Work in Progress Symposium 2023

Program and Abstracts

ELTE

COGNITIVE PSYCHOLOGY DEPARTMENT

Schedule & Contents

SESSION 1

LANGUAGE & CONCEPTS

Chair: Bálint Forgács
10:00 - 11:00

Tri-level norming: The effects of semantic combinatorics on the emotional dimensions of figurative language

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Empirical study with results

Márton Munding (Doctoral School of Psychology, ELTE), Alex Roland Ilyés (Doctoral School of Psychology, ELTE), Bálint Forgács (Department of Cognitive Psychology, ELTE)

Metaphors are frequently used in everyday language, however the neurocognitive mechanisms behind their semantic processing are unclear, partly due to uncontrolled psycholinguistic factors, including the context they appear in. In this study we created 540-540 Hungarian context-manipulated sentences ending either with novel concrete or metaphoric adjective-noun word pairs. A series of psycholinguistic norming studies were conducted to explore the underlying interactions between concreteness, imageability and emotional variables (arousal, valence) in our word pairs; and the effects of sentence context manipulation on such variables. We also analyzed how the frequency and norms of the individual words effect the psycholinguistic variables of our novel word pairs created from them. Our results not only indicate that our dataset is suitable to be used as stimulus material in brain imaging studies, but the acquired psycholinguistic norms can also be used as covariates during the analysis of such studies, improving the validity of their results.

Keywords: psycholinguistics, metaphors, sentence context

Is the discrete semantic system (DSS) part of the more general conceptual or linguistic network?

Research plan

Kimberly Brosche (University of Vienna, Austria), Attila Krajcsi (Eötvös Loránd University, Budapest, Hungary)

When asked to identify the smaller/larger one of two Arabic numbers, participants' performance improves with increasing numerical distance between the stimuli. Rather than on the value represented by the number symbols, this so-called symbolic distance effect

might rely on a linguistic and/or conceptual network of associations (Discrete Semantic System, DSS). Indeed, a similar effect also occurs when elements of non-numeric ordered lists are compared. To test our hypothesis that these distance effects are manifestations of the same mechanism, we will subject adult participants to three different comparison tasks, using Arabic numbers, letters of the alphabet and months of the year as stimuli. Subsequently, we will analyze whether the distance effect slopes for participants' accuracy and response time are correlated (reliability-adjusted correlations) across the three domains. Finding such a correlation would support the view that the distance effect observed in symbolic number comparison tasks is the result of linguistic/conceptual associations.

Keywords: numerical cognition, discrete semantic system, comparison task, distance effect

Individual differences in behavioral entrainment to speech and music

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Empirical study with results

Maria de Lourdes Noboa Cepeda (ELTE - Doctoral School of Psychology, TTK - Brain Imaging Centre, Research Centre for Natural Sciences)

Entrainment can be defined as the temporal alignment of endogenous activity and an exogenous rhythmic stimulus. We conducted an experiment to detect individual differences in behavioral and neural entrainment patterns to speech and music. We will present preliminary results of behavioral entrainment measured with a tapping task and with the Speech-to-Speech Synchronization (SSS) test adapted to the Hungarian population. The aim was to find the commonalities between music and speech perception measured through sensorimotor synchronization. We found a significant positive correlation between the degree of synchrony of speech production and perception (SSS test) and the average synchrony of the tapping tasks. Furthermore, we also found a significant correlation between the degree of synchrony and musical background. Our results suggest individual differences in sensorimotor synchronization patterns and provide support for its role in the perception of speech and music rhythms, facilitating temporal attention and prediction.

Keywords: entrainment, music, speech, synchronization

Experimental methods of measuring mental grammar: a computation-based grouping of irregular noun stems in Hungarian

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Pilot study

Bruno Schütz (Eötvös Loránd University, Budapest, Hungary), Bálint Forgács (Eötvös Loránd University, Budapest, Hungary)

Hungarian language, given its rich morphological nature and abundance of irregulars, is well placed to examine the distinction of regular and irregular inflection. However, as it is a vigorously debated topic of psycholinguistics, we suggest a new grouping of irregular nouns based on underlying computations, so various inflections can be defined as formal logical transformations, where the number and quality of these computations may lead to slower reaction times and/or more errors in production. We tested 30 healthy young adults with a mean age of 21.3 years (SD = 2.5) in a RT-measurement task, inflecting irregular and matched regular stems in plural. Based on the results we argue for the existence of such computations as they tax executive functions and working memory in morphological complex word production. These factors may play complementary roles in predicting latency and accuracy of irregular inflection.

Keywords: mental grammar, irregular inflection, computation

Perception of Causality

Research plan

Daniel Bermúdez (Middle European Master in Cognitive Science), Zoltán Nadasdy (ELTE; University of Texas

The question that constitutes the principal objective of this project is: Whether or not causality is perceived retrospectively? The theoretical debates around this question are vast and concern the fundamental assumptions about human cognition. First of all, if the perception of causality involves a retrospective analysis of the visual scene or it is unfolding with the sequence of interaction between objects. Secondly, where does this retrospective perceptual process occur? Perception of causality possibly combines information deriving from the higher motion analysis as part of the motion pathway (area V5) and temporal areas to identify the agents of these interactions. Therefore, it is likely associated with the temporal-parietal junction in the brain. Alternatively, it would also be plausible that the neural networks in our brain implemented a statistical analysis of the scene from which the most likely interaction can be derived.

Keywords: perception, causality, kinetic energy

SESSION 2

Neurodiversity & Methods

Chair: Attila Keresztes
11:00 - 12:00

Examining the relationship between phonological working memory, word reading and spelling in beginning and competent readers

Pilot study

Claudia Laskay-Horváth (Eötvös Loránd University, Budapest), Orsolya Pachner (Eötvös Loránd University, Budapest), Kemény Ferenc (Karl-Franzens-University, Graz, Austria, Eötvös Loránd University, Budapest, Hungary)

The aim of the study was to investigate the relative contribution of phonological working memory to literacy of beginning (2nd grade) and advanced (6th grade) Hungarian readers. Reading performance was assessed using a one-minute word and pseudoword-reading task; spelling with spelling-to-dictation task, and phonological working memory with a nonword repetition task. Regression analyses demonstrated that the phonological working memory explains 15% of the variance in word-reading in beginning readers. Such a relationship cannot be found among sixth graders. Furthermore, phonological working memory explained 5% variance of pseudoword reading in beginning readers. Again, no such results were observed in advanced readers. In terms of spelling, a significant negative correlation was found between advanced readers' spelling abilities and phonological working memory. Overall, our preliminary results demonstrate the importance of phonological working memory early in reading development. Later on, however, the disengagement of phonological skills is required to obtain expertise in reading.

Keywords: phonological working memory, reading, spelling

The role of executive functions in place-value notation

Research plan

Bojana Mišulić (Eötvös Loránd University, Budapest, Hungary.), Attila Krajcsi (Eötvös Loránd University, Budapest, Hungary.)

The purpose of this research is to investigate the link between executive functions and notation of place-value numbers. Previous works show that a) place-value notation is more difficult to process than sign-value notation for healthy adults and b) dyscalculic adults show more impairment when processing place-value notations, in comparison to sign-value. Moreover, previous studies demonstrated that the executive functions are impaired in

dyscalculia. We hypothesized that handling place-value notation heavily relies on the executive functions, and the impairment of the executive functions may lead to the difficulties with handling place-value notation in dyscalculia. Here, we empirically test the relation of executive functions and place-value notation handling. University students' multi-power number handling in place-value and sign-value notations will be measured using new artificial notation systems, as well as their executive functions using the Simon task and Task switching task. We hypothesize that the correlation between executive functions and place-value notation will be higher than the correlation of executive functions and sign-value notation.

Keywords: numerical cognition, place-value, sign-value, executive functions, dyscalculia

The effect of emotional cues on prospective memory: the role of valence

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Research plan

Bernadett Mikula (Department of Cognitive Science, Faculty of Natural Sciences, Budapest University of Technology and Economics), Gyula Demeter (Rehabilitation Department of Brain Injuries, National Institute of Medical Rehabilitation, National Institute of Locomotor Diseases and Disabilities, Budapest, Hungary; Department of Cognitive Science, Faculty of Natural Sciences, Budapest University of Technology and Economics)

Our ability to formulate, maintain and execute future intentions at a designated time point is referred to as prospective memory (PM). Emerging evidence suggests that emotional manipulation of PM cues leads to improved performance. However, the contribution of valence and arousal of the emotional content remains unclear. In this study, a laboratory paradigm will be used to explore the role of valence alongside controlled levels of arousal. While engaged in an ongoing activity, participants will need to remember to press a specific key when encountering a predefined pair of either emotionally valenced or neutral pictures. We hypothesize that positive cues, compared to neutral and negative ones will facilitate reaction times on PM trials. Additionally, smaller costs of maintaining the PM intention are expected when the ongoing activity and the PM task are positively valenced. Our results will provide a deeper insight into the relationship between valence and PM performance.

Keywords: prospective memory, emotion, valence

Mind-wandering, local sleep and visuomotor learning – in search of how slow waves affect task performance and mental state - a pilot study

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Pilot study

Bogdány Tamás (Eötvös Loránd University), Miha Likar (University of Ljubljana), Simor Péter (Eötvös Loránd University), Németh Dezső (Eötvös Loránd University)

The term 'mind-wandering' is quoted to describe the state when an awake person - mostly unintentionally - is engaged with internally generated mental content, instead of directing their attention to tasks which are required by the current external environment and/or the present moment. Mind-wandering shares features with dreaming, which made propose theories that the two can be placed on the same intensity continuum, meanwhile others propose that mind-wandering is the result of spatially restricted, ‘sleep like’ theta and/or delta activity of the brain, a term called 'local sleep'. In this pilot study, we are interested if spatially restricted frequency decrease of wake EEG activity and subjective level of mind-wandering is concomitant with performance change in ASRT. Meanwhile, mind-wandering is linked to ADHD and lower level of executive functioning, which can result in decreased performance in behavioural tasks. We hypothesize that ongoing local sleep episodes may help to boost performance in following ASRT sessions. This would explain the lack of sleep effect in previous ASRT findings and may give insight into how local sleep plays a role in offline and online learning in visuomotor tasks.

Keywords: local sleep, mind-wandering, motor learning, EEG

Helping the researcher - Automating reliability analyses

Empirical research with results

Tamás Szűcs (ELTE Department of Cognitive Psychology), Attila Krajcsi (ELTE Department of Cognitive Psychology)

Experimental effects in psychology have been shown to have varying levels of reliability (Hedge et al., 2018) which can lead to a decrease in statistical power. Measuring and reporting reliability on the other hand are often omitted in current research practice. Statistical packages offer a wide range of methods for reliability analysis to choose from, however this choice is not straightforward.

Which metric should we use? Does the software calculate confidence intervals? How can I visualize the reliability of my data to get a better understanding of it? What are the assumptions of the various reliability analysis methods?

We present an automated solution for reliability analyses in the open-source statistical analysis software CogStat. From the current state of literature on reliability and the drawbacks of currently available software solutions, we hope to pave the way for clear analysis pipelines to be used in future research.

Keywords: reliability, automatic analysis, research methods, reproducibility crisis

SESSION 3

Lifespan Development 1.

Chair: Hanna Marno
12:30 - 13:15

Investigating the role of pedagogical feedback in children's explorative behavior

Pilot study

Rebeka Zsoldos (Eötvös Loránd University, Budapest, Hungary) Ildikó Király (Eötvös Loránd University, Budapest, Hungary)

Children are motivated to explore their environment, taking into account information provided by their partners. A growing body of literature suggests that the nature of information provision influences children's learning. For example, it has been shown that children play with a novel toy for shorter periods and explore fewer possible functions following pedagogical instruction than following non-pedagogical demonstration (Bonawitz et al., 2011). However, little is known about what happens when, instead of an adult, it is the child who delivers the information by discovering it, and the adult provides only feedback concerning the discovery.

The present study investigates how the mode of information delivery (child-directed discovery, adult-directed demonstration) and the instruction's type (pedagogical, non-pedagogical) affect children's individual learning. Our aim is to replicate the classic study by Bonawitz and colleagues (2011) in a Hungarian sample and extend its results by examining the role of pedagogical instructions when given as feedback.

Keywords: individual learning, exploration, pedagogy

Facial prosodic features of infant- and dog-directed communication

Pilot study

Édua Koós-Hutás (Doctoral School of Psychology, ELTE; Comparative Behavioural Research Group, Research Centre for Natural Sciences)

Although it has been long known that prosody includes both visual and acoustic components, the characteristics of parental facial expressions remained unexplored. My PhD studies aim to investigate, characterize and compare visual prosody (i.e. facial movements) in infant-, dog- and adult-directed communications during naturalistic everyday 3-4 minutes long situations. In these scenarios, female and male speakers are interacting with their child (6-18 months, IDS), their family dog (DDS) and an adult (ADS). Using the

FACS method, we previously found that Prosodic Faces are not only typical in both fathers and mothers but in dog-directed communication as well. As in the recent study, speakers got to engage with their partners during ADS, the presumed dynamics of visual and acoustic prosody and context-specific functions got twisted. To crystallize the factors behind the novel pattern of facial prosody intensity, further investigations are planned.

Keywords: Motherese, visual prosody, comparative study

Asymmetric distance effect in preschool children in a number comparison task

Empirical study with results

Asbóth Hanna Ágota (ELTE PPK), Krajcsi Attila (ELTE PPK)

There are two main strategies for processing numbers. Quantity-specific processing and order-specific processing. In quantity-specific processing, distance effect is observed when comparing pairs of numbers, which means that the task becomes easier as the distance between the numbers increases. The emergence of the two strategies is probably not sharply separated, and interference between the two strategies can lead to an asymmetric distance effect in adults, meaning that the distance effect is weaker for pairs of numbers presented in increasing order than for pairs of numbers presented in decreasing order.

In the present study, a quantity-comparison task was used to investigate this phenomenon among subset knower children (N=47). Children did not show asymmetric distance effect or higher error rates when processing number pairs presented in descending order than in number pairs presented in ascending order, suggesting that children do not use ordinal-specific processing in the quantity- comparison task.

Keywords: asymmetric distance effect, subset knowers

Selective memory: SS-RIF in the presence of two outgroups

Research plan

Carlos Magzel (Doctoral School of Psychology, ELTE)

Adult studies show that collective forgetting and selective remembering occur when speakers and listeners share group membership. In addition, studies indicate that children are sensitive to social group information and show in-group preference. We asked here whether children, as seen in adults, display concurrent retrieval as a function of a group membership. In the present research, by adopting Hirst and Coman's (2015) design, Arab-Israeli and Hungarian children between 10-12 years of age will learn about a summer camp, then will listen to either an in-group (Arab-Israeli/ Hungarian child) or an out-group member (Jewish-Israeli/ international child). Lastly, they will be asked to recall the items

learned. We expect to find that there is a significant difference between the types of items remembered in both experimental conditions. Furthermore, we expect to find that cultural practices assessed by parental questionnaires correlate with the children's recalling.

Keywords: collective memory, selective memory, children's memory, SS-RIF, minority, cultural practices

SESSION 4

Lifespan Development 2.

Chair: Márton Nagy
13:15 - 14:00

The possibilities of spatial intelligence development during adolescence

Research plan

Dóra Hegyesi (Eötvös Loránd University, Budapest, Hungary)

During my research I would like to examine which components of spatial thinking are developed effectively through formal education. I would like to compare these results with the PISA results. In my research I also assess athletes' spatial skills and development.

Keywords: spatial thinking, curriculum cognitive

A developmental shift between specificity and generalization in early childhood - A longitudinal study

Pilot study

Hunor Kis (Eötvös Loránd University, Budapest), Király Ildikó (Eötvös Loránd University, Budapest), Attila Keresztes (Eötvös Loránd University, Budapest)

Distinct neural computations of hippocampal subfields support core aspects of human memory. Recent neuroimaging and behavioral evidence suggest that the differential development of these subfields could explain the major shift from focus on abstracting regularities through experience (generalization) towards remembering unique events (specificity) in early ontogeny. The aim of this project is to investigate this hypothesis in a 3-year longitudinal developmental study. We will measure the performance of 4–6-year-old children on several memory tasks that have been linked to these different neural computations, identify the underlying processes as latent variables, and track their change using latent growth curve models. In addition to behavioral measurements, we will use high-resolution MRI to investigate the maturational differences of hippocampal subfields. With this study we aim to provide a better behavioral and neural insight into childhood memory development.

Keywords: hippocampus, neural computations, generalization, specificity, maturation

Investigating differential age-related changes in medial temporal lobe integrity and pattern separation

Research plan

Menta Havadi-Nagy (Doctoral School of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary; Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary; Brain Imaging Centre, Research Centre for Natural Sciences, Eötvös Loránd Research Network (ELKH), Budapest, Hungary)

Human, animal and computational modeling studies strongly suggest that the hippocampus plays a role in pattern separation, the ability to orthogonalize similar inputs into distinct memory representations. Extant work has shown that mnemonic discrimination performance, a behavioral index of pattern separation, is associated with white matter tract integrity of medial temporal lobe (MTL) regions. The aim of this study is to investigate this relationship in a cross-sectional sample of healthy younger (n=46) and older adults (n=100) using diffusion tensor imaging as well as a novel task developed to test mnemonic discrimination. We expect an association between the age-related differential functional decline of two distinct, modality-specific hippocampal pathways and white matter tract integrity measures representing the connectivity of these pathways in the MTL. These results demonstrate structural changes that may predict age-related decline in memory function and provide further evidence for the differential engagement of hippocampal pathways in episodic memory.

Keywords: hippocampus, episodic memory, diffusion tensor imaging, aging

Age-related decline in mnemonic discrimination of semantically similar phrases

Empirical study with results

Alex Ilyés (Doctoral School of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary; Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary; Brain Imaging Centre, Research Centre for Natural Sciences, Eötvös Loránd Research Network (ELKH), Budapest, Hungary), Borbála Paulik (Brain Imaging Centre, Research Centre for Natural Sciences, Eötvös Loránd Research Network (ELKH), Budapest, Hungary), Attila Keresztes (Brain Imaging Centre, Research Centre for Natural Sciences, Eötvös Loránd Research Network (ELKH), Budapest, Hungary; Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary)

Late adult decline of episodic memory is linked to the changing integrity of the hippocampus, which implements pattern separation, i.e., the orthogonalization of similar memory traces. Although semantic representations remain intact until later in life, it is an open question whether the decline of hippocampal computations affects navigating semantic spaces. We

investigated the effect of aging on mnemonic discrimination – a behavioural correlate of pattern separation – as a function of semantic similarity. Young adults (aged 20–30 years, N=40) and older adults (aged 65+ years, N=40) encoded adjective-noun phrases. Then, we assessed their ability to discriminate between repeated, semantically similar, and novel phrases. Increased semantic similarity made mnemonic discrimination harder and young adults performed better overall. We found an age × semantic similarity interaction predicting discrimination for highly similar phrases, independent of other cognitive abilities and phrase properties. These results suggest that age-related changes in hippocampal computations affect retrieval amodally.

Keywords: semantic memory, hippocampus, pattern separation, mnemonic discrimination, lifespan psychology