PhD Conference

PhD School in Psychology, Budapest University of Technology and Economics

9 June 2021, Online (MS Teams)

PROGRAM

Session 1, Chair: Mihály Racsmány

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11:15 - Boglárka Bűdi: Executive function, theory of mind and social communication in preschool children with high functioning autism

11:30 - Bernadett Mikula: The role of emotional cues on prospective memory performance

11:45 - Anita Lencsés: Prospective memory functioning after traumatic brain injury: Preliminary data with the Virtual Week task

12:00 - Edina Török: The relationship between mentalization, mindfulness, working memory, and schizotypal personality traits in the general population

12:15 - Zsófia Pálffy: Cross-modal auditory priors drive the perception of bistable visual stimuli with reliable differences between individuals

Session 2, Chair: Ágnes Lukács

12:30 - Levente Rónai: A little hectic out there? Increased levels of unstable and inflexible negative affect both predict changes in depression

12:45 - Flóra Fülöp: Investigating earworms in a Hungarian sample: Associations with schizotypy and non-clinical obsessive-compulsive disorder, and frequent earworm songs

13:00 - Karolin Suri: Examining the relationship between face perception, mental health and the COVID-19 epidemic, in light of attachment styles

13:15 - Noémi Báthori: Sleep and daytime mental health during the first COVID-19 home confinement

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13:45 – 14:15 BREAK

Session 3, Chair: Szabolcs Kéri

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14:30 - Bence Schneider: Hypnospectrogram derived from a set of temporally evolving, non-redundant spectral EEG parameters

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15:30 - Boglárka Nagy: Can training modulate resting-state neural network dynamics? – An age-related multiscale entropy and spectral power density study on task-switching

15:45 - Petra Csizmadia: The effect of ambiguous and unambiguous stimuli on target processing in less creative and creative groups

16:00 - Nóra Csikós: Automatic processing of interwoven oddball sequences: Two visual mismatch response studies

16:15 - Annamária Manga: Shared visual feature binding in short- and long-term memory

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ABSTRACTS

Session 1, Chair: Mihály Racsmány

11:00 - Statistical learning in developmental language disorder across modalities and domains

Dorottya Dobó[1,2], Krisztina Sára Lukics[1,2], Ágnes Lukács[1,2]

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The vulnerability of statistical learning (SL) in developmental language disorder (DLD) has mainly been demonstrated with metacognitive offline measures which give little insight into the more specific nature and timing of learning. We explored SL in school-age children with and without DLD matched on age and sex (n = 36). SL was investigated with the use of acoustic verbal and visual nonverbal segmentation tasks relying on online (reaction times and accuracy) and offline (two-alternative forced choice, 2AFC and production) measures. Learning was evident in both groups in visual and acoustic online measures as well. The visual production task showed significant learning in both groups, while the visual 2AFC and the two acoustic offline tasks showed learning effect only in the control group. The comparison of learning indices revealed an SL impairment in DLD, which is present in both modalities. These results indicate that DLD children learn statistical patterns less effectively than TD peers, which impairment is present across modalities and domains. Our findings also suggest that in spite of their SL impairment, children with DLD are able to extract patterns that are cued only by transitional probabilities. Results of different online and offline measures imply that online tests are more sensitive and valid indices of SL than offline tasks, and the combined use of different methods provide great opportunity in testing and comparing learning efficiency of different groups of children.

This work was supported by the Lendület Research Grant of the Hungarian Academy of Sciences.

11:15 - Executive function, theory of mind and social communication in preschool children with high functioning autism

Boglárka Bűdi[1], Anna Babarczy[1,2]

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During preschool years Executive Function (EF) and Theory of Mind (ToM) are two developing important cognitive elements that are essential for understanding and managing in the social world. Individuals with high functioning autism (HFA) exhibit impaired social interaction and communication (APA, 2013). The aim of my research is to investigate the role of EF, ToM and Social Communication (SC) in typical development and HFA during the preschool and primary school years of development (age 6-12). There are similarities and relations between these two phenomenons, and children's EF skills convolute with developing mentalization abilities (Kimhi et al, 2017; Kokulari et al, 2018). To test these relations a series of standard experimental paradigms will be used to assess various aspects of mentalization ability and social cognition. A comprehensive test battery measuring affective and cognitive ToM abilities is under development. Online piloting phase for the Hungarian adaptation of Social Stories test (Happé, 1994) is completed. A non-literal language comprehension test (Szűcs-Babarczy, 2017) was administered with a group of HFA children. In person testing was restricted due to the present circumstances of the pandemic

outbreak, an online questionnaire was administered to discover the perceptions of families of individuals with ASD during the COVID-19 crisis.

11:30 - The role of emotional cues on prospective memory performance

Bernadett Mikula[1], Anita Lencsés[1], Gyula Demeter[2,3]

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Prospective memory (PM) refers to our ability to form, maintain and execute intended actions in an appropriate future time point. Emerging evidence suggests that emotional content can influence PM performance, however, the literature is inconsistent on the effects of valence and the characteristics of the PM task. Our aim was to assess emotional PM in two laboratory paradigms with explicitly social and non-social stimuli. We applied an event-based PM task requiring participants to engage in an ongoing activity while remembering a specific action to be performed. The PM cue was a previously learned item that consisted of either a human face pair (social) or a pair of pictures depicting objects, animals or landscapes (non-social). Preliminary results with healthy undergraduate students show that valence reflected by happy, fearful or neutral faces does not affect PM performance. In contrast, emotional non-social pictures with negative valence elicit slower reaction times compared to positive and neutral images. Ceiling effect on accuracy rates might be attributed to the low level of task complexity. Our results suggest that emotional valence may not enhance performance on simple event-based PM tasks, which contradicts previous literature that found positive cues to facilitate PM performance.

11:45 - Prospective memory functioning after traumatic brain injury: Preliminary data with the Virtual Week task

Anita Lencsés[1], Bernadett Mikula[1], Gyula Demeter[2,3]

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Prospective memory (PM), the memory for future intentions, is a complex neurocognitive ability that is impaired in various neurological and neuropsychiatric disorders affecting the prefrontal areas and the frontoparietal networks. Based on a recent meta-analysis, PM impairment is a robust finding after traumatic brain injury (TBI), but this deficit is moderated by task and injury characteristics and comorbid cognitive disorders.
Nine TBI patients and 7 matched healthy controls participated in this study. Virtual Week, an ecologically valid laboratory measure, was administered to assess performance on regular and irregular, time- and event-based PM tasks. Participants also underwent a comprehensive neuropsychological assessment. Compared to the control group, the patients had significantly lower performance on all irregular tasks and time-based regular tasks, but not on regular event-based tasks. The patients also had difficulties with the recognition of the task content on irregular but not regular tasks. Our results suggest that irregular PM tasks with more retrospective memory demands are challenging for TBI patients, and they are less accurate in time-based cues, indicating impairments in monitoring processes rather than automatic retrieval. Further data collection is required to determine interactions between these variables, as well as the possible clinical and cognitive correlates of PM performance.

12:00 - The relationship between mentalization, mindfulness, working memory, and schizotypal personality traits in the general population

Edina Anikó Török[1,2], Szabolcs Kéri[1,2]

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[2] Department of Cognitive Science, Budapest University of Technology and Economics, Budapest, Hungary

Individuals with high schizotypal traits exhibit less ability to consciously observe, describe, and monitor feelings, thoughts, and experiences. However, the relationship between mindfulness, mentalization, working memory, and schizotypy has not been explored.
Three hundred individuals from the community completed questionnaires examining schizotypal traits, mindfulness, and mentalization. Participants also completed a set of working memory tasks. Linear regression analysis indicated that mentalization was a significant and common predictor of all schizotypal traits, including unusual experiences, cognitive disorganization, introverted anhedonia, and impulsive nonconformity, when the analysis was controlled for mindfulness and working memory. We also demonstrated a significant correlation between mindfulness and mentalization. Moreover, low mindfulness and mentalization abilities were both associated with high levels of schizotypal features. Working memory was only weakly associated with cognitive disorganization and introverted anhedonia. These findings indicate that weak mentalization is a common feature of schizotypy independent of mindfulness and working memory.

12:15 - Cross-modal auditory priors drive the perception of bistable visual stimuli with reliable differences between individuals

Zsófia Pálffy[1], Kinga Farkas[2], Gábor Csukly[2], Szabolcs Kéri[1,3], Bertalan Polner[1]

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Perception is an inference process performed by the brain, during which it combines sensory information with prior expectations. One can differentiate between higher- and lower-level priors, and manipulate them with associative learning and sensory priming, respectively. We conducted a perceptual inference task to examine the differential effect of auditory vs. visual associative cues on visual perception and examined the reliability of individual differences. Healthy individuals (N=29) performed the task twice with a one-week delay. They indicated perceived motion-direction of dot pairs, which were preceded by a probabilistic visuo-acoustic cue. In 30% of the trials, motion direction was ambiguous, and in half of these trials, the auditory vs. the visual cue predicted opposing directions. On these trials participants made more decisions consistent with the prediction of the acoustic cue. Priming effects were observed as the perception of ambiguous stimuli was influenced by perceptual decisions on the previous ambiguous and unambiguous trials. Importantly, we found substantial inter-individual variability which showed high test-retest reliability (intraclass correlation coefficient (ICC) > 0.78). Overall, we found auditory dominance in the domain of higher-level priors, while lower-level priors were also in action. The observed reliability implicate that such tasks could be valuable tools during large-scale biomarker studies.

Session 2, Chair: Ágnes Lukács

12:30 - A little hectic out there? Increased levels of unstable and inflexible negative affect both predict changes in depression

Levente Rónai[1], Bertalan Polner[1]

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Studies have shown that emotional inertia (rigidity of emotional states, as reflected by the autocorrelation of time series) and instability (dramatic fluctuations in emotional states, as indicated by the mean successive squared difference) are related to baseline and follow-up depressive symptom severity. Yet, little is known about the relationship between the above dynamic indicators of affect and depressive symptoms within shorter periods of time (e.g.: within a few days). To investigate the relationship between affective dynamics and depressive symptom severity, we conducted an Experience Sampling Method study during the first wave of the pandemic in Hungary, in which we examined dynamics of basic momentary emotional states (measured in valence-arousal dimensions) and depressive symptoms (SCL-90) via a web application (formr.org). Data from 112 participants (NFemales = 95, MAge = 39.5, SDAge = 13.8) from the general population were analyzed with multilevel models. We found that emotional instability (in interaction with higher levels of negative emotional states) and inertia had significant positive associations with depressive symptom severity within 3-day-long measurement windows. Our results imply that within-subject alterations in dynamics of momentary affective states indicate changes in depression, and they may reflect distinct deficits of emotion regulation.

12:45 - Investigating earworms in a Hungarian sample: Associations with schizotypy and non-clinical obsessive-compulsive disorder, and frequent earworm songs

Flóra Fülöp[1,2], Ferenc Honbolygó[2]

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[2] Research Centre for Natural Sciences, Brain Imaging Centre, Budapest, Hungary

Earworms are a widespread phenomenon, however, no study has investigated its characteristics in the Hungarian population. We conducted a large-scale survey with 4346 Hungarian participants. Using questionnaires, we examined different aspects of earworms and their associations with certain personality traits. Earworms are a non-clinical phenomenon, however, prior research has shown relationships between earworm length, frequency and negative attitudes towards earworms, and personality traits such as schizotypy and subclinical obsessive-compulsive disorder. Based on previous research, we hypothesized that people with higher levels on these traits would differ from those with lower levels in how frequently and for how long they experience earworms, and their attitudes towards them. To investigate this, correlations and two-sample t-test were used. We examined the validity of the Hungarian version of the Involuntary Musical Imagery Scale, a questionnaire examining different aspects of earworms, using exploratory factor analysis. We also collected songs that often become earworms - overall, over 10,000 songs were collected, together with their preference ratings. Our aim with this list is to examine what songs people most often experience as earworms, and whether or not these songs are more preferred. As analysis is still in progress, preliminary results, as well as methodological questions are discussed.

13:00 - Examining the relationship between face perception, mental health and the COVID-19 epidemic, in light of attachment styles

Karolin Suri

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As human faces provide important sources of social-emotional information, we often use these to interpret the internal states of others. Attachment styles may influence processing of emotionally significant stimuli, possibly through attentional orientation or stimulus coding.
Therefore, before the COVID-epidemic began, we conducted an experiment to study whether there is an association between attachment styles, emotion perception and face memory. Eye-tracking was used during the emotion decision and the subsequent facial memory task; performance and reaction time were also measured. The study included neurotypical individuals (N=50, 19-36 years). Our results indicate alternative fixation patterns in individuals with different attachment orientations.
New life situations (home office, restrictions etc.) created by the COVID-19 epidemic also have an impact on mental health. Therefore, we created an online questionnaire to measure these effects during the first wave of COVID. It consisted of the ECR, STAI-T, BDI-13 and CD-RISC-25 questionnaires, and contained questions regarding face perception (e.g. the effect of mask wearing on the subjectively perceived effectiveness of face perception). Our data (N=155, 18-82 years) suggest that attachment characteristics play an important role on how we cope with stressful situations, as well as how we perceive our efficiency of face processing. The results also point out that in the current situation, efforts to maintain mental health are even more important.

13:15 - Sleep and daytime mental health during the first COVID-19 home confinement

Noémi Báthori[3], Péter Simor[1,2], Bertalan Polner[3], Rebeca Sifuentes-Ortega[2], Anke Van Roy[2], Ariadna Albajara Sáenz[2], Alba Luque González[4], Oumaima Benkirane[2], Tamás Nagy[1], Philippe Peigneux[2]

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Sleep quality and daytime experiences are associated; however, the temporal directions of these phenomena are inconsistent. Furthermore, stressful life events could affect both mental health and sleep. The lockdown caused by the novel coronavirus changed our daily routine, work- and social environment, which provided us new opportunities to model the relationship between daytime- and night-time experiences without intentional manipulations.
We investigated subjective sleep parameters and daytime experiences in an online prospective study for 14 days and nights across three European countries (Belgium, Hungary, Spain) N=166. We analyzed the within- and between-person associations of subjective sleep quality and the presence of rumination, psychotic-like experiences (PLE), and somatic complaints of the typical symptoms of the coronavirus.
Daily COVID-19 related deaths in the specific country predicted more PLE, increased negative mood and somatic complaints during the day, and lower sleep quality during the following night. Poor sleep quality on average was associated with worse mental health. Disrupted sleep predicted more rumination, PLE, and somatic complaints during the next day. However, this association seemed to be unidirectional since daytime experiences were not significant predictors of sleep quality. These findings suggest that sleep quality fluctuations seem to predict coping with daily experiences during the lockdown.

13:30 - The Graded Novelty Encoding Task: Novelty gradually improves recognition of visual stimuli under incidental learning conditions

Richárd Reichardt, Péter Simor, Bertalan Polner

Novel stimuli are preferentially encoded into memory. However, treating novelty as a categorical variable in experimental research is simplistic. We highlight the dimensionality of novelty and propose that experimental designs should continuously manipulate novelty. We created the Graded Novelty Encoding Task, in which the differences between stimuli (i.e. novelty) are parametrically manipulated. We first designed an algorithm which generates visual stimuli by placing colored shapes in a grid. First, the participants were repeatedly presented five pictures. Next, participants were asked to recognize the previously seen familiars among a set of novel images that varied along their degree of difference to the familiars. Finally, participants completed a surprise recognition memory test, where the novels from the previous phase were interspersed with distractors. We numerically expressed the differences between the stimuli to compute a dimensional indicator of novelty and assessed whether it predicted recognition memory performance. We hypothesized that the more novel a given picture was, the better subsequent recognition performance participants would demonstrate. Recognition performance was indeed higher for more novel stimuli. The Graded Novelty Encoding Task captures the continuous nature of novelty, and it may be useful in future studies that examine the behavioral and neurocognitive aspects of novelty processing.

Session 3, Chair: Szabolcs Kéri

14:15 - Anatomical and functional description of the intra-amygdalar microcircuitry

Ákos Babiczky[1,2], Ferenc Mátyás[2,3]

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The amygdala is a central hub in the brain circuit that controls emotional behaviors. Although a huge effort has been made to reveal the structural, physiological and behavior-controlling aspects of the amygdala, the description of the intra-amygdalar wiring is still incomplete. Therefore, the main focus of my research is the detailed investigation of this intra-amygdalar network, using classical and cell type-specific anatomical techniques in mice.
With the combination of multiple immunohistochemical staining and confocal microscopy, we identified a line of molecular markers that can define anatomical borders within the amygdala. Using these markers and classical retrograde and anterograde tracing, we mapped the afferent and efferent connections of the main amygdala subnuclei, namely the lateral, basal, basomedial, centromedial, centrolateral nuclei, as well as the amygdalostriatal transition area and the intercalated cells. Furthermore, we tested three genetically modified mouse strains (Thy1-, NL189-, Rbp4-Cre) that can be used to specifically investigate the basal and basomedial nuclei both anatomically and behaviorally.
Our results revealed parallel pathways within the amygdalar microcircuitry, a notion that has been mostly neglected so far. The topography of these pathways is in good correspondence with our previous results describing the thalamic afferents innervating the amygdala in a similar parallel manner.

14:30 - Hypnospectrogram derived from a set of temporally evolving, non-redundant spectral EEG parameters

Bence Schneider[1], Róbert Bódizs[2]

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Power spectral analysis is one of the most basic yet important tools of sleep EEG signal processing, it can provide biomarkers of aging, health and cognitive traits. The practice of deriving measures from the power of predefined, fixed frequency bands is common, however it ignores the spectral landscape of the underlying neural processes. Typically the power spectrum of sleep EEG is composed of a decaying, power-law like aperiodic component, originating from the neural background activity and spectral peaks that are present due to neural oscillations. In our research we extract the parameters describing these features looking for correlations with age, sex and intelligence coefficient by using the FOOOF (fitting oscillations & one over f) procedure. Furthermore we consider the temporal evolution of these parameters during sleep, which strongly reflect the alteration of sleep stages, indicating an opportunity to use them for automatic stage classification.

14:45 - Dynamic action-effect-related motor adaptation

Sámuel Varga[1,2], Bence Neszmélyi[1,3], Nándor Hajdú[1,2], János Horváth[1,4]

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Simple, repetitive everyday actions (pinches, taps, button presses) differ in applied force depending on the consistent presence or absence of an auditory action-effect. This has been explained by suggesting that the consistent auditory action-effects enabled motor optimization by providing feedback on the success of the actions. In the present experiment, we investigated whether such motor optimization occurred when tones were elicited unpredictably. Young adult participants produced even-paced sequences of pinches and taps, which elicited a 1000 Hz sinusoid tone (50 ms duration and a variable dB intensity depending on the individual's hearing threshold) with 50% probability. We found that the applied force was modulated by the tone-elicitation pattern of preceding actions: pinches/taps preceded by tone-eliciting actions were softer than those preceded by actions without tone-effects. The effects were more pronounced for pinches and taps preceded by longer and more homogenous action sequences. These findings indicate that auditory action-effects are used in the dynamic optimization of repetitive actions even if they occur unpredictably.

15:00 - Generalizability of action-effect related motor adaption to visual stimuli

Erika György[1,2], Virág Vass[2], Bence Neszmélyi[3], Sámuel Varga[1,2], János Horváth[2,4]

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Simple, repetitive everyday actions (button presses, pinches, taps) differ in applied force depending on the consistent presence or absence of an auditory action-effect. This action-effect related motor adaption can be observed for action-effect delays up to 200 ms with auditory effects. The goal of the present study was to replicate and extend this finding in the visual domain. Participants pinched a force sensitive resistor every 3 seconds. Pinches elicited either a red light-emitting diode (LED) flash with 0 ms delay, an LED flesh with 400 ms delay, a 1000 Hz sinusoid tone with 0 ms delay, or a 1000 Hz sinusoid tone with 400 ms delay in four groups, respectively. To keep participants attention focused on the elicited stimuli, rare, random target stimuli in the same domain were also presented, and participants reported the number of such stimuli at the end of the approximately 9 minutes long blocks. In accord with previous findings, action-effect related motor adaption was found, that is force application was softer for 0-ms than for 400-ms delays in both modalities. These results suggest that action-effect related motor adaption is not restricted only to the auditory domain but also applicable to visual action-effects.

15:15 - The role of action-effect congruency in motor adaptation

Adrienn Oláh[1,2], Erika György[1,2], Bencze Neszmélyi[2], János Horváth[2]

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Previous studies show that the latency and availability of auditory feedback plays an important role in adjusting the movement during keypresses. We would like to investigate whether spatial congruency between action and its effect has a role in motor adaptation.
Our experiment consists of four conditions: motor condition, congruent condition, incongruent condition and random condition. Participants will press a button (the applied force will be measured by force sensitive resistors ~ FSRs), which will elicit a tone. In the motor condition actions do not elicit a tone, but in all of the three other conditions each action results in the elicitation of a tone: in the congruent condition when the participant uses her right hand the tone will be elicited from the right, when she uses her left hand, the tone will come from left. In the incongruent condition when she uses her right hand the tone will be elicited from left and vica versa. In the random condition the direction of the tone is totally random. The participants will get the following instruction: „Your task is to press the button either with your right hand or your left hand (approximately 50-50%)". We hypothesize that the common feature (spatialness) of the action and its effect will enhance motor adaptation, because they share a common feature: spatialness.

Session 4, Chair: Kornél Németh

15:30 - Can training modulate resting-state neural network dynamics? – An age-related multiscale entropy and spectral power density study on task-switching

Boglárka Nagy[1,2], Andrea B. Protzner[3,4], Hongye Wang[3], Gwen van der Wijk[3], Filomeno Cortese[4,5], István Czigler[1], Zsófia Anna Gaál[1]

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In the present study we investigated whether cognitive training could cause general changes in task-independent neural network dynamics. Younger and older adults were divided into control and training groups and the training groups executed 8 one-hour long practice of an informatively cued task-switching paradigm between pre- and posttraining sessions. In the beginning of both sessions, resting-state EEG was recorded and we applied multiscale entropy (MSE) for measuring brain signal complexity changes in different timescales and spectral power density (SPD) for identifying changes in different frequency bands. The resting-state MSE and SPD data were analyzed with partial least squares (PLS) which is a data-driven multivariate statistical analysis. These analyses revealed increased coarse temporal scale MSE at right fronto-central areas and increased power in delta and theta frequency bands at right centro-parietal areas (connected to long-range neural interactions) and slightly increased finer temporal scale MSE (connected to local information processing) at left fronto-central areas in old-training group from pre- to posttraining. While these changes in global information processing reveal the compensatory mechanism of cognitive training against the local network processing shift with aging, until the detected changes in local neural communication can be connected to better task-switching performance in the old-training group.

15:45 - The effect of ambiguous and unambiguous stimuli on target processing in less creative and creative groups

Petra Csizmadia[1,2], István Czigler[1], Boglárka Nagy[1,2], Zsófia Anna Gaál[1]

[1] Institute of Cognitive Neuroscience and Psychology, Research Centre for Natural Sciences, Budapest, Hungary
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We studied how creative and less creative younger and older adults processed irrelevant stimuli with different levels of ambiguity, and whether this processing would influence operant responding. Our experiment design was based on the Emotional Interrupt Task, in which unambiguous and ambiguous portrait paintings and photos of faces were presented in equal proportions before the target stimuli. We hypothesised that available cognitive resources would decrease if participants attended to distractor stimuli. As older adults cannot inhibit the processing of the task-irrelevant stimuli sufficiently, they are more exposed to this effect. If creativity begins with the perception of the stimuli of the environment than the engagement of attention would be influenced by the ambiguity of stimuli at different levels in creative and less creative participants. According to our results, aging affected behavioural and event-related potential responses, but there were no interactions between age and either stimulus type or creativity. The reaction time was faster for targets following the faces than for portrait paintings. Stimuli were differentiated in early and late phases

of cognitive processes as well and, creativity had an effect in the earliest (P1) and the latest stage (CNV): creativity affected the early perception of stimuli and task preparation.

16:00 - Automatic processing of interwoven oddball sequences: Two visual mismatch response studies

Nóra Csikós[1,2], Zsófia Anna Gaál[2], Béla Petrő[2], István Czigler[2]

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Our cognitive system automatically forms predictions based on the sequential regularities of incoming visual events, and reacts to the violation of these predictions. The electrophysiological index of this is an event-related potential (ERP) component, the visual mismatch response (vMMR). However, relatively little is known, whether it is capable of dealing with more than one independent regularities simultaneously.
In both studies we applied a passive visual oddball paradigm to measure the vMMR to simultaneously presented sequences, first with stimuli presented to the upper and lower, then to the left and right hemifields. The stimuli were checkerboards with two different stimulus sizes, one of them appeared frequently (standard), the other appeared infrequently (deviant), and vice versa. We obtained data from 20 participants in the first, and 21 in the second study (aged between 18-30).
Our results show that in the first study, rare stimuli in the lower visual field elicited larger vMMRs within the 130-170 ms latency range. In the second study, larger sized deviants elicited larger vMMRs, which were clearly lateralized, depending on the stimulated hemifield. Altogether the results show that when the cognitive system meets with simultaneously presented, but independent visual sequences, one will most likely dominate over the other.

16:15 - Shared visual feature binding in short- and long-term memory

Annamária Manga[1,2], Petra Madurka[1], Pál Vakli[1], C. Brock Kirwan[3], Zoltán Vidnyánszky[1]

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Successful cognitive performance relies greatly on the formation of coherent representations containing all features of multidimensional objects, and also on the ability to discriminate the representations belonging to different objects. In spite of the crucial role of feature binding in working memory and pattern separation in episodic memory, the connection between these two processes remained unexplored. In our study we aimed at filling this gap in the literature by testing how participants perform on a delayed-estimation working memory task and on the Mnemonic Similarity Task. Since the Mnemonic Similarity Task constitutes an excellent tool for capturing age-related memory decline, we investigated the relationship of these two memory domains on a large sample of 59 older adults. Our results show that a higher tendency to misbind object features in working memory is related to lower lure discrimination performance in long-term memory in old age. This correlation is especially pronounced when the memory demand placed by interfering representations is high. Based on these findings we suggest that object feature binding in working memory and pattern separation in long-term memory are related processes, sharing a common neural mechanism, possibly with a hippocampal basis.

16:30 - Neural representation of the operatic voice in professional opera singers

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The most salient differences between the "natural" and operatic singing are vibrato, timbre, and perceived loudness. We investigated the neural basis of the formation and perception of operatic voice with a multimodal approach using behavioral, fMRI, and EEG paradigms. Participants were professional opera singers, choir singers and untrained subjects.
The fMRI results revealed stronger activation for operatic, then for natural voices in the primary auditory cortex (A1), auditory association area A4, ventromedial prefrontal, posterior cingular, and opercular cortices. Additionally, during the processing of operatic sounds we found increased task-based functional connectivity between many of these regions, including the auditory and ventromedial prefrontal cortices.
The results of our working memory experiment provided further evidence for selective neural processing of operatic voices. Distractor interference on the maintenance of operatic voice stimuli was significantly weaker in case of operatic as compared to natural voice distractors. Additionally, we found a significant correlation between overall working performance and singing expertise.
Our results provide the first experimental evidence for specialized representation of the operatic voices in the human brain, including stronger involvement of the brain networks associated with emotion and reward processing than in the case of natural voices.

* The effect of grammar type and complexity on Artificial Grammar Learning

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While there are results showing that statistical learning in Artificial Grammar Learning tasks is sensitive to grammar complexity and abstractness, these factors have received little attention so far. In our study, we wanted to directly compare the effect of complexity and abstractness in the acoustic verbal domain. We tested learning of a less (simple grammar) and a more complex grammar (complex grammar) differing in topological entropy in young adults. We developed versions of the grammar defined over a) five nonsense syllables or b) five categories of three nonsense syllables for both grammars. This yielded four conditions: 1) simple grammar over items, 2) simple grammar over categories, 3) complex grammar over items, 4) complex grammar over categories. We observed significant learning in all conditions except in the complex category-based grammar. Learning category-based grammars proved to be more difficult than learning item-based grammars. Learning was also more difficult with complex grammars (both with items and categories), though this effect was non-significant. These results show that complexity and abstractness of grammars are crucial factors in influencing learnability. They are also in concert with the constructivist proposal that children start with the easier item-specific constructions and develop category-based constructions only later.

* Not part of the program.