfikacja DSM-5, ujmując zależność między specyficznymi trudnościami w uczeniu się i inteligencją ogólną, zmniejsza wagę kryterium diagnostycznego opartego na ilorazie inteligencji. Badania wskazują jednocześnie na związek dyskalkulii z innymi zaburzeniami uczenia się (np. dyslekksja). Z kolei zdolnościami poznawczymi współwystepującymi z umiejętnościami matematycznymi są: pamięć i uwaga. Role deficytów uwagi w podłożu dyskalkulii potwierdza jest współwystepowanie z ADHD. Znacząca część z wyżej wymienionych kryteriów poznawczych można diagnozować przy użyciu popularnego testu do pomiaru inteligencji – WISC-R. Poszczególne podskale umożliwiają pomiar zaburzeń uczenia się, a także deficytów uwagi czy umiejętności wzrokowo-przestrzennych. Celem analiz przeprowadzonych w ramach badań było sprawdzenie korelacji między poziomem wykonania poszczególnych podskal WISC-R oraz wykonaniem zadań, które pozwalają na pomiar bazowych kompetencji matematycznych – szacowania, porównywania liczb oraz operowania mentalna osią liczbową. Do pomiaru tych umiejętności matematycznych użyto testu „Prokalkulia 6-9”. Dodatkowo przeprowadzono badania kwestionariuszami oceny umiejętności, które na naszą prośbę wypełniły dzieci (samoocena umiejętności matematycznych), rodzice oraz nauczyciele. Kwestionariusze te zawierały pytania o to, jak dzieci radzą sobie z matematyka zarówno w szkole, jak i w domu. W badaniu udział wzięło 25 uczniów szkoły podstawowej w wieku 7-8 lat. Zdecydowana większość istotnych korelacji dotyczyła umiejętności dziecka w posługiwaniu się mentalną osią liczbową. Dzieci, które ujawniły większy błąd wskazania miejsca liczb na osi miały również niższy iloraz inteligencji. Taka sama zależność wystąpiła między błędami wskazania na osi liczbowej i Skala Słowna WISC-R. Podskala skali słownej, której związek z umiejętnościami matematycznymi jest najsielniejszy, jest Arytmetyka. Analizy wykazały, iż mniejsza liczba punktów uzyskana w tej podskali wiąże się z gorszym szacowaniem miejsca liczb na osi, co objawia się w szczególności niedoszacowywaniem i przeszacowywaniem lokalizacji liczb. Zdecydowanie najczęściej dotyczy to liczb od 4 do 6, czyli tych ze środka zastosowanej w badaniach osi liczbowej. Badanie ujawniło związek między podskala Powtarzanie cyfr i wykonaniem testu „Prokalkulia 6-9”. Wyższy wynik w tej podskali wiąże się zarówno z lepszym szacowaniem i porównywaniem cyfr u dziecka, jak i z dokładnością wskazywania liczb prezentowanych w formacie symbolicznym na osi liczbowej. Co więcej, dzieci, których rodzice oceniali gorsze ich rozumienie materiału w matematyce, mniej dokładnie określały miejsce liczb na osi. Najwyraźniej widoczne było to dla liczb o wartościach 5 i 6 (środek zastosowanej w teście osi). Tak samo było w przypadku umiejętności dodawania i odejmowania – dzieci, które sobie z tym nie radzili, wskazywały miejsce liczb na osi z większą wartością błędu szacowania. Wyniki analiz udowadniają, że poziom wykonania poszczególnych podskal (zwłaszcza mierzacych zdolności wzrokowo-przestrzenne) WISC-R koreluje z problemami związonymi z dyskalkulią, co niewątpliwie wymaga kolejnych badań. Przedstawione wyniki są pewna część wiekszego złożonego projektu, więc korelacja były liczone tylko dla części próby badanych.

**Keywords**— dyskalkulia, inteligencja, samoocena

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# Projektowanie UX dla dzieci w kontekście rozwoju pamięci i uwagi

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## Streszczenie

W 2011 roku zaledwie 1% amerykańskich dzieci miało własne urządzenie mobilne, w 2017 roku – już 42%. Od kilku lat wzrasta pokolenie, dla którego bezustanny kontakt z technologiami jest oczywisty i od pierwszych miesięcy życia stanowi ważny kontekst rozwoju. Dzieci te określane są mianem digital natives, cyfrowych tubylców, którzy nie znają świata bez szerokopasmowego Internetu, ekranów dotykowych i gier, które umilają im jazdę samochodem. Osoby sceptycznie nastawione do technologii wskazują, że nie znamy jeszcze długofalowych skutków zanurzenia w świecie cyfrowym od najwcześniejszych lat dzieciństwa. Rodzice również często obawiają się negatywnego wpływu ekranów na poznawczy, emocjonalno-społeczny i motoryczny rozwój dziecka, co pozwalały na długotrwałe, nienadzorowane korzystanie z urządzeń elektronicznych. Nauczyciele zwracają uwagę na problem uzależnienia od smartfonu i tabletu, którego doświadczają coraz młodsze dzieci. W obliczu tych wyzwań i zagrożeń coraz więcej firm tworzących produkty cyfrowe dla dzieci zatrudnia specjalistów-psychologów, integrujących wiedzę o potrzebach i możliwościach dzieci w tworzenie wartościowych edukacyjnych zabawek i gier.

Zdolności poznawcze człowieka rozwijają się w ramach nabywania doświadczeń i dojrzewania układu nerwowego. Percepcja, pamięć i uwaga dzieci istotnie zmieniają się na przestrzeni czasu. Etapy rozwoju uwagi i pamięci w dzieciństwie wydają się być uniwersalne, zmieniają się natomiast środki przekazu wiedzy i umiejętności, jakie świat multimedialny oferuje dzieciom. Obecnie już dwuletki są grupą docelową działań twórców stron internetowych i aplikacji, a ruch „swipe” często jest przez dzieci przyswajany szybciej, niż umiejętność przekładania stron książki. Badania wskazują, że doświadczenia emocjonalne zbierane przez dziecko podczas korzystania z ulubionych aplikacji, są kodowane w pamięci dokładniej i zostają w niej na dłużej. Aplikacje mobilne dają możliwość wykonania wielu powtórzeń tej samej aktywności, co sprzyja konsolidacji nabytych informacji w pamięci długotrwałej i stanowi źródło radości dla młodszych dzieci. Starsze dzieci częściej podejmują interakcje oparte na rywalizacji, pokonywaniu przeszkód czy realizowaniu zadań - dzięki zastosowaniu grywalizacji w aplikacjach edukacyjnych stają się one atrakcyjną formą nauki. Pokazują też dziecku, że może uczyć się poprzez zabawę, w środowisku, które nagradza jego starania. Wraz z wiekiem wzrastają możliwości dzieci - w zakresie czytania, nawigacji, rozpoznawania powszechnie używanych symboli. Z czasem dzieci mają coraz większe możliwości organizowania przedmiotów w polu widzenia i ignorowania dystrakcyjnych reklam. Do pewnego czasu dzieci nie korzystają sprawnie z ‘internetu dorosłych’ - kiedy zaczynają czytać, poruszają się w nim intuicyjnie. Do tego czasu ich środowiskiem cyfrowym będą aplikacje przygotowane z myślą o nich jako o głównych odbiorcach. Wiedza na temat psychologii rozwojowej dziecka jest niezbędnym elementem warsztatu projektanta, który tworzy strony internetowe i aplikacje dla dzieci.

Naszym wystąpieniem pragniemy zainteresować Państwa tematyką wykorzystania wiedzy o rozwoju pamięci i uwagi na rzecz projektowania interfejsów cyfrowych. Pokażemy przykłady, które unaoczniają wartość wiedzy o psychologii rozwojowej dla projektowania dobrych produktów cyfrowych dla najmłodszych.

**Keywords**— cognitive development, user experience, user interface, design for children, interface, digital

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# Uwaga w procesie selekcji informacji a efekt coctail party

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## Streszczenie

Osoba przebywająca na tłocznym i głośnym przyjęciu nie jest w stanie rejestrować wszystkiego co się wokół niej dzieje. Zazwyczaj skupia się na rozmowie, którą aktualnie prowadzi. Prowadzona konwersacja znajduje się w centrum pola uwagowego danej osoby a za przetwarzanie informacji w niej uzyskanej odpowiada uwaga intensywna. Rozmowy poboczne odbierane są w części peryferyjnej pola, a ich selekcjonowaniem zajmuje się uwaga ekstensywna [1]. Osoba przebywająca na przyjęciu wie, że wokół niej toczą się różne rozmowy, ale niekoniecznie rejestruje jaki jest ich temat. Jeśli jednak usłyszy swoje imię wypowiedziane przez kogoś stojącego na drugim końcu pokoju, natychmiast zauważa swoją uwagę na osobie, która je wypowiedziała [2]. Ten fenomen nazywany efektem przyjęcia koktajlowego po raz pierwszy opisał Colin Cherry w 1953 roku [3]. Psychologia poznawcza tłumaczy powstawanie efektu coctail party na kilka sposobów. Rozpatrywać można go w kontekście trzech koncepcji selekcji uwagi: teorii zwrotnicy Broadbenta, teorii wielu filtrów uwagowych Treisman oraz teorii zasobów uwagi Kahnemana. W swoim eksperymencie Cherry zastosował technikę cieniowania w słuchaniu dwusznym. Badanie stało się punktem wyjścia dla teorii filtra uwagowego Broadbenta, a w efekcie również teorii wielu filtrów uwagowych Treisman. Koncepcja Broadbenta nie dała odpowiedzi na przyczynę występowania efektu coctail party. Bliżej rozwiązania tej zagadki znalazła się Treisman ze swoją teorią wielu filtrów. Zgodnie z nią bodźce mają określony poziom dostępności do uwagi, a nasze imię jest bodźcem o bardzo wysokim poziomie dostępności. Inaczej efekt coctail party można rozpatrywać w kontekście teorii zasobów uwagi Kahnemana, którego koncepcja w przeciwnieństwie do teorii filtrów zakłada aktywną selekcję informacji [4]. Jego występowanie obserwuje się nie tylko u ludzi, badania dowiodły, że występuje również w koloniach pingwinów królewskich [7].

**Keywords**— efekt coctail party, słuchanie dwuuszne, cieniowanie, filtry uwagowe

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# Funkcjonowanie pamięci i uwagi u osób jedno- i wielojęzycznych

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## Streszczenie

Obecnie szacuje się, że ponad połowa populacji jest wielojęzyczna, a w skutek coraz powszechniejszych migracji, liczba osób posługujących się więcej niż jednym językiem stale się powiększa. Używanie języka jest złożonym procesem poznawczym, angażującym m. in. takie struktury mózgu jak płat czołowy, skroniowy i ciemieniowy. W związku z powyższym nie jest zaskakujące, iż liczne eksperymenty neuropsychologiczne wskazują na występowanie różnic w funkcjonowaniu poznawczym osób jedno- i wielojęzycznych. Udowodniono, iż każdy język, który dana osoba zna, I którym się posługuje jest stale zaktywizowany w jej strukturach poznawczych, przez co nieustannie dokonuje wyboru adekwatnego do danej sytuacji. Skutkuje to lepszymi możliwościami poznawczymi, większą podzielnością uwagi i łatwością przenoszenia jej z jednego obiektu (zadania) na drugi. Celem prezentowanego plakatu jest porównanie funkcji pamięciowych oraz uwagowych osób posługujących się na co dzień jednym językiem z tymi, które używają ich więcej. Różnice w funkcjonowaniu poznawczym pomiędzy tymi dwoma grupami zostaną przedstawione ze szczególnym uwzględnieniem wieku: pośród dzieci, osób dorosłych oraz w okresie starości, gdyż wykazano, że korzyści z posługiwania się dwoma lub większą ilością języków przejawiają się w każdej grupie wiekowej. Pomimo pozornych trudności, dzieci wielojęzyczne wykazują się większą giętkością poznawczą oraz przerzutnością uwagi. Nie tylko szybciej rozwiązują zadania, co świadczy o wysokim funkcjonowaniu pamięci roboczej, ale również wykazują się w nich większą kreatywnością. Natomiast starsze osoby wielojęzyczne w porównaniu z jednojęzycznymi rówieśnikami, dłużej zachowują dobre funkcjonowanie poznawcze, a demencja występuje u nich statystycznie później. Przedstawione zostaną aktualne badania obrazujące plastyczność mózgu pozwalającą na dostosowanie funkcji poznawczych w zakresie funkcjonowania uwagi i pamięci w zależności od ilości przyswojonych języków zarówno z perspektywy kognitywnej, jak i behawioralnej.

**Keywords**— dwujęzyczność, pamięć, procesy poznawcze, uwaga, wielojęzyczność

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# Style przywiazania i aleksytymia a rozpoznawanie ekspresji mimicznych emocji podstawowych

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## Streszczenie

Celem przeprowadzonego badania było określenie związku stylów przywiazania i aleksytymii a rozpoznawaniem ekspresji mimicznych emocji podstawowych prezentowanych w postaci sekwencyjnej lub symultanicznej w trzech kodach: obrazowym, werbalnym, oraz abstrakcyjnym. W badaniu wzięły udział 103 osoby (studenci Uniwersytetu SWPS) w liczbie: 62 kobiety i 41 mężczyzn. W ramach badania mierzono style przywiazania i poziom aleksytymii kwestionariuszami: KSP i TAS-20. Do pomiaru rozpoznawania emocji w trzech kodach zastosowano program Inquisit 5. W ramach badania nie wykazano istotnych różnic pomiędzy kobietami a mężczyznami w trafnym rozpoznawaniu emocji. Wykazano dodatnia korelację pomiędzy poprawnością w rozpoznawaniu emocji w kodzie obrazowym a unikowym stylem przywiazania, a także w kodzie werbalnym i lekowo-ambivalentnym stylem przywiazania. Po zastosowaniu podziału na sekwencyjny i symultaniczny sposób prezentacji zaobserwowano dodatnia korelację pomiędzy lekowo-ambivalentnym stylem przywiazania a rozpoznawaniem emocji w kodzie werbalnym prezentowanym symultanicznie. Potwierdzono hipotezę o związku aleksytymii z rozpoznawaniem ekspresji mimicznych emocji podstawowych. Wraz ze wzrostem trudności w werbalizacji emocji, osoby średnio gorzej rozpoznawały emocje podstawowe w kodzie werbalnym prezentowanym sekwencyjnie. Wykazano również, że wraz ze wzrostem wyników ogólnych aleksytymii, osoby średnio gorzej rozpoznawały emocje w kodzie werbalnym prezentowanym sekwencyjnie. Wyniki te mogą wskazywać na deficyty w procesach poznawczych odpowiadających za pamięć przez co osoby z wysokimi wynikami w pomiarze aleksytymii po zaprezentowaniu emocji podstawowej mogły mieć trudności w odtworzeniu jej w pamięci i w konsekwencji w jej trafnym rozpoznaniu. Ponadto, wraz ze wzrostem na skali operacyjnego stylu myślenia, osoby średnio gorzej rozpoznawały emocje w kodzie werbalnym prezentowanym symultanicznie. W dalszych analizach nie wykazano związku w poziomie trafności w rozpoznawaniu emocji podstawowych ze względu na sposób ich prezentowania (sekwencyjnie vs. symultanicznie). Dodatkowe analizy wykazały, że osoby z możliwa lub stwierdzona aleksytymii mają tendencje do wyższych wyników w pozabezpiecznych stylach przywiazania, a osoby z brakiem aleksytymii do wyższych wyników w bezpiecznym stylu przywiazania. Ponadto, do analiz wykorzystano również czas reakcji w trzech kodach i wykazano, że różnił się on w zależności od trudności zadania. Wykonanie zadania zajmowało badanym średnio najdłużej w kodzie abstrakcyjnym, w którym procedura łączyła się z poprawnym odniesieniem stanu emocjonalnego osoby prezentującej daną emocję z kontekstem sytuacyjnym. Ograniczenia w niniejszym badaniu mogą wynikać z samoopisowego charakteru pomiaru dwóch zmiennych. Ponadto, warto zwrócić uwagę, że sam styl przywiazania może nie wpływać na poprawne rozpoznawanie ekspresji mimicznych emocji podstawowych w warunkach naturalnych. Ewentualne wprowadzenie elementu eksperymentalnego, który polegalby na wyobrażeniu danego stylu przywiazania w charakterze subiektywnego odniesienia, mógłby sprawić, że wyniki rozłożyłyby się w inny sposób. Porównanie wyników na tej samej grupie badanych przed i po zastosowaniu elementu eksperymentalnego mogłoby wykazać nowe zależności i potwierdzić hipotezy postawione w niniejszym badaniu. Zapewne jest to obszar do podjęcia w dalszych badaniach w przyszłości.

**Keywords**— style przywiazania, aleksytymia, teoria psychicznej reprezentacji emocji, rozpoznawanie ekspresji mimicznych, emocje

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# Wybitna pamięć autobiograficzna i jej neuronalne korelaty

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## Streszczenie

Wybitna pamięć autobiograficzna (HSAM, z ang. Highly Superior Autobiographical Memory) to względnie niedawno odkryta zdolność, po raz pierwszy zbadana w 2006 roku u amerykanki Jill Price. Osoby z taką pamięcią są w stanie z wyjątkowo wysoką dokładnością przywołać zdarzenia ze swojego życia, o ile są to wydarzenia dotyczące ich bezpośrednio. Mimo to nie wyróżniają się podczas zadań wymagających zapamiętania ciągu cyfr, słów lub bodźców wizualnych. Mimo, że przeciwieństwie do sawantów i osób z autyzmem, hipermnestykom nie towarzyszą skutki uboczne w postaci zaniżonych umiejętności społecznych i emocjonalnych, większość z nich wykazuje różne formy zachowań obsesyjno-kompulsywnych, takich jak zespół zbieractwa czy obsesyjna organizacja. Obraz powyższych umiejętności i cech składa się na całkowicie nową i różną od dotychczas znanych zdolność. Odkrycie tak nietypowej zdolności i związanych z nią zależności od razu przywodzi na myśl pytanie – czym różni się mózg hipermnestyka od ludzi ze zwykłą pamięcią? Podczas badań przeprowadzonych na grupie osób z wybitną pamięcią autobiograficzną wykryto kilka regionów w mózgu, które wyraźnie różniły się od regionów osób z grupy kontrolnej. Co ważne, istnieją badania wiążące wiele z tych rejonów z działaniem pamięci autobiograficznej. Mimo że badania pokazują związek między zmianami strukturalnymi owych regionów a HSAM, wciąż potrzeba ich więcej, aby odkryć, czy są one przyczyną, a może jedynie skutkiem hipermnezji autobiograficznej. Zmiany w wyróżnionych rejonach osób z HSAM powiązane są także z zaburzeniami pamięci jak np. choroba Alzhaiamera. Dalsze badania wybitnej pamięci autobiograficznej mogą doprowadzić do zwiększenia wiedzy na temat nie tylko działania ludzkiej pamięci, ale i jej zaburzeń.

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# Rola uwagi w rysunkowych sposobach rozumienia metafor u dzieci z autyzmem wczesnodziecięcym i zespołem Aspergera

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## Streszczenie

Celem prezentacji jest przedstawienie i omówienie uwagi jako właściwości psychicznej w rysunkowych sposobach rozumienia metafor u dzieci z autyzmem wczesnodziecięcym i zespołem Aspergera. Pierwszym krokiem prezentacji będzie wyjaśnienie pojęcia neuroróżnorodności oraz uwagi. W dalszym kroku przedstawione zostanie pojęcie metafory i języka figuratywnego.

Proces rozumienia wyrażeń metaforycznych jest bardzo złożony. Składa się na to wiele czynników, decydujących o poziomie trudności zadania, wymagającego samodzielnej interpretacji znaczenia figuratywnego. Dla dzieci ze spektrum autyzmu ta swoistość wyrażeń figuratywnych stanowi niezwykłą trudność. Do posługiwania się językiem figuratywnym, będącym procesem poznawczo-językowym, niezbędny jest prawidłowy rozwój dwóch systemów wiedzy: wiedzy o świecie i wiedzy o języku. Skupię się na wymienieniu dwóch czynników biorących udział w procesie analizy tego zjawiska. Po pierwsze, ważna jest analiza dosłownego znaczenia nim zacznie się wnioskować o jego znaczeniu symbolicznym. Po drugie, zrozumienie znaczenia symbolicznego wymaga od nas samych pracy umysłowej i zaangażowania specjalnych, wyższych procesów poznawczych. W momencie gdy dane słowo lub wyrażenie pisane językiem figuratywnym jest rozumiane prawidłowo, tzw. symbolicznie, wtedy włączają się dodatkowo procesy poznawcze takie jak: uwaga, pamięć, wyobraźnia, myślenie.

Poruszone kwestie są dodatkowo oparte na własnych badaniach. Podważają one tezę mówiącą o braku zdolności dzieci autystycznych do rozumienia i posługiwania się metaforami w życiu codziennym. Przyjmując podejście neuroróżnorodności (neurodiversity) proponuje się badanie zjawiska metaforycznego z innego punktu widzenia. Mianowicie, główna uwaga w badaniach własnych skupiona była na próbie znalezienia odpowiedzi na pytanie: Jak dzieci autystyczne rozumieją metafory?

Reasumując, aktywność uwagowa i metaforyczna w większym lub mniejszym stopniu jest widoczna u dzieci ze spektrum autyzmu ale poza znanym osobom neurotypowym schemacie poznawczym.

**Keywords** — autyzm wczesnodziecięcy, zespół Aspergera, uwaga, metafory rysunkowe. neuroróżnorodność, język figuratywny

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# Wykorzystanie zjawiska neuroplastyczności w treningu poznawczym Seniorów.

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## Streszczenie

Celem naszego wystąpienia jest ukazanie zjawiska neuroplastyczności jako fundamentalnej właściwości mózgu, obecnej na wielu poziomach struktury i funkcji (Herzyk, 2006). Istnieje wiele czynników, które warunkują plastyczność i zdolności kompensacyjne. Należą do nich: cechy funkcjonowania mózgu, czynniki osobowe, czynniki psychospołeczne, czy indywidualne uwarunkowania (Domańska, Borkowska, 2011). Intensywność zmian plastycznych w ludzkim mózgu ulega zmianie w biegu życia - jest ona najwyższa u dzieci i z wiekiem maleje. Nie oznacza to jednak, iż mózg dorosłych traci tę niezwykłą zdolność (Wójcik, 2011). Obecnie przyjmuje się, iż obwody neuronalne są plastyczne i modyfikowalne przez całe życie (Kossut, 2014). Na podstawie przeglądu literatury naukowej oraz własnych obserwacji chcemy przedstawić wstępne wyniki skuteczności prowadzonych treningów poznawczych, zaznaczając przy tym iż tytułową neuroplastyczność nie będzie przez nas wprost dowodzona.

Coraz więcej badań wskazuje, iż spadek zdolności poznawczych związany z wiekiem może zostać spowolniony lub nawet powstrzymany, gdy mózg zachowuje swoją elastyczność. Jest to poparte skuteczną reorganizacją strukturalnych i funkcjonalnych składników mózgu, aby zrekompensować fizjologiczne i fizyczne zmiany, które ostatecznie powodują spadek zdolności poznawczych (Styliadis, 2015). Złożona aktywność umysłowa może zwiększać integralność mózgu w celu udanego starzenia się poznawczego. Neuroplastyczność zaś może być wykorzystywana do łagodzenia skutków starzenia się mózgu za pomocą treningu kognitywnego u Seniorów (Chapman, Aslan, 2013).

Przykładem takiego treningu jest jedna z form działalności Sekcji Terapii Neuropsychologicznej Koła Nauk Psychologicznych PRAGMA-projekt Senior Wigor, oparty na cotygodniowych treningach poznawczych dla Seniorów. W naszej pracy odwołujemy się do stwierdzenia, iż dostępność różnych bodźców oraz aktywność z nimi związana mogą być kluczowe dla zachowania dobrej kondycji mózgu (Mozrzymas, 2011). Treningi te opierają się głównie na ćwiczeniach usprawniających pamięć, uwagę i koncentrację oraz funkcje wykonawcze.

**Keywords** — neuroplastyczność, trening poznawczy, seniorzy

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# Pamięć ucieśniona - "melodie kinetyczne" i nie tylko. Konsekwencje dla robotyki i kognitywistyki.

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## Streszczenie

Poster przedstawia początki koncepcji ucieśnionego poznania, których można doszukać się w pracach fenomenologów takich jak Maurice Merleau-Ponty. Filozof ten odegrał znaczącą rolę w do-konującym się na przestrzeni ostatniej dekady niemalże buntowniczym przewrocie przeciwko czysto funkcjonalnym teoriom z dziedziny kognitywistyki i psychologii poznawczej ignorujących role ciała w warunkowaniu poznania. Teoria ucieśnionego poznania wyraźnie sprzeciwia się naiwej wersji putnamowskiego kognitywizmu zakładającego, że świadomość i inteligencja mogą być w pełni realizowane przy pomocy dowolnej architektury, takiej jak program odtworzony na dowolnej jednostce obliczeniowej. W treści zawiera się rys teorii ucieśnionego poznania ze wskazaniem filozoficznego podłożą, jak i bardziej współczesnych ujęć oraz jego tez. Poster skupia się na temacie pamięci, która nie stanowi wyjątku dla zwolenników teorii ucieśnionego poznania i również jest głęboko zakorzeniona w cielesności oraz zdolnościach sensomotorycznych. Przywołano postać ojca neuropsychologii, Aleksandra Łurii i jego dzieła, w których posługuje się pojęciem melodii kinetycznej, gdzie możemy upatrywać początku neurologicznego i naukowego poruszenia kwestii ucieśnionego charakteru pamięci. Osobne miejsce poświęcono aktualnym próbom zastosowania teorii ucieśnionego poznania w wyjaśnianiu mechanizmów pamięciowych. Dzisiejsze doniesienia naukowe z tego paradymatu ukazują, że wbrew intuicji, rola ciała jako całego systemu, nie ogranicza się jedynie do pamięci niedeklaratywnej/proceduralnej. Roli systemu "ciało - środowisko", nie da się również przecenić w procesie wydobywania pamięci autobiograficznej. Autorzy badania przytoczonego w treści postera wskazują, że odtwarzanie pamięci może być ulepszone przez kontekst sytuacyjny, zwłaszcza kontekst powiązany z doświadczeniem ciała. Nawet tak proste działania jak przyjmowanie tej samej pozycji ciała podczas odtwarzania pamięci autobiograficznej może znaczco ułatwić ten proces. Poster zawiera również od-autorską refleksję dotyczącą konsekwencji teorii poznania ucieśnionego dla kognitywistyki i robotyki - głównych zainteresowań naukowych autora.

**Keywords** — pamięć, poznanie ucieśnione, kognitywistyka, melodia kinetyczna

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# Zaburzenia procesów uwagi oraz pamięci u pacjentów ze stwardnieniem rozsianym

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## Streszczenie

Stwardnienie rozsiane to przewlekła, progresywna choroba ośrodkowego układu nerwowego charakteryzująca się występowaniem wieloogniskowych uszkodzeń, w przebiegu której dochodzi do demielinizacji oraz rozpadu komórek nerwowych. Ma ona 4 postacie. Z uwagi na rozproszone miejsca uszkodzeń obraz kliniczny stwardnienia rozsianego może się znaczco różnić wśród pacjentów. Symptomy SR stanowić mogą: zaburzenia motoryczne, czuciowe, zaburzenia nastroju, zaburzenia psychiatryczne, a także deficyty funkcji poznawczych. Te ostatnie występują u 40-70% pacjentów. Mogą mieć zarówno charakter wybiorczy w zakresie pojedynczych funkcji, jak i bardziej uogólniony. Nasilenie tych deficytów zależy od wielu czynników, a ich obraz mieści się w przedziale od lekkich zaburzeń do pełnego otępienia. Zaburzenia funkcji poznawczych obejmują m.in. deficyty w zakresie uwagi, pamięci, funkcji wzrokowo – przestrzennych, czy funkcji wykonawczych.

Zaburzenia uwagi pojawiają się w stosunkowo wczesnych etapach choroby u 55-78% pacjentów ze stwardnieniem rozsianym. Najczęściej zaburzenia widoczne są w następujących komponentach uwagi: przerzutność oraz podzielność uwagi, zdolność do jej długiej koncentracji i selektywność. Jednakże wyniki badań wydają się być niekonkluzywne i ukazują heterogeniczność deficytów w zakresie uwagi. W prowadzonych badaniach wykorzystywane są różne testy neuropsychologiczne oraz różnorodne grupy badawcze. Obserwuje się także osłabienie uwagi wzrokowej i słuchowej oraz zwiększoną podatność na dystraktory.

Zaburzenia pamięci stanowią jeden z najbardziej wyraźnych deficytów w SR, jednakże dotyczą one różnych jej komponentów w odmiennym stopniu. Obserwuje się zaburzenia pamięci deklaratywnej, w tym epizodycznej. Kwestię sporną stanowi przyczyna tych deficytów. Trudności występują także w obszarze uczenia się list słów, zapamiętywania i odtwarzania po odroczeniu materiału verbalnego, jak i niewerbalnego, zmniejszenia zakresu pamięci krótkotrwałej oraz pamięci operacyjnej.

Badania z użyciem fMRI wykazały reorganizację aktywności mózgu podczas wykonywania zadań związanych z pamięcią oraz uwagą wśród pacjentów ze stwardnieniem rozsianym.

**Keywords** — stwardnienie rozsiane, pamięć, uwaga

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# Jak pomóc dzieciom z FAS w rozwijaniu podstawowych umiejętności matematycznych przy pomocy gry komputerowej i czujnika ruchu Kinect?

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## Streszczenie

Niewiele wiadomo na temat poziomu umiejętności matematycznych dzieci z Płodowym Zespołem Alkoholowym (Fetal Alcohol Syndrome, FAS), choć obserwacje wskazują na problemy w tym zakresie. Ze względu na deficyty pamięci i problemy z myśleniem abstrakcyjnym, opanowanie matematyki jest dla nich niezwykle trudne [1]. Badania wskazują jednak na pozytywny efekt treningów ruchowych na funkcjonowanie poznawcze, w tym to związane z umiejętnościami matematycznymi [2]. Interaktywne gry komputerowe znajdują zastosowanie w terapii zróżnicowanych chorób i zaburzeń. Wykorzystana w naszych badaniach gra „Kalkulilo” jest programem interwencyjnym dla dzieci przejawiających trudności z matematyką, opartym na operowaniu osią liczbowa [3]. Dziesięciu dzieci w wieku 6-11 lat ze stwierdzonym FAS wzięło udział w dwukrotnym (pretest i posttest) badaniu podstawowych umiejętności matematycznych przy użyciu testu komputerowego „Prokalkulia 6-9”, składającego się z zadań z zakresu porównywania liczb i szacowania lokalizacji liczb na osi oraz testu papierowego „Skala Gotowości Matematycznej i Ryzyka Dyskalkulii”. Po pretestach przeprowadzono treningi poznawczo-ruchowe z gra „Kalkulilo” z użyciem czujnika ruchu Kinect, które miały wspomóc kształcenie się u dzieci mentalnej osi liczbowej. Pierwsze efekty treningu pojawiły się jeszcze w trakcie jego trwania oraz stwierdzono je podczas posttestów. Przejawiały się one w szybszym porównywaniu liczb w formacie zarówno symbolicznym (cyfry) jak i niesymbolicznym (kropki) oraz w dokładniejszym określaniu miejsca liczb na osi. Po odbyciu treningów zaobserwowano dodatkowo poprawę w zakresie odróżniania stron (prawo-lewo) i koordynacji ruchowej, w przeliczaniu obiektów, wykorzystywaniu znaków relacji oraz w dodawaniu i odejmowaniu. Wykazane efekty udowadniają, że trening prowadzony z gry komputerowej z zaangażowaniem ruchu wpływa znaczaco na poziom umiejętności matematycznych, a także wzmacnia motywacje w tej grupie dzieci.

**Keywords**— dyskalkulia, FAS, trening poznawczo-ruchowy, gra komputerowa

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# Odświeżanie pamięci roboczej oraz hamowanie wśród graczy komputerowych.

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## Streszczenie

Problematyka funkcji wykonawczych w ostatnich latach stała się często podejmowanym zagadnieniem nie tylko na gruncie psychologii, ale także medycyny. Szczególnie intrygującym obszarem jest rozwój funkcji wykonawczych na przestrzeni życia oraz możliwość ich rozwijania przy wykorzystaniu różnych metod, m.in. sportu czy gier komputerowych. W psychologii można wyróżnić wiele modeli i podejść dotyczących funkcji wykonawczych, jednak jednym z najczęściej stosowanych jest wieloczynnikowy model zaproponowany przez Miyake i współpracowników. Wyróżnili oni trzy funkcje wykonawcze, tj. odświeżanie pamięci roboczej, hamowanie oraz przerzutność uwagi (2000). Odświeżanie pamięci roboczej, wiąże się z monitorowaniem i kodowaniem przychodzących informacji ze względu na ich użyteczność w wykonywanym zadaniu, a następnie odpowiednią modyfikacją elementów przechowywanych w pamięci roboczej, zastępując stare, już nieistotne informacje, nowszymi, bardziej istotnymi. Z kolei hamowanie definiowane jako umiejętność celowego zahamowania dominującej, automatycznej reakcji, kiedy jest to wymagane (Miyake i in., 2000). Przerzutność uwagi można ująć umiejętnością przełączania się między wieloma zadaniami, operacjami lub stanami umysłowym (Monsell, 1996). Funkcje wykonawcze jako ogólny konstrukt są odpowiedzialne za celowe zachowanie człowieka, szczególnie w nowych, nietypowych sytuacjach (Banich, 2009). W związku z wielkim znanieniem funkcji wykonawczych dla codziennego funkcjonowania, wiele dzisiejszych badań skupia się na poszukiwaniu możliwości ich usprawniania, między innymi poprzez zastosowanie różnego typu gier komputerowych (Hyun i in., 2013; Martínez i in., 2013). W ramach niniejszego wystąpienia zaprezentowane będą wyniki badania pilotażowego przeprowadzonego na gracach komputerowych dotyczące odświeżania w pamięci roboczej oraz hamowania. Badania zostały przeprowadzone w ramach Ogólnopolskiego Kongresu Sportów Elektronicznych w Katowicach przy zastosowaniu dwóch testów w wersji komputerowej: Corsi block tapping test oraz Stop-signal task. W pierwszym teście badani zapamiętywali sekwencję kolejno wyświetlanych klocków, by następnie ją odtworzyć. W drugim teście badani mieli za zadanie jak najszybciej zareagować na bodziec, a w przypadku wyświetlenia sygnału stop, powstrzymać się od reakcji. Oprócz testów uczestników poproszono także o wypełnienie ankiety dotyczącej między innymi preferowanego gatunku grania oraz średniego czasu spędzanego na graniu w gry komputerowe.

**Keywords**— funkcje wykonawcze, gry komputerowe, pamięć robocza, hamowanie

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