The 10th Conference on Cognition Research of the Israeli Society for Cognitive Psychology – Akko (2023)

Tuesday, February 14th

11:30 - 12:30 Registration and light lunch (provided by hostel)

12:30 - 14:10 Talk Session 1 (3 parallel sessions in rooms A, B and C)

Room A: Symposium 1: A Multifaceted View on Speech Perception (Organizer: Boaz Ben David)

12:30- 12:50	Speech in adverse listening conditions: exploring brain states and traits to find targets for neurofeedback and neurostimulation to enhance speech comprehension *Alexis Hervais-Adelman* University of Zurich, Switzerland
Listeners processing speech in adverse listening conditions display great individual differences in their ability to comprehend spoken targets even with matched hearing levels. I will present recent work using MEG and EEG that seeks to find the neural basis of these differences by exploring the role of inter-individual differences in resting state brain networks and intra-individual variability in pre-stimulus brain states for degraded speech recognition. Results indicate that word-in-noise recognition ability is related to individual differences in resting state activity in left auditory cortical areas, and that prestimulus activity in the alpha band (8-12Hz) reflects a suppression mechanism that may be helpful in improving the recognition of speech in noise. I will discuss how the patterns of brain activation that appear beneficial for speech comprehension in these investigations provide the basis for ongoing work that aims to use non-invasive electrical stimulation and individualized neurofeedback to enhance comprehension of acoustically challenging speech.	
12:50-13:10	The impact of face masks on auditory perception and cognition *Vered Shakuf [1], Yaniv Mama [2], Daniel Blum [1], Oria Appel [2] Leora Levy [1], and Daniel Algom [1,3]* [1] Achva Academic College; [2] Ariel University; [3] Tel Aviv University
The COVID-19 pandemic affected billions of people worldwide, producing long-term changes in lifestyle and habits. Although almost all COVID-19 restrictions were lifted, it looks like many are still using face masks due to regulations (e.g., in clinics and hospitals), health status, or a fear of infection. The use of masks is prevalent among populations who experience communication difficulties and in places where correct comprehension of the auditory message is of great importance. Studies show that wearing a face mask alters several of the acoustic properties of the speaker's voice and impairs speech intelligibility. In a set of studies, we tested the effect of these changes on several aspects of auditory and speech perception and, in turn, attention and performance. Our results show that while the effect of face masks on some aspects of auditory perception, like voice recognition, was minimal, it had a profound effect on word processing time and, in turn, on cross-modal orientation of spatial attention. We will further discuss the implications of these findings for the understanding of the processes underlying the perception of degraded auditory input.	
13:10-13:30	"They that sow in tears shall reap in joy" how older adults use spoken semantic context: effects of aging and cognitive load on eye-movements and pupillometry

	Boaz Ben-David [1], Tami Harel-Arbeli [1, 2], and Yuval Palgi [2] [1] Reichman university; [2] Haifa University
Older adults use spoken context at least as efficiently as young adults. Context use is based on cognitive resources that decline with aging, which may pose a conundrum. We tried to shed light on this question, testing age-related differences in the use of context and the cognitive demands associated with it. Eye movements were examined as 30 young (18-30 years old) and 30 older adults (60-75 years old) listened to spoken instructions to touch an image on a monitor. The predictability of the target word was manipulated: non-predictive, predictive, or predictive of two images (competition). In tandem, listeners were asked to retain 1 or 4 spoken digits (low or high load) for later recall. Results indicated that:1) processing context (predictive sentences) called for more cognitive resources than processing non-predictive sentences (as indicated in the statistical analysis by load effects); 2) context processing (with or without competition) was more cognitively taxing for older than young adults (as indicated by age-group and load interactions); 3) semantic competition reduced target-word predictions for older adults more than for young adults (as indicated by an age-group effect); 4) predictive context erased the aging-related increase in the cognitive toll associated with word processing. (no significant age-group and load interactions). Taken together, ageing-related effects in the rate of processing semantic context and associated cognitive cost disappear as the predicted word unfolds in time.	
13:30-13:50	On the predictive value of visual and auditory stroop performance for speech in noise perception *Antje Heinrich* University of Manchester, UK
Inhibitory control is an important component of cognition, enabling an individual to focus on appropriate targets while suppressing distractions and prepotent responses. One situation for which inhibition of irrelevant sound is particularly important is speech-in-noise perception. Conceivably, individuals with a better ability to suppress irrelevant sound will also be better placed to comprehend speech in noisy environments. The ability to inhibit irrelevant information declines with age, and this change could provide part of the explanation for age-related changes in speech-in-noise perception. The Stroop task has long been considered an effective measure of inhibitory control, yet its correlation with speech-in-noise perception has been variable. In its classic format, the Stroop test is a visual task, although auditory versions have been developed. Often, the implicit assumption is made that tests in different modalities still measure the same underlying concept. This study tested this assumption by examining 1) the correlation between auditory and visual versions of the Stroop task and 2) whether performance on auditory and visual Stroop tasks differ in their predictability of speech-in-noise perception. One challenge with any auditory version of the Stroop task is that is it less clear how contrasts between dimensions can be created. The current study used two different versions of an auditory Stroop as well as the classic visual Stroop task and compared the predictability of performance on each of these Stroop tasks for speech perception in noise and babble in young adults. The results showed that performance on the visual Stroop task was not predictive of speech-in-noise perception under any condition. Performance on one version of the auditory Stroop task (but not the other) predicted speech-in-noise performance of both noise and babble but only when intelligibility overall was reasonably high. As a next step older adults will be tested on the same task.	
13:50-14:10	Intonation units in spontaneous speech evoke a neural response beyond speech acoustics *Maya Inbar, Shir Genzer, Anat Perry, Eitan Grossman, and Ayelet N. Landau* The Hebrew University of Jerusalem
Spontaneous speech is produced in chunks called Intonation Units (IUs). IUs are defined by a set of auditory cues and are present cross-linguistically. Linguistic theory suggests that IUs pace the flow	

of information and serve as a window onto the dynamic focus of attention in speech processing. IUs provide a promising handle for studying the neural mechanisms of communication thanks to their unique cross-linguistic pertinence and consistent temporal structure across different grammatical and socio-cultural conditions. We identify a neural response unique to the boundary defined by the IU. This response is independent of the acoustic boundary strength, which suggests that it contributes to neural speech tracking in the delta band even in the absence of prosodic modulations. We measured the EEG of participants who listened to different speakers recounting an emotional life event in Hebrew. We analyzed the speech stimuli linguistically, and modeled the EEG response at word offset using a GLM approach. Words were categorized as either IU-final or IU-nonfinal. Additionally, we quantified an acoustic-based measure of prosodic boundary strength. We find that the EEG response to IU-final words differs from the response to IU-nonfinal words over and above the expected response for a given acoustic boundary strength. To the best of our knowledge, this is the first time this is demonstrated in spontaneous speech under naturalistic listening conditions, and under a theoretical framework that connects between the cross-linguistic prosodic chunking of speech and the flow of information during communication.

Room B: Consciousness

12:30-12:50	Can perceptual completion take place in the absence of visual awareness? *Ruth Kimchi, Dina Devyatko, and Shahar Sabary* University of Haifa

Objects in our environment are often partly occluded by other objects or by themselves, yet we perceive a coherent scene filled with complete objects. The visual system apparently fills in the missing parts – a process that is referred to as amodal completion – based on figural information at or near the occlusion boundary (local completion) or on whole shape regularities (global completion). We investigated the involvement of visual awareness in amodal completion, and specifically, whether visual awareness plays a differential role in local versus global completion, using a primed shape discrimination paradigm and the Color-Opponent Flicker technique to render the prime invisible. In three experiments, participants were presented with a partly occluded prime followed by a clearly visible target. For each prime local completion (based on good continuation) and global completion (based on object symmetry) diverge into different shapes. The target corresponded to the shape that could arise from a local or a global completion of the prime. For each experiment with an invisible prime we conducted a version with a visible prime. Results showed no completion, local or global, in the absence of visual awareness for occluded prime that generated multiple completions when visible. Local completion was observed in the absence of visual awareness for occluded prime that generated a single, local completion. No indication of unconscious global completion was observed. Taken together, these results point to two factors that appear to be involved in unconscious amodal completion and need to be disentangled: global vs. local completion and multiple completions.

12:50-13:10	Is predictive processing involved in priming of visual awareness across the visual field? *Tim Gastrell and David Carmel* Victoria University of Wellington, New Zealand

Predictive processing suggests that our experience of the visual world is determined by precision-weighted combination of prior expectations with available sensory data. Here, we tested whether the influence of priors on awareness of ambiguously rotating spheres could be modulated by sensory precision. In our first experiment we induced priors for rotation direction by presenting an unambiguously rotating sphere and measured its influence on awareness once the sphere transitioned to ambiguous rotation. Consistent with precision weighting, we found that observers'

awareness of ambiguous spheres was less biased towards the prime when spheres were presented to peripheral vision, where sensory precision is low, compared to foveal vision. In a second experiment, we aimed to verify that this effect was driven by top-down expectations, by moving spheres between the two eccentricities as they transitioned from unambiguous to ambiguous rotation. However, under these new conditions the effect disappeared, suggesting that contrary to precision-weighting, other factors specific to each location in the visual field were responsible for the original effect. In a third experiment we replicated the original effect and investigated whether spatial differences in visual motion adaptation might explain it. We indeed found stronger adaptation to visual motion for peripheral compared to fixated stimuli. However, this effect was not predictive of the effect of visual eccentricity on primed awareness, suggesting some other mechanism must be at work. We consider the implications of these results for predictive processing theories of awareness and propose how future work may isolate the mechanism/s behind this novel effect.

13:10-13:30	Meta analysis of unconscious semantic processing *Maor Schreiber, Adi Sarig, and Liad Mudrik* Tel Aviv University

The extent and scope of unconscious semantic processing is yet to be agreed upon. Studies of unconscious semantic processing have yielded conflicting findings, leading some researchers to argue in favor of such processing, and others to doubt its existence. A possible cause for this mixed pattern of result is the variety of methods used in the field, pertaining mainly to the way stimuli are suppressed from consciousness, and the way subjects' awareness of the stimuli is assessed. The influence of this heterogeneity has not been quantitatively assessed yet in a comprehensive manner. Here, we conducted a wide-scale meta-analysis (with 136 papers in which 741 effects were reported) in an attempt to determine whether unconscious semantic processing is a robust phenomenon, and how it might be modulated by the methodological choices of the researchers. A main effect for unconscious semantic processing was found, suggesting that semantic processing indeed occurs in the absence of awareness. However, evidence for publication bias as also found. In addition, methodological factors relating to the suppressed stimulus, to the type of the awareness measure and to the experimental task were found to moderate the results. The results thus call for further reexamination of semantic processing without awareness, in future experiments that take these moderators into account.

13:30-13:50	Consciously aware learning? Monkeys, fish, and machine learning *Moshe Shay Ben-Haim [1,2], Ashael Raveh [3], Shai Gabay[3], and Ran Hassin [2]* [1] Yale University; [2] The Hebrew University of Jerusalem; [3] University of Haifa

Animals show complex learning behaviours, yet how can we tell if such impressive learning behaviours are accompanied by conscious awareness in those who cannot report it? We argue that learning to associate stimuli with a non-dominant response is principally difficult, if not impossible, without awareness (in humans, at least under the conditions we used for several hundred trials), and thus it creates a unique opportunity to reliably separate conscious from non-conscious learning. We present our recent findings applying this approach in humans and rhesus monkeys (Ben-Haim et al, PNAS, 2021), as well as preliminary data for learning of non-dominant response associations in the archer fish. We also present a novel machine learning hierarchical clustering approach to segregate performance of aware human learners with those of unaware human learners next to (unlabeled) animal learning data. The results of this trial sensitive analysis support the clustering of animal learners next to aware human learners, rather than unaware human learners.

13:50-14:10	Linking the temporal resolution of experience to the anatomy of consciousness *Gal Vishne [1], Edden M. Gerber [1], Robert T. Knight [2], and Leon Y. Deouell [1]*

	[1] The Hebrew University, Jerusalem, Israel; [2] University of California, Berkeley, United States
Two riddles plague the scientific quest for consciousness: First, what is the temporal resolution of experience? Consciousness is often likened to a stream, with contents continuously flowing in and out of awareness. Yet, this intuitive understanding is challenged by behavioral findings, and particularly, postdictive effects, which suggest we experience the world in discrete temporal packets. Second, what are the anatomical underpinnings of consciousness? Most notably, are they localized to the back or the front of the brain? These questions are commonly studied in isolation; however, we show they are deeply intertwined. We analyzed intracranial recordings from ten patients undergoing epilepsy surgery while they viewed passively diverse images in multiple durations. Taking advantage of the high spatial resolution of ECoG, we apply population state-space approaches, inspired by animal physiology. Posterior sensory regions (occipital and ventral-temporal cortex) showed rich and highly dynamic population responses. Yet, within this variability, we find a stable representational subspace, affording a temporally-invariant readout of visual category and exemplar-level information, which was available continuously throughout stimulus presentation. Thus, representation in posterior regions corresponds to a continuous view of temporal experience. Importantly, prefrontal and parietal cortex also showed significant visual representation, which was confined to the onset response, in accordance with a discrete change-based view of time-consciousness. In conclusion, while our results do not provide a unique solution to these puzzles, they show time phenomenology and the neural correlates of consciousness inform and constrain each other, thus illuminating a hitherto unidentified duality between the when and where of consciousness.	

Room C: Development & ADHD

12:30-12:50	Executive functions in young children with genetic syndromes of intellectual disability: a neglected field *Yael Landau* The David Yellin Academic College of Education, Jerusalem
Executive functions (EF) and their centrality in pre-school children are a topic of increasing interest both in typically developing children and in children with developmental disorders. EF have been associated with the prefrontal cortex, one of the regions in the cortex found to be more dependent on heredity than others. Thus suggesting the centrality of impaired EF in the trajectory of children with genetic syndromes. Moreover, often clinicians note a gap between expected level of functioning and the actual level in children with genetic syndromes. The questions addressed in this study were if deficient EF are the basis of this gap, and if this gap differs from syndrome to syndrome. Fifty-eight children were studied with a comprehensive neuropsychological battery, twenty-nine in the clinical group (mean mental age = 50.94 ± 11.97 months): (twelve children with Prader-Willi syndrome and seventeen with Down syndrome) and twenty-nine children in the comparison group case matched by mental age, sex and socio-economic status (mean mental age = 53.63 ± 11.25 months). The results confirmed the central hypothesis that children with genetic syndromes of intellectual disability (ID) display significant deficits in EF when compared to the mental age-matched comparison group. Our study also confirms the hypothesis that the gap between mental age and level of executive functioning varies from syndrome to syndrome. The main theoretical and practical ramifications of this study are in elucidating the role of EF in genetic syndromes of ID and deemphasizing the major focus on the intellectual functioning of these populations.	
12:50-13:10	Global vs. local processing in adhd – evidence from the auditory domain *Aviv Akerman Nathan, Amit Etkovitch, and Eyal Kalanthroff*

	Hebrew University of Jerusalem
The cognitive mechanism of processing stimuli and information is often divided into global and local characteristics. In visual tasks, the seminal work of Navon and others has shown that we tend to process the global dimension prior to the local one. In recent years, evidence indicates that individuals with attention-deficit/hyperactivity disorder (ADHD) do not pose the "Navon effect", in other words, they lack this global precedence. Music can be spatially and temporally hierarchically organized in timescales and subdivisions, allowing us to investigate levels of processing. In the current study, we investigated the cognitive attentive process in ADHD through the auditory domain. ADHD and non-ADHD controls were asked to listen to 160 melodic-like musical tunes, in two blocks (global or local). Each "melody" consisted of 9 tones grouped to form 3 triplets of notes. Participants had to determine whether the triplets or the melody is "ascending" or "descending". These patterns were manipulated so there were congruent or incongruent conditions. The control typically-developed group showed only the local congruency effect ("Navon effect", as demonstrated in previous visuospatial tasks), while the ADHD group showed a similar congruency effect for the global and local tasks, indicating a lack of automatic global bias. These results indicate the global processing bias is not limited to the visuospatial modality and is likely to reflect a deeper and broader cognitive processing style. Furthermore, a lack of global processing bias might play a crucial role in the ADHD phenotype.	
13:10-13:30	Disentangling shared and distinctive effects of ASD and ADHD on neurocognitive functions *Einat Ken-Dror [1], Einat Avni [2], Ditza A Zachor [1,2], and Lilach Shalev Mevorach [1]* [1] Tel Aviv University, Israel; [2] Shamir Medical Center
Disentangling Shared and Distinctive Effects of ASD and ADHD on Neurocognitive Functions Background: Autism Spectrum Disorder (ASD) and Attention-deficit/Hyperactivity Disorder (ADHD) share some neurocognitive deficits and their comorbidity is highly rated. Previous studies on attention and executive functioning reported deficits among these clinical groups, however, results were inconsistent. Objectives: The present study aimed to reveal the effects of ASD, ADHD and the interaction between them on attention and executive functioning, using a factorial design. Method: The sample included a total of 89 boys aged 8–11-year-old:13 ASD, 24 ADHD, 27 ASD+ADHD and 25 neurotypical participants. Four neurocognitive functions were examined: Sustained Attention; Inhibition; Verbal and Spatial Working Memory; and shifting. Results: Sustained attention was significantly influenced by ADHD and ASD independently only in SD-RTs, yet omission errors were significantly influenced only by ADHD. Inhibition was significantly influenced only by ADHD whereas Verbal and Spatial WM were significantly influenced only by ASD. Interestingly, shifting was significantly influenced by the interaction of ASD *ADHD. Conclusions: Shared effects of ASD and ADHD were obtained only in one measure of sustained attention; a distinctive effect of ADHD was obtained in inhibition whereas a distinct effect of ASD was obtained on WM. The decreased ability in shifting in children with ASD and ADHD seems to be amplified by poor sustained attention. Our findings emphasize the importance of careful neurocognitive evaluation assessing children with ASD and/or ADHD, and the importance of understanding the intricate challenges they are facing.	
13:30-13:50	Father-infant brain-to-brain synchrony and the role of paternal chemosignals *Linoy Schwartz, Yaara Endevelt- Shapira, and Ruth Feldman* Reichman University
Father involvement in childrearing has markedly increased over the last few decades and the paternal contribution to child's development and well-being become an important area of research. Father-infant interactions differ from those of the mother and involve more energy, stimulatory contact, play, and exploration compared to the lower-arousal safety-signaling mother-infant interactions. Both patterns of interactions are suggested to play a crucial role in tuning the	

developing infants' brain to the social world. However, while the mechanisms by which mothers form interbrain synchrony with their infants has been explored, little is known about the mechanisms of father-infant interbrain synchrony during the sensitive maturational period of the social brain. Building on our previous study, which shows that maternal body odor (BO) serves as safety-promoting signal facilitating interbrain synchrony, the role of the father's chemosignaling remains unknown. This study is the first to evaluate neural and behavioral synchrony between fathers-infants and the effect of paternal BO on infants-strangers interactions. Utilizing ecological paradigms and dual-EEG recording, neural and behavioral synchrony were examined between father-infant and stranger-infant pairs. The interactions with strangers included those with and without the presence of the father's BO. Results indicate that interbrain synchrony emerged while infants were exposed to the father's BO, suggesting that paternal chemosignaling plays a role in facilitating the infants' ability to form bonds outside of the familial unit. Our results shed new light on the role of the fathers in tuning the infants' brain to form new real-life bonds within social groups.

13:50-14:10	White matter properties in fronto-parietal tracts predict functional activation and behavioral performance in response inhibition in ADHD *Tamar Kolodny[1,2], Daniel Smullen[3], Andrew P. Bagshaw[3], Shlomit Tsafrir[4], Lilach Shalev[5], and Carmel Mevorach[3]* [1] University of Washington, Seattle; [2] The Hebrew University of Jerusalem, Jerusalem, Israel; [3] University of Birmingham, UK; [4] Clalit Health Services, Israel; [5] Tel-Aviv University

Reduced ability to suppress inadequate but prepotent responses is of the most prominent characteristics of individuals with ADHD. Response inhibition is executed via fronto-striato-parietal networks. We have previously shown that functional connectivity between the intraparietal sulcus (IPS) and the inferior frontal gyrus (IFG) during inhibitory load is scaled with ADHD severity, suggesting deficient top-down control as the culprit in ADHD. In the current study, we tested a possible source for this maladaptive functional connectivity: changes to the underlying structural substrate of the white matter pathways connecting the IPS with the IFG. 49 young adults with ADHD and 25 neurotypicals participated in this multi-modal study. Participants completed diagnostic interviews, neuropsychological tasks, self-report questionnaires and structural, functional and diffusion-weighted MRI scans. A Go/No-go task with target frequency manipulation was used to assess response inhibition performance and to pinpoint inhibition-related activation in fMRI. Seed-based probabilistic tractography was performed on the diffusion data to delineate white matter tracts connecting bilateral IFG and IPS, and assess microstructural properties of these bundles. We show that individual differences in structural properties of the IPS-IFG circuit, including tract volume and diffusivity along various axes, predict both fMRI activation and behavioral response inhibition task performance. The results reveal the structural basis of functional top-down control and support maladaptive connectivity as a mechanism of deficient inhibition in ADHD. Our findings force the point of treating ADHD as a continuum, and point to the potential of individual differences in tract-specific functional and structural connectivity properties as neuromarkers of ADHD.

14:10 – 16:00 Poster Session 1 (and coffee break)

Posters 1-33: Main Lobby

Numerical Cognition I

1	A pure syntax of multi-digit numbers in the absence of lexicon and semantics *Dror Dotan, Noa Handelsman, Anan Yablonko, and Legal Yariv* Tel Aviv University

A key characteristic of human cognition, hypothesized to be unique to humans, is our ability to represent complex cognitive structures as a set of syntactic relations. In the numbers domain, such syntactic representations are essential to our ability to handle multi-digit numbers. However, we still have little understanding of the precise nature of the core syntactic representation of numbers. The current study examined whether the core syntactic representation of numbers can be generated independently of semantic and lexical representations. Participants repeated sequences of number-like nonwords- either grammatical, i.e., their morpho-syntactic structure was congruent with a whole number ("palir hundred tugumty-bab"), or non-grammatical, i.e., their morpho-syntactic structure was segmented ("bab, tugumty, palir-hundred"). Repetition accuracy was higher for grammatical sequences than for non-grammatical ones. This effect, which mirrors similar findings with real numbers, indicates that when a sequence was grammatical, the participants represented its syntactic structure, and used this representation to merge the nonwords into chunks in short-term memory, thereby improving memorization. Because the stimuli were nonwords, the findings entail that the syntactic representation can exist even in the absence of semantic and lexical representations; and it can be generated even without a number lexicon, merely based on the morpho-syntactic cues in the verbal stimulus. This fits the view of syntax as a set of separate cognitive processes, independent of semantics.

2	Why is it difficult to multiply? The types of learning disorders that impair multiplication table knowledge *Maayan Boguslavsky and Dror Dotan* Tel Aviv University

A main mathematical skill learned in elementary school is the ability to remember arithmetic facts, such as the multiplication table, and to retrieve them from long-term memory without relying on calculation strategies. This is a big challenge, which creates considerable difficulty for many children. Nevertheless, to date, the origins of this difficulty were not examined systematically, certainly not while considering that these origins may be different for different children.
Here, we examined the origin of difficulty for 19 adults with poor multiplication-table knowledge. We considered cognitive origins – long-term memory, short-term memory, working memory, proactive interference, and attention disorder; emotional origins – general and math anxiety; and a pedagogical origin – insufficient learning during primary school. We identified the origin of difficulty for each of the participants. They were very heterogeneous: no single origin accounted for the difficulty of all participants – not even for most of them. Cognitive impairments accounted for the difficulty of 12 participants, with no single predominant impairment; anxiety (mainly math-specific) accounted for 12 participants; and insufficient learning accounted for 7. This emphasizes the complexity of multiplication-table learning; the heterogeneity of poor multiplication- table knowledge, a form of dyscalculia; and the importance of precise assessment – cognitive, emotional, and pedagogical – if we are to provide optimal, personalized treatment. It also shows that dyscalculia does not necessarily originate in impaired mathematical domain-specific mechanisms, but may arise from domain-general impairments in memory and attention.

3	The role of spatial working memory in arithmetic problems in adults *Joanna Marjieh-Abu Samra and Tali Leibovich-Raveh* University of Haifa

Adults solve simple addition and subtraction problems mentally daily, to calculate tips, make sure they carry enough cash in their wallets, etc. Therefore, it is important to understand the cognitive underpinnings of this ability. Previous studies found a relationship between working memory (WM) and arithmetic. There is also evidence for different neural processes that are involved specifically in mental addition and subtraction. However, most studies included children. To fill this gap, we asked whether mentally solving addition and subtraction problems require different WM resources in adults. Adults performed a WM/arithmetic dual task where they first memorized the location and color of three (i.e., low load) or six (i.e., high load) items in the picture, and then saw an addition or subtraction equation (e.g., 34+40=74) and decided whether it is correct or not. Next, they saw one of the items from the WM picture and decided if the item was in the same position and color as in the original picture. The results demonstrated that high WM load reduced accuracy rates, but only for subtraction problems. This suggests that in adults, spatial WM is required more for mental subtraction than for solving mental addition problems.

4	Measuring executive functions in general and specific middle-school level geometry context *Hissen Ghadban, Leah Nachmias, and Tali Leibovich-Raveh* University of Haifa

Executive Functions (EFs) are a set of cognitive abilities allowing us to function appropriately in our everyday lives. EFs are also critical for formal learning and specifically for mathematics. Such studies usually employ cognitive tasks in a general context to evaluate EF (e.g., color-word Stroop task to measure inhibition, or a backward letter span to study working memory [WM]). We asked whether it is possible to measure EF in a context-specific manner and whether the specific context and the general-context measures correlate. Adult participants solved middle-school level geometry problems that we have devised (i.e., EFGT). Each problem required mainly inhibition, working memory, or task switching. Then they performed general-context EF tasks. The results revealed a correlation between total accuracy in the EFGT task and inhibition and spatial WM. In addition, we also found specific correlations between the same EFs measured in specific and general contexts for inhibition and WM. This study demonstrated the importance of EFs to middle-school level geometry and the differences and similarities between studying EFs in general and specific contexts. The advantages and limitations of the EFGT tool that measures EFs in a specific geometric context are discussed.

5	Number line estimation *Hanit Galili, Avigail Langer, and Avishai Henik* Ben-Gurion University of the Negev

In number line estimation tasks, participants are presented with a number (e.g., 435) and asked to estimate this number position on a line between 0 and 1,000 (0 and 100 for young children or 0 and 1 for fractions). Researchers have suggested that this task captures participants' intuitions regarding numbers and their magnitudes. Accuracy on this task, which correlates with math achievement, was higher at specific orientation points (e.g., ends or middle of the line) and for integers than for fractions. We reasoned that the different estimation requirements, for different orientation points and fractions compared to integers, entail different needs of mental manipulation and attention. For example, positioning a number close to one end of the number line might require choice among a small number of alternative positions. In contrast, a number that is distant from an end might require contrasting and weighing more alternatives. However, an opposite expectation might be supported by assymetric eye-movements and fixations (longer and more frequent fixations at orientation points than other points along the line). We examined these expectations in experiments that measured pupil changes. The pupils dilated while participants

prepared to respond. In addition, the pupils were larger at the orientation than other points along the line. This pattern of results suggests that more mental attempts or weighing of alternatives might be required in cases of numbers closer to the ends.

Body processing

6	The embodied sense of agency: an EEG study *Amit Regev Krugwasser, Reina van der Goot, Geffen Markusfeld, Yair Zvilichovsky, and Roy Salomon* Bar-Ilan University

The subjective experience of being in control over one's actions is referred to as having a 'Sense of Agency' (SoA). It has been suggested that SoA relies on an internal comparator mechanism, whereby predictions about the behavior of the motor system are compared to the actual sensory consequences of the performed action. Some have suggested the existence of two distinct processes, an early implicit and a late explicit component, in the formation of SoA. Even though SoA is fundamental to our interactions with the external world and the construct of the self, its underlying neural mechanism remains elusive. In this pre-registered EEG study, we used time-frequency and multivariate pattern analysis to investigate the electrophysiological characteristics associated with SoA. Using an established virtual-reality task, visual feedback of a finger movement was modulated to study the (mis)match between the expected and actual sensory feedback, using both anatomical and spatial virtual hand alterations. In accordance with our pre-registered hypothesis, we found that a reduced SoA is associated with decreased attenuation in the alpha frequency band. More so, we show that reduced SoA trials can reliably be decoded from baseline trials with up to 68% accuracy starting around 200 ms after movement onset. Cross-decoding analyses revealed similar neural patterns between reduced SoA conditions at a later processing stage starting at 500 ms after movement onset. Together, our results identify and characterize reduced alpha attenuation as a cortical signature of loss of SoA and provide evidence that further support the multi-level formation of SoA.

7	Unreal? Investigating cardiac responses to deviations from sense of reality *Oded Hirsh, Gadi Drori, Paz Bar-Tal, Yair Zvilichovsky, and Roy Salomon* Bar-Ilan University

The Sense of Reality (SoR) is the feeling that our perceptions reflect the actual environment. Distortions in SoR are diagnostic criteria for numerous neuropsychiatric and neurological disorders. While perception of reality is an important element in defining mental and neurological health, we do not have a good understanding of its underlying cognitive and neural processes. When SoR is challenged (i.e. we undergo strange experiences diverging from our typical world model), neurophysiological responses that resemble the response to surprise or uncertainty might appear. Therefore, it is interesting to research physiological and interoceptive mechanisms underlying SoR. In this study we employed a custom virtual reality environment (UnReal) that allows to experimentally manipulate aspects of visual reality and create Virtual Hallucinations. These manipulations are representative of three conceptual domains: Perceptual changes- visual appearance of the scene is manipulated; Laws of nature (e.g. alterations of Time and Gravity) and changes of self, represented by conflicts between visual signals and self-related information. These domains are hallmarks of the phenomenology of hallucinations in psychedelic, neurological, and psychiatric states. In this work we present exploratory results of 26 subjects, from which we recorded cardiac and respiratory signals and collected their subjective reaction to the different manipulations. Preliminary results indicate of unique modulation of subject's heart-rate in response to each of the three domains. This cardiac activity was found to be coherent with the

subjective nature of the different domains. These results can be a first step towards understanding the connection between explicit and implicit mechanisms underlying SoR.

8	Beliefs about body's immunity are associated with daily experience of physiological symptoms *Hodaya Adelman and Liron Rozenkrantz* Bar-Ilan University

We recently showed that people's beliefs regarding perceived illness susceptibility (PBI) predicted the experience of COVID-like physical symptoms (1). In the current study we set two goals: First, we examined this effect in a wider context beyond COVID, and tested the association of PBI with daily experience of physical symptoms and daily function. Second, we assessed whether it is possible to change one's PBI by exposure to a short video explaining the function and effectiveness of the immune system. Method: We conducted a follow-up study of over 200 participants from our original study, and ran pilot exploratory analyses on N=30 (80% women, age 18+). Participants were asked to report their general physiological symptoms and daily functioning (using validated questionnaires such as PHQ-15 and FSQ). Next, participants were randomly assigned to either a video or a no-video condition, after which all participants reported their PBI. Results: We found that PBI is associated with experienced physiological symptoms ($r=-0.732$, $p<.001$), number of medical leave days ($r=-0.472$, $p=.01$) and daily functioning ($r=0.536$, $p=.003$). Additionally, no effect of the video manipulation on PBI was observed, though this should be re-tested in the larger sample size. We next plan to preregister the analysis plan and conduct on full sample size Conclusions: PBI, a novel scale we recently devised, is strongly associated with daily physical well-being. As beliefs about one's health are linked to actual symptoms experience (2,3), this scale may help predict the occurrence of physical symptoms and further inform belief-related interventions.

9	Heart-brain interactions predict emotion regulation selection *Lior Kritzman [1,2], Gal Sheppes [1], and Nava Levit-Binnun[2]* [1] Tel Aviv University; [2] Reichman University

Selecting an emotion regulation strategy when encountering an emotional situation depends on various factors, and doing so adaptively is integral to mental health and well-being. Interoception, the sense of the physiological condition of the body, has been associated with emotional experience and decision making, but has never been directly examined in the context of emotion regulation strategy selection. In two studies, we utilized the EEG heart-brain response (HBR), a neurophysiological measure of cardiac interoception, while participants performed an emotion regulation selection task. Participants were presented with emotional images in varying intensities, and had to select between distraction and cognitive reappraisal in order to regulate their emotions. In both studies, we found that the amplitudes of the first HBR positively predicted selection in distraction strategy, above and beyond the predictive value of images' intensity. In study 2, we extended the results and found that a later (i.e., the second) HBR positively predicted selection in cognitive reappraisal, above and beyond intensity and the immediate HBR amplitudes. These findings demonstrate the involvement of cardiac interoception in emotion regulation strategy selection and suggest that immediate and later interoceptive signals play a differential role in emotion regulation strategy selection.

10	The perception of body's immunity scale: development and validation *Nofar Mizrachi, Imad Rabah, Hodaya Adelman, and Liron Rozenkrantz* Bar-Ilan University

Objective: A growing body of research points to a possible link between how people perceive their health and their actual physiological and psychological health (1-5). The aim of the present study was to develop and validate a novel, short questionnaire to formally assess one's perceived body's immunity. Methods: In a pilot study, 26 healthy participants (50% women), aged 18-54, completed

an online-questionnaire consisting of demographic characteristics, the perception of body immunity (PBI) scale, and additional validated scales of experiences physiological symptoms, general perceived health, mental resilience, and health anxiety. Results: Principal Components Analysis showed that 14 out of 19 PBI's items loaded onto one factor, hypothesized to best represent the perception of the body's immunity. Internal consistency of 14-items PBI was high (=.868). Pearson correlation showed that PBI was highly correlated with general perceived health (r=0.67, p<0.01), and mental resilience (r=0.51, p 0.01), but less correlated with health anxiety (r=-0.30, p=0.135). In addition, the PBI was moderately correlated with actual physiological symptoms (r= 0.37, p= 0.06). Conclusions: These results indicate that the 14-items PBI has good reliability and validity in healthy populations. Specifically, people's perceptions of their body's immunity (e.g., to what extent their immune system can fight and handle diseases), was strongly associated with overlapping constructs of health assessment and mental resilience, and moderately related to distinct constructs of health anxiety.

Consciousness

11	Attentional and visual benefits of ocular-biofeedback training *Tchiya Ben Joseph [1,2], Ehud Ahissar [2], and Yoram Bonneh [1]* [1]Bar Ilan University ;[2]Weizmann Institute of Science

The visual system is based on multiple closed loops at different levels, some conscious and some hidden. Using the innovative technology of ocular biofeedback training, we seek to enable the subject to semi-consciously control a hidden loop in a virtual reality environment where her unconscious eye movements are consciously monitored via visual and auditory sensory channels. Our research is focused on examining the hypothesis that training of these semi-conscious processes in attention deficit population will alleviate some of these deficits. For this goal we developed a virtual reality setup with an environment that changes as a function to the subject's eye movements patterns, such as saccades, fixations and drift. We present here preliminary results of our setup, on healthy individuals.

12	Individual differences in response to invisible phobic-related stimuli *Eden Elbaz, Rony Hirschhorn, Gal Sheppes, Ido Tavor, and Liad Mudrik* Tel Aviv University

Unconscious processing of phobic-related stimuli has been extensively investigated and is still debated. Several studies have found behavioral and physiological evidence for such processing, including changes in eye movements, skin conductance, and heart rate variability. Yet others did not find any evidence for such processing. Importantly, most studies manipulated stimulus awareness in a two-dimensional environment, using highly artificial paradigms (e.g., using masking or Continuous Flash Suppression). Here, we investigated the existence and scope of unconscious processing of phobic-related stimuli in an ecological setup, using multi-trial inattentional blindness in a virtual reality setup. We further examined whether individual differences in cockroach fear levels were correlated with behavioral and physiological responses following the exposure. 30 healthy volunteers who varied in their fear of cockroaches (based on the Fear of Cockroach Questionnaire) participated. In the unaware condition, participants were instructed to follow one of three target balls as they drove through a city street. During this time, phobic-related (cockroaches) or control images (USB flash drivers) appeared on bus stops. In the aware condition, participants were instructed to ignore the target ball and concentrate solely on the bus stops. Participants' heart rate variability, and electrodermal activity (EDA) were assessed continuously as they performed both tasks. The results provided evidence of conscious perception of phobic-related stimuli, while a more complex pattern was observed for unconscious processing of phobic-

related stimuli. This study thus opens the gate for further investigations of such processing in an ecological setup.

13 Reexamining the functional significance of the readiness potential: does it index decision-making or anticipation?

Yarden Shir [1], Uri Maoz [2,3,4], Aaron Schurger [2] and Liad Mudrik [1]
[1] Tel-Aviv University; [2] Chapman University; [3] University of California, Los Angeles; [4] California Institute of Technology

The Readiness Potential (RP) is a well-known, highly replicated EEG component, mostly interpreted as an index of preparation for action and decision-making. In the context of the free-will debate, the onset of the RP prior to the reported conscious experience of deciding to move was taken as evidence against free will. Yet the RP is very similar to the Contingent Negative Variation (CNV), another EEG component, found when responding to a predicted cue, thus marking anticipation. This similarity might lead to a confusion, where studies reporting the RP might have actually probed the CNV. Notably, if the two components are not functionally distinguishable, they cannot be taken as distinct markers for the cognitive processes ascribed to them. Thus, it is crucial to test whether they are two distinct components. This has yet to be carried out in a paradigm that minimizes potential confounds. Here, we directly compare self-initiated movements with cued responses – a typical control condition in RP experiments. However, cued responses were either predictable or abrupt, providing overall 3 experimental conditions with similar paradigms (within-subject design, N=20). As expected, an RP and a CNV, respectively, were found for the first two conditions, and neither was found for the last condition. However, the CNV had a larger amplitude than the RP, indicating that the RP and the CNV index different cognitive processes. Nevertheless, as the two components share many features, special care should be taken not to confound or confuse the two in future studies.

14 More than words - examining free reports as tools to assess the richness of perception

Rony Hirschhorn and Liad Mudrik
Tel Aviv University

How rich is our conscious experience? We feel that we experience the world in great detail, yet whether this is indeed the case is actually widely debated. While some researchers hypothesize that conscious experience is rich and detailed, others claim that experience is coarse and sparse. Despite the increasing diversity of paradigms in experimental cognitive psychology, this question remains unanswered. Recently, a novel method has been suggested to demonstrate that a brief experience of a scene is nevertheless a rich, detailed one (Chuyin et al., 2022). In this paradigm, subjects were asked to freely report words describing their experiences. The authors created a metric ("Intersubjective Agreement"; IA) that quantifies the uniqueness of words in describing a specific image. They concluded that this metric demonstrates that experience is rich and detailed even when brief. In two experiments, we challenge this interpretation and examine whether this reliance on verbal reports is fitting when used as a tool to assess the richness of conscious experience. We show that both detailed and degraded experiences score high in the IA metric, despite yielding experiences that differ in their perceived richness.

15 Transferring predictions from one visual cue to another in implicit learning

Felice Tavera and Hilde Haider
University of Cologne

When we process stimulus characteristics and our motoric response, we integrate them to have a coherent episodic representation of the event – an event file. In this study, we tested a prediction derived from the event file hypothesis that learning contents can be transferred from one visual feature to another if the features have been bound together in an event file. We did so in an implicit learning paradigm, because there are conflicting theoretical assumptions on whether such

integrative processes should be possible in the absence of awareness. We used a visual search task in which three out of six distractor shapes predicted the target position in a learning phase. In the transfer phase, three out of six distractor colors predicted the target position. In a pre-learning phase, in the experimental condition, each of the six shapes had been bound to a color. In the control condition, the shapes had been associated with meaningless spatial positions. We found that in both conditions, response times to the target in a predictable position was faster than to an unpredictable position. But only the experimental condition showed a transfer effect when the distractor shapes were replaced with colors. The associations of shapes and colors with target positions remained implicit. We discuss these findings against the background of consciousness theories and the event file hypothesis.

16 Hearing without listening - semantic determinants of speech selection to consciousness

Gal R. Chen, Leon Y. Deouell, and Ran R. Hassin
The Hebrew University of Jerusalem

The study of unconscious processing usually examines conditions where subliminal, undetected stimuli influence behavior or neural responses. While major advances were made in recent decades, the field remained focused on the visual modality, which limits the conclusions to visual unconscious perception. Few studies examined unconscious speech perception, and those who did relied on the degradation of the auditory stimulus and did not find evidence for semantic processing. Here, we examine the selection to consciousness of undegraded spoken words in a newly developed paradigm that relies on inattentional deafness under cross-modality dual tasks. Our paradigm included a primary visual task while a stream of pseudowords was played in the background. A secondary task was answering subjective and objective questions regarding real Hebrew words that were embedded in the stream. We show that under those conditions, subjects could miss a substantial amount of the task-relevant spoken words, which were validated to be completely audible and not subliminal. Importantly, our analyses revealed a consistent and highly replicable influence of word valence on selection to awareness, which dissociated from the influence of valence when subjects were attentive to the words without performing a dual task. The effect held when controlling for possible confounds. This study highlights the importance of relying on undegraded and relevant stimuli to studying consciousness, revealing that when performing a visual task, semantic information can influence the probability of consciously recognizing background speech.

17 Fulfilling expectations about stimulus depth inconsistently affects its emergence into awareness

Uri Korisky, Niv Cohen, Mor Farjun, Noa Kaner, Yael Solar, and Liad Mudrik
Tel-Aviv University

The scope of our (visual) consciousness is limited, so incoming perceptual information must be filtered upon entering awareness. One approach for better understanding this filtering mechanism, is to examine the time it takes different stimuli to emerge to awareness when suppressed by masking techniques. For example, studies have shown that stimuli which match our expectations overcome suppression more easily (e.g. upright faces vs. inverted ones). In previous works, we showed that actual, tangible objects placed in front of participants escaped “real-life” Continuous Flash Suppression (“real-life” CFS) faster than their 2D photographs, but only when these objects were familiar. In a series of carefully planned replication experiments, we asked whether this result might be explained by the expectation to perceive such stimuli in 3D as opposed to 2D form. The results further strengthened the finding of real objects overcoming suppression more easily than their photographs. However, a mixed pattern was found for stimuli which are commonly experienced in 2D - letters, words and logos - either showing no difference in suppression times or faster emergence of their 2D form. These results call for further inspection of

the role of expectations about depth in access to awareness, and also highlight the importance of replication attempts for novel findings, especially for complex and novel paradigms.

Development, perception

18	Improvements in oculomotor functions following optometric visual training during elementary school *Avi Portnoy [1] and Sharon Gilaie-Dotan [1,2]* [1] Bar Ilan University; [2] University College London, London, UK

We recently found that almost a third of a normative first grade class were classified as having oculomotor difficulties which were predictive of poor reading. It is unclear what treatments may help overcome these difficulties. Optometric vision therapy (OVT) is a non-invasive, non-medicated, individualized training program (>=12 1hour/weekly sessions, 15-min daily home exercises) administered by an optometrist aiming to address visual dysfunctions by enhancing awareness to visual input, improving precision of oculomotor responses and motor planning relative to them. Most studies on OVT's effectiveness for improving fixations and saccades focus on non-neurotypicals or adults. We retrospectively examined the influence of OVT performed by 17 optometric practitioners (performed or overseen by a certified optometrist) on oculomotor functions of 30 children (8 girls, 22 boys, 6-12yrs old). They were enrolled to OVT programs by their parents seeking treatment for visual-related learning difficulties despite normative visual acuity. Oculomotor functions were assessed pre- and post-OVT by the Developmental Eye Movement (DEM) test that has quantitative age-based norms. Post-OVT we found significant improvements in vertical speed ($Z=-2.9716$, $p=.00298$), horizontal speed ($Z=-3.8154$, $p=.00014$) and accuracy ($Z=-4.0495$, $p<.00001$). Oculomotor dysfunction (OMD) classification determined by DEM dropped by 40% post-OVT. Seven children were reassessed 1-36 months after finishing OVT. Whilst not all of them performed at age-appropriate levels, none were classified as having OMD, and all maintained improved horizontal oculomotor performance relative to pre-OVT. Our results suggest that during early school years OVT can significantly reduce oculomotor difficulties and may facilitate improving visual skills necessary for reading.

19	The development of linear time perception *Tamuz Ram On [1], Yaffa Yeshurun [1], Barbara Kaup [2], Rolf Ulrich [2] and Naomi Havron [1]* [1] University of Haifa; [2] University of Tübingen

Following the presentation of a visual stimulus, saccade rate (SR) is inhibited for ~100 ms and this inhibition is followed by a 'rebound' like effect and a slow return to baseline. Extensive evidence suggests that the extent of this modulation is affected by both top-down and bottom-up processing characteristics and reflects various cognitive processes in adults. Specifically, evidence suggests that object familiarity is linked to the magnitude of the SR rebound phase. Not much is known about the developmental trajectory of this SR modulation and whether it can be linked to the development of object recognition in infants and children. The goal of this preliminary study is to develop a prototypical experimental design that will be later used to examine the development of the post-target SR modulation and its link to object meaningfulness, in infants ages 3 to 12 months. Adult participants were presented with meaningful and unmeaningful (i.e. abstract) images, simultaneously with a varying auditory sound, while their eye movements were being recorded. The preliminary findings reveal a higher SR at the rebound phase for meaningful relative to unmeaningful images. This supports the use of this design for studying the development of object recognition mechanisms and their link to oculomotor processes in infants.

20	The role of word familiarity and crowding on letter recognition among adults and school-age readers *Adi Shechter, Shani Ben Aderet, Sivan Medina, David L. Share, and Amit Yashar* University of Haifa

Linear time perception is the capacity of viewing events in time as a part of a unidirectional line, where events are represented according to the time they last and their positions (Tillman et al., 2017). The directionality of an individual's linear time perception is likely the result of cultural constructions, such as the direction of the writing system used (Starr & Srinivasan, 2021; Tversky et al., 1991). Linear time perception is claimed to develop between three and nine years of age; however, most children succeed in these tasks from the age of five or six (e.g., Autry et al., 2020;Tversky et al., 1991). We test the performances of 3- to-5-year-olds in a task that is more adapted to children's abilities than previously used. The child is asked to order three pictures representing, for example, peeling an orange and eating it, and verbally describe the event.
We hypothesised that with age, both linear ordering and correct verbal explanation will increase. Moreover, we hypothesised that there will be more correct verbal responses than linear responses.The responses of seven participants have been coded and analysed. They show higher performance with age, regarding correct verbal explanations (three-year-olds: 30%, four-year-olds: 77%, five-year-olds: 69%) and linearity (13%, 46%, 83% respectively). 19 additional participants were tested but not yet coded. By February we expect to have tested and coded 15 more. Our preliminary findings suggest an increase in both the verbal and spatial aspects of linear time perception, with verbal ability preceding the spatial one.

21	Post-stimulus modulation of saccade rate and the development of object recognition: a preliminary study *Yael Ben Shalom and Shlomit Yuval-Greenberg* Tel Aviv University

According to Bayesian models of vision, perception is affected by incoming input (sensory likelihood) and past experience (perceptual priors). The influence of priors on perception is especially strong for ambiguous stimuli. In speed perception, previous studies in adults have demonstrated priors favoring low speed - ambiguous objects that are moving are judged as moving slower than their true speed (i.e., the Thompson effect). It is unclear if and how these priors change across development. Given that speed perception evolves along the lifespan, the use of priors may also differ between adults and children. Here, we examine how the prior for slow speed differs between young children (age~7) and adults (age>18). Participants viewed two drifting gratings – a standard with a speed of 2/sec and a test with higher/lower speeds. Participants performed a 2AFC speed discrimination task (i.e., which stimulus is faster). We examined speed perception (sensitivity measured in thresholds, and biases) in two conditions: (1) Same contrast: the test and the standard had the same low contrast (5%), allowing us to examine speed discrimination; and (2) Different contrast: the standard had lower contrast than the test (5% vs. 50% - standard more ambiguous), allowing us to examine the influence of the slow speed prior. Preliminary results show similar perceptual priors for both age groups. Thus, despite the difference in speed perception, children and adults tend to attribute a slower speed to stimuli who are sensory ambiguous. These results suggest that priors develop at a young age.

22	Speed perception and priors in children and adults *Omer Arielle Marom, Bat-Sheva Hadad, and Sarit Szpiro* University of Haifa

In vision, crowding refers to the failure to identify a peripheral item because it is presented along nearby items. Crowding hinders the identi?cation of basic stimuli such as letters and thereby, sets a critical limitation over reading. Studying crowding among novice and expert readers might lead to a better understanding of the perceptual processes involved in reading. Here, we asked whether and how word familiarity reduces crowding. The current study included three experiments in which participants were asked to identify a letter located at the periphery. The target could appear in isolation (uncrowded display) or flanked by two letters (crowded display). This arrangement created a Hebrew trigram, which could either be a word (i.e., למד) or a non-word (i.e., דמל). We used a staircase procedure in order to individually measure visual acuity (isolated letter font size) and critical spacing (trigram font size) using the same scale (font size). Experiment 1 (N = 14) and Experiment 2 (N = 14) were conducted among university students, whereas Experiment 2 (N = 48) included third graders. First, the smallest font size was found in the isolated letter condition. Second, we found a familiarity effect with larger font sizes for the non-words compared with the words. Importantly, the pattern of results was the same across all ages. Our results pointed to the impact of word familiarity on crowding among skilled adult readers and school age readers alike. They suggest that already at an early age, readers rely on context to overcome crowding.

Developmental disorders, ADHD and ASD

23	Computational modeling of value-based learning among individuals with attention-deficit/hyperactivity disorder *Gili Katabi and Nitzan Shahar* Tel-Aviv University

Attention-Deficit/Hyperactivity Disorder (ADHD) is a disorder with marked deficits in the ability to act in a persistent manner, allowing one to complete a daily task without losing interest or focus. Whether an individual is studying for a test, or doing homework, such everyday tasks require multiple actions to be made before the end goal can be obtained. A fundamental idea in computational reinforcement-learning is that the end value of task completion is mentally transmitted to initiatory actions (i.e., initiatory actions are actions that are taken in the beginning of the task and are distant in time from the end goal). Mental transmission of value from the end goal to initiatory actions, allows the individual to 'know' internally the value of actions that are distant in time from the desired goal. Despite the known difficulty of individuals with ADHD to act in pursuit of long-term goals, we are not aware of any study putting these state-of-the-art developments in reinforcement-learning modeling into use to study value-based mechanisms ADHD. Here, we use computational reinforcement-learning to explore value assignment to initiatory actions in ADHD. 60 undergraduate students (ADHD/TD) completed a sequential-decision task where they were asked to make each trial several actions to gain rewards. We then fitted a rescorla-wagner model allowing us to estimate in a continuous manner the ability of each individual to 'backpropagate' the value of an outcome from the end of a trial to initiatory actions. Results are discussed in light of current reinforcement learning theories in ADHD.

24	Investigation of the Bayesian view of perceptual decision making and meta-cognition in Autism *Laurina Fazioli [1], Bat-Sheva Hadad [1], Rachel Denison [2], and Amit Yashar [1]* [1] University of Haifa, [2] Boston University

Autism Spectrum Disorder (ASD) is a class of neurodevelopmental disorders that affect social interaction, communication, sensory processing, and other aspects of cognition and behavior. Although ASD research has traditionally focused on social cognition, alterations to sensory

processing are increasingly recognized as a core phenotype. Perceptual decision making lies at this interface, and influential theories propose a Bayesian decision-theoretic framework for understanding processing alterations in ASD. Yet perceptual decision making has received scant direct investigation. Here we ask two questions about Bayesian decision making in ASD. First, to what extent does perceptual decision making in ASD incorporate prior knowledge, sensory uncertainty, and reward? Second, to what extent does higher-level metacognitive decision making in ASD incorporate these three components? Two groups of participants [ASD and typically developed (NT)] performed an orientation categorization task. To test the Bayesian component, we manipulated stimulus probability (priors), reward (cost function), and contrast (likelihood). To assess both perceptual and metacognitive decisions, participants will be asked to categorize the orientation of shapes and to report their confidence about their choices. Both groups shifted criteria to favor the category with higher probability or reward in a similar sub-optimal manner. Furthermore, the ASD group showed typical abilities in metacognitively assessing their performances. Contrary to recent views, when making a categorical judgment, individuals with ASD rely on Bayesian inference, similar to NT. Our study suggests that alterations in decision-making and the use of priors cannot explain atypical perception in ASD.

25	Visual perceptual processing in minimally verbal children with autism *Hannah Sykes-Haas and Yoram Bonneh* Bar Ilan University

An extensive body of research into visual perceptual processing exists among verbal individuals with autism. In contrast, little is known about visual perceptual processing among their minimally (<30 spoken words) verbal counterparts. Fifteen minimally verbal children with autism, ages 6-12, performed an oddball paradigm. They had to find an odd target among an array of distractor elements presented on a touch screen. The stimuli consisted of odd color, size, and shape (low-level conditions) as well as 3D shapes from shading and perspective (mid-level condition). We further examined the impact of distractor saliency. Verbal instructions and prompted practice trials were provided prior to testing. Successful responding was rewarded with praise and access to preferred items. Already at the low-level vision tests two groups emerged. Ten participants detected the oddball at or near ceiling, whereas the other 5 performed at or slightly above chance. Successful responding among lowest performers increased with reduced distractor saliency. With increasing complexity, at midlevel vision tests, performance deteriorated among some previously 'high' performers. Conclusions: All children could do the task, with performance sensitive to the distractor saliency and stimulus complexity. The results could not be explained by limited task comprehension or lack of cooperation. They therefore suggest differences in early visual processing among minimally verbal children with autism, some presenting diminished performance of the lowest level of visual processing. Also, visual complexity appears to jeopardize performance, suggesting that their visual perception is based on low-level representations with attenuated inference-based processing.

26	Increased dynamic range as a driver of ASD behavioral differences *Oded Wertheimer and Yuval Hart* The Hebrew University of Jerusalem

Individuals diagnosed with Autistic Spectrum Disorder (ASD) exhibit both neuronal and behavioral differences compared to the neurotypical (NT) population. These include heightened ability to discriminate between stimuli, higher variance in neuronal activity, slower updating in the face of abrupt changes in the environment, slower switching rates in binocular rivalry tasks, deficits in learning and generalization, reduced encoding capacity, and increased co-morbidity with epileptic seizures. Here, we suggest that these myriad of differences stem from a computational principle that relies on the dynamic range of the neuronal population response. The dynamic range of a sensing system is the range of signal values for which the system is responsive. A larger dynamic

range means that the system's response to input changes is more gradual. We show that an increased dynamic range in the neuronal population response accounts for the neuronal and behavioral differences seen in ASD, across all outlined tasks and conditions. We further specify a plausible biological mechanism for the increase in the dynamic range, namely increased heterogeneity in the half-activation point of individual neurons in ASD. The model provides proof of concept for a novel mechanism that can account for ASD, and offers novel and testable predictions about the behavioral, neuronal, and biological underpinnings of ASD.

27	The association between attention functioning and word reading errors in children with ADHD *Shani Terner, Inbar Lucia Trinczer, and Lilach Shalev-Mevorach* Tel-Aviv University

Many children with attention deficit/hyperactivity disorder (ADHD) experience reading difficulties and some are even diagnosed with dyslexia (i.e., specific reading disability) in addition to ADHD. However, various studies reported conflicting results regarding the relationship between dyslexia and ADHD. Apparently, poor academic performance is one of the major obstacles faced by elementary school children with ADHD. To better understand the implications of the core attention deficits of children with ADHD in the context of reading difficulties, this study examined whether the attention functioning of 80 children with ADHD (3rd to 6th grade) was related to the frequency and error types they make in reading. The TILTAN word reading screening battery (Friedmann & Gvion, 2003) was used for this purpose. Participants' attention profile was assessed according to the four functions of attention model (Tsal, Shalev, & Mevorach, 2005). A significant correlation was found between attention control (more specifically, conflict resolution) and reading errors. That is, the poorer attention control (as measured by a conflict resolution task) children with ADHD showed the higher number of errors they performed in word and non-word reading tasks. The present results implicate that reading difficulties experienced by children with ADHD may be related at least partly to poor attention control. We recommend that future studies will examine the effect of applying attention control training and, in particular, conflict resolution training embedded in various reading activities as one of the possible remedies for reading difficulties experienced by children with ADHD.

28	Updating motor plans in individuals with autism *Adi Glebotzki, Yifat Prut, and Merav Ahissar* The Hebrew University of Jerusalem

Autism is a neurodevelopmental disorder that is traditionally characterized by impaired social skills. However, a wide range of motor impairments is frequently observed in individuals with autism, constituting one of the earliest observable symptoms. To date, motor deficits are not considered a diagnostic criterion due to apparently large heterogeneity in their expression and severity. Perceptual discrimination studies have shown that people with autism are specifically impaired in their rate of updating perceptual predictions. Based on these findings we hypothesize that slow updating of motor plans may underlie the motor difficulties exhibited by individuals with autism. To test this hypothesis, 80 adults (41 Autism; 39 Neurotypicals) preformed a target-reaching task using a touch screen. The task included two types of reaching movements triggered by a "go" signal: direct movements, in which subjects were required to attain a pre-cued target; and update movements, where subjects were required to rapidly update their motor plan in response to a change in target location which occurred after the "go" signal. In the direct movement reaction time of individuals with autism was significantly longer and with larger variability. In update movement condition, the time from the change in the target location to the followed change in the direction of movement trajectory towards the updated target, was substantially longer in the autism group and with larger variability. A group × condition interaction revealed that individuals with autism struggle in the update movement condition to a greater

extent. These results reveal significant impairment in motor planning among individuals with ASD, with a particular difficulty in updating pre-planned motor plans based on newly available information.

Auditory Perception

29	Effect of stimulus type on temporal summation in young and aging adults *Chanit Cohen [1,2] and Leah Fostick [1]* [1] Ariel University; [2] Meuhedet Health services

Aging adults have higher hearing thresholds. They also have difficulty perceiving short sounds. Temporal summation combines loudness and duration and states that longer sounds are perceived as louder than shorter ones. However, it is not clear whether temporal summation will be as effective among aging adults that show difficulties in temporal processing. Also, most studies tested temporal summation for pure tones (PT) and it is unclear whether temporal summation will be effective in complex sounds we hear daily. Temporal summation was tested on 24 normal-hearing young adults (age 20-35 years) and 24 aging adults (age 60-75 years) for five speech-shape-noise (SSN) sounds (/a/, /i/, /u/, /sh/, and /m/), three PTs (500, 1000 and 4000Hz), and for white noise (WN). Hearing thresholds in each sound were tested for five different durations (1, 5, 20, 50, and 100 ms). A general decline in hearing thresholds was observed as stimulus duration increased, reflecting a temporal summation for all stimuli, but for /m/ (for all participants) and /sh/ (for aging adults only). In line with the literature, the largest slope was 500 and 1000Hz pure tones than temporal summation for complex sounds. Aging adults' temporal summation was larger than young adults' for WN and /i/, but smaller for the high-frequency stimuli 1kHz, 4kHz, and /sh/. These findings suggest that temporal summation is mostly effective for low-frequency PT but not lees so for complex sounds. Also, the benefit aging adults can have from temporal summation in daily life is limited.

30	Rhythmic sampling in audition in blind and sighted individuals *Eva Khasis, Akshatha Bhat, Daniele Re and Ayelet N. Landau* Hebrew University of Jerusalem

It has been proposed that, in vision, perception unfolds rhythmically. Here, we examined whether rhythmic sampling goes beyond vision and serves as a domain-general principle in perception. We, therefore, examined auditory performance in sighted and blind individuals. We predicted that if rhythmic sampling is domain-general, it will appear in both populations. However, if it is dependent on visual experience, maybe only sighted individuals will exhibit auditory rhythmic sampling. Finally, if it is domain-general, however hinders under reflexive visual processes, meaning that it is dominantly governed by visual processing in sighted individuals, we might reveal rhythmic sampling in blind individuals only. Sighted (n=21) and congenitally blind participants (n=12) were instructed to detect a decrement within an ongoing white-noise stimulus lasting 40 ms. The decrement appeared at different intensities. We found no evidence for rhythmic sampling in sighted individuals, while the blind individuals showed rhythmic sampling at 8 Hz. A possible explanation is that in the presence of visual rhythmic sampling, auditory sampling cannot be measured, or does not emerge. To test whether rhythmic sampling exists in sighted participants when visual input is prevented, we recruited a third sighted blindfolded group (n=27), and a fourth acquired-blindness group (n=13). We did not find any evidence for rhythmic sampling in both groups. This suggests that rhythmic sampling might exist in audition under certain circumstances, such as early plasticity in the congenitally blind individual.

31	An ecological investigation of effect of noise on neural tracking and speech perception in a virtual classroom

	Orel Levy, Yair Zvilichovsky, Adi Korisky, and Elana Zion Golumbic Bar Ilan University
Attachment security has consistently been found to correlate with relaxed exploration, openness, and mindful attention to incoming information. In our previous study (Nagar & al., 2022, PsySci) we found that contextually infusing a sense of attachment security (security priming) can improve hearing in young and older adults. Young and older adults performed a standardized pure-tone audiometric threshold test twice. In the security priming condition, a picture of a participant's security-enhancing figure was presented throughout the task. In the control condition, a picture of an unknown person or a circle was used as a neutral prime. Across studies, participants performed better (lower hearing thresholds) in the security priming condition. As our previous study was the first to show that attachment security improves sensory perception, in the current study we engage Signal Detection Theory to uncover the sensory and cognitive processes underlying this effect. Young participants are asked to indicate the presence or absence of pure tones presented near their sensory thresholds. Preliminary data suggest that attachment priming can engender a deep sensory change as evident by an increase in d'. We will discuss the study's meaningful implications for theory and clinical hearing tests.	
32	The impact of auditory rhythmic stimulation on continuous performance and being "in-the-zone" *Talya Shlesinger, Flor Kusnir, Hillel Gottesmann, Yael Kaplan, Leah Snapiri, and Ayelet N. Landau* The Hebrew University of Jerusalem
In our daily life, it is often hard to stay focused on the task-at-hand, as attention wanes during sustained cognitive effort, negatively impacting our performance. In a recent task, we observed preliminary evidence for the role of external rhythms in promoting focused attentional states. In a gradual continuous performance task (gradCPT), the amount of time individuals stayed "in-the-zone" (i.e., exhibited more stable and accurate responses) depended on the task-rhythm. In another study, we observed that different task-rhythms affected perceptual discrimination benefits with varying levels of efficiency (Snapiri et al., 2022). Both findings suggest that not all rhythms have an equivalent impact on our cognitive system. In this study, we take this discovery one step further by exploring whether external rhythmic stimulation can improve individuals' performance in an unrelated task. Participants performed a gradCPT (n = 60) while listening to beats embedded in background sounds. These beats were presented at varying rhythms (1, 2, or 5 Hz) and intensities (clearly or liminally audible) in a blocked design. To assess their impact on task performance, we measured individuals' stability in response times to the ongoing stimuli (city scenes), and their ability to withhold responses to the rare stimuli (mountain scenes; requiring a different key-press) across the different rhythmic-stimulation blocks. Overall, we report a negative impact of rhythmic-stimulation on performance. We also explore the relationship between individual differences in self-generated, spontaneous rhythms and performance decrements, to assess the interaction between participants' susceptibility to external rhythmic structure and endogenous rhythmic preferences.	
33	Your voice is music to my ears *Shlomi Frige [1], Bruno Gingras [2]* [1] The Hebrew University of Jerusalem; [2] Innsbruck Austria
Comparative studies of music and speech perception suggest that prosodic and musical features, such as melodic contour, dynamics and rhythm, function analogously, providing comparable structural and expressive cues in the two domains. Here, we explore these functional analogies using a novel music production paradigm. In Experiment 1, 17 professional pianists were asked to improvise along two readings of a poem: a slower, softer version (Reading 1), and a faster, louder one (Reading 2). We hypothesized that improvisations based on each reading would differ both	

along acoustic parameters common to speech and music (such as sound intensity) and along exclusively musical features (such as mode). As hypothesized, improvisations based on Reading 2 displayed acoustic parameters more similar to those observed for Reading 2 than for Reading 1. Improvisations also differed along dimensions not directly comparable to speech parameters. For instance, improvisations based on Reading 1 predominantly used the minor mode, while those based on Reading 2 were generally in major. Results suggest that musicians recreate affective and structural dimensions of speech both by emulating prosodic features and through exclusively musical means, conceived as functionally analogous to prosodic features.In Experiment 2, we tested whether naive listeners would respond differently, in terms of felt emotions, to the improvisations produced for each reading in Experiment 1. Listeners rated improvisations based on Reading 1 as significantly less arousing and pleasant than those based on Reading 2, suggesting that musicians had effectively captured the salient prosodic features of the readings and transduced them into music.

Posters 34-49: Upper Lobby

Action I

34	Physiological signals dissociate explicit and implicit measures of sense of agency *Ophir Netzer [1], Yoni Stern [2], Asaf Appelbaum [1], Oz Mashiah [1], Gabriella Panishev [1], Amir Gilad [1], Yair Zvilichovsky [1] and Roy Salomon [2]* [1] Bar-Ilan University; [2] University of Haifa

Sense of Agency (SoA) is the feeling of control over our actions. A prominent model describing the neurocognitive processes underpinning SoA suggests that it consists of two components: an implicit component relying on sensorimotor cues, and high-level explicit judgments, factoring in contextual information. The first component is based on a comparator mechanism which compares the predicted motor plan to the actual sensory feedback, allowing for the correction of actions online. If the conflict between predictions and feedback is substantial, one experiences a loss of agency and can explicitly report it. SoA is typically tested by introducing sensorimotor conflicts between participants' actions and their visual feedback, and having them judge if the action was their own. However, this only allows access to explicit judgments of agency while the implicit components remain veiled. Here, using virtual reality, we examined whether implicit physiological signals are indicative of sensorimotor conflicts and their relationship to explicit judgments of agency. Preliminary results (n=35) showed that three distinct physiological signals: pupillometry, oculomotor and motion kinematics, allow classification of sensorimotor conflicts. Critically, SoA classification from implicit physiological signals outperformed participants' explicit judgments of agency. This dissociation between implicit sensorimotor information and explicit agency judgments indicates that although the brain holds information of the conflict, it does not necessarily drive the loss of agency to awareness. This “suboptimal inference” may suggest the process by which the brain constructs the conscious experience of SoA, disregarding discrepancies between sensorimotor predictions and feedback to maintain a “smooth” subjective experience of agency.

35	The effect of the ponzo illusion on grasping movements in right and left handers *Yarden Mazuz and Tzvi Ganel* Ben-Gurion University of the Negev

According to the two-visual streams account, separate cortical pathways process different types of visual information. The ventral stream mediates the perception of objects, and the dorsal stream mediates visuomotor control of actions. This account has been supported by numerous studies

that showed dissociations between perception and action in patients and in healthy participants. The most common psychophysical paradigm that dissociates perception from action involves presenting target objects on the background of size-contrast illusions, that heavily affect perceptual estimations, but have little or no effect on grasping. Yet, most previous studies focused on grasping of right-handed subjects using their right hand. The few studies that compared grasping between right and left-handed subjects suggested that the two groups have a similar pattern of performance in which right-handed, but not left-handed grasping escapes the effect of illusions. These findings had been attributed to left hemispheric dominance in visuomotor control. Yet, the relatively small samples used in previous studies may have prevented detecting functional differences between the two populations. Here, we recruited a relatively large sample of 60 right and 60 left-handed subjects that grasped objects in the context of the Ponzo illusions either with their right or left hands. The results indicated larger susceptibility to the illusion in left compared to right-handers. The findings are discussed in relevance of the two-visual streams account.

36	The influence of active tracing on shape representation in visual pathways *Guy Baratz, Batel Buaron, and Roy Mukamel* Tel Aviv University

How a stimulus is perceived is contingent on the physical properties of the stimulus and the neural state of the individual perceiving it. Specifically, research has demonstrated that voluntary actions modulate neural responses and the corresponding perception of their sensory consequences relative to otherwise physically identical stimuli from an external source. It is an open question whether such modulations sharpen the neural tuning curve to the expected sensory outcome. We use fMRI to investigate the neural representation of visual shapes during active shape tracing and passive viewing of similar dynamic shape traces. We hypothesize that motor engagement facilitates the distinction between the neural representation of different shapes. We operationalize this by examining the decoding accuracy levels of fMRI activity in visual regions evoked by two different visual shapes. In the scanner, participants completed three experimental conditions: Active tracing of the shapes on an MR-compatible drawing board, viewing of dynamic shape traces, and viewing of static images of the shapes. Additionally, participants completed a localizer to identify visual regions sensitive to shapes and a localizer to identify regions sensitive to visual motion. Preliminary data (n=7) demonstrated that the active trace condition resulted in higher shape classification levels in visual regions relative to observing shape traces. This was manifested by more voxels demonstrating high classification rates and greater mean classification rates across voxels in the active condition. This pattern of results is compatible with the notion that the neural representation of visual shapes is sharpened by motor engagement.

Emotion perception

37	Questioning the right hemisphere dominance in facial emotion perception *Vasilisa Akselevich[1] and Sharon Gilaie-Dotan[1,2]* [1] Bar Ilan University [2] University College London

According to the Right Hemisphere Hypothesis (RHH) the right hemisphere specializes in processing all emotion-related information regardless of emotional valence (the emotion's pleasantness). The Valence Hypothesis (VH) agrees with the RHH for negative valence but suggests that positive valence is processed in the left hemisphere. According to retinotopic organization of the visual cortex, the right hemisphere (RH) is likely to be more sensitive to information presented to the left visual field while the left hemisphere to information presented to the right visual field. Here we examined these theories in an emotional valence categorization task by presenting facial emotion stimuli to the left or right visual field. 37 participants evaluated emotional valence of faces with positive, neutral, or negative valence presented each for 200 ms at central or parafoveal locations (one of 4 quadrants at 2° or 4°) while eye movements were being monitored.

Accuracy for negative expressions was higher in the left VF (LVF) compared to the right VF (RVF) in line with both theories, but positive expression accuracy was higher for RVF compared to LVF contradicting the RHH. No right-left VF response time differences were found.
Our results challenge the view that the right hemisphere is uniquely involved in processing all emotion-related information (support for RH dominance only found for negative valence) and suggest a more complex interplay between the two hemispheres in processing emotional stimuli.

38	Noisy emotions: the interaction of sensentation and cognition in the perception of emotional speech-in-noise among young and older adults *Yehuda I. Dor [1,2], Techlet Bressler [2], Daniel Algom [1], and Boaz M. Ben-David [2]* [1] Tel-Aviv University; [2] Reichman University

Older adults process emotions in speech differently than young adults, relaying less on emotional prosody (tone) relative to emotional semantics (words). Several mechanisms have been proposed in the literature to explain these age-related differences. However, it remains unclear to what extent age-related sensory and/or cognitive changes play a part in the perception of spoken emotions in prosody and semantics separately, as well as in the integration of information from these two speech channels. In the current study, 51 young (age 20-30) and 43 older (age 60-75) participants preformed the Test for Rating of Emotions in Speech containing spoken sentences with emotional content in both prosody and semantics. Stimuli were presented on the background of either speech-spectrum noise (representing sensory interference) or 8-talker babble noise (representing both sensory and cognitive interferences), and performance was compared to that in quiet. Results show that the addition of masking noise affected young and older listeners differently. Specifically, after tailoring speech-noise-ratio to (partially) mitigate age-related auditory degradation, we note performance for young adults in babble noise closely mimicked that of older adults in speech-spectrum noise. This suggests that both sensory and cognitive factors contribute to age-related differences in the percerption of emotions in speech, and highlight the residual role of cognition in the speech processing.

39	Perceiving emotions in sign language: lexical (words) vs. Non-lexical (tone) channels *Svetlana Dachkovsky [1,2], Rose Stamp [2,3], Vered Shakuf [4], Wendy Sandler [2] and Boaz Ben-David [5]* [1] Gordon College, [2] University of Haifa, [3] Bar-Ilan University, [4] Achva Academic College, [5] Reichman University

The emotional content of language is critical for effective communication. Emotion can be conveyed by the meaning of words (lexical channel), and by the emotional tone (non-lexical channel). Previous studies show that the non-lexical channel has more impact on the interpretation of emotion than the lexical channel (Ben David et al., 2016). However, no study has investigated this interplay in sign languages. Signers can express lexical emotions with the use of manual signs, e.g., the lexical signs in “I won the lottery” express happiness. Accompanying facial expressions (Fig.1, A-D) convey non-lexical emotional information. Since facial expressions also signal important linguistic information in sign languages (e.g., raised eyebrows in yes/no questions), deaf people may be more sensitive to the non-lexical channel (Goldstein et al., 1996). Alternatively, as many deaf children born to hearing parents often experience language delays, they may have less emotional exposure than hearing people (Wood, 1991).
To understand the effects of the hearing status and native language exposure, we examine emotional perception in four groups of Israeli Sign Language signers: deaf native signers, non-native deaf signers born in hearing families, hearing native signers, and non-native hearing signers from hearing families. In this talk, we will present initial results of a perception experiment in which participants rated 30 ISF sentences, expressed in three emotional conditions - sadness, happiness, anger - and neutral. These findings give us a better understanding of the interplay between lexical and non-lexical channels in human language in general.

40	Darker, but seems brighter: pupillary response to aversive gratings and text images *Ron Meidan and Yoram Bonneh* Bar-Ilan University

Background: Some children find pages of black and white text to be very unpleasant. The text resembles a monochromatic high-contrast square wave gratings, which are known to give rise to visual discomfort, unpleasant sensation, glare, and illusory motion, and at the same time induce pupillary size change with a smaller pupil for higher spatial-frequency. Here we linked the two phenomena and conducted a parametric study of the stimuli that cause visual discomfort and its pupillary expression. Our end goal is to obtain objective measures for individual discomfort and investigate its principles. Methods: observers (n=103) watched a slide show of flashed square wave gratings or text images with different spatial-frequency, contrast, and iso-luminant background color, and reported their subjective rating of aversion or free-view the images while their pupil size was recorded. Results: Spatial-frequency, background color and total stimulus size had a significant effect on pupil size change as well as on the subjective aversion ratings. Importantly, these two measures were significantly correlated, consistent with the known tendency of the pupil to constrict following aversion or disgust. Different iso-luminant colors caused markedly different subjective aversion and a correlated pupil constriction, while low plus-add lenses had no significant effect. Dark but not bright Plano filter lenses had a significant effect on both ratings and pupil size, despite having the same wavelength cutoff. Conclusions: These findings are in line with suggestions that traditional text displays might give rise to an immediate aversive response, and how those sensations could be alleviated by text design and clinical intervention.

Language, Reading

41	Sticking the landing: Orthographic uncertainty predicts sophisticated information-seeking behavior in naturalistic text reading *Yaakov Raz [1], Ram Frost [1,2,3], and Noam Siegelman [1,2]* [1] Hebrew University of Jerusalem; [2] Haskins Laboratories; [3] Basque Center on Cognition, Brain and Language

When proficient readers fixate on a word in text, their gaze tends to initially land around its center; deviations from this so-called optimal viewing position have been typically dismissed as oculomotor error. Here we ask whether the amount of orthographic information available for word recognition at the position of initial fixation accounts for eye-movement reading behavior. To this end we developed a novel measure quantifying orthographic uncertainty (i.e., entropy) based on the number and frequency of words compatible with presumed perceived letters, under the assumption that the likelihood of perceiving a letter is inversely related to its distance from the fixated position. We first validated the measure using the second language (L2) portion of the Multilingual Eye-Movement Corpus (MECO), a large eye-tracking dataset obtained from L2 English speakers reading encyclopedic passages. We found that uncertainty at the fixated position negatively impacts first fixation duration but positively impacts refixation rate, suggesting that initial landing at an unfavorable position within a word minimizes information seeking at that position and promotes refixation on a more informative position. We found similar effects in the English, Hebrew, and Spanish first language (L1) portions of MECO, demonstrating their cross-linguistic generalizability. Taken together, these findings suggest that proficient readers are attuned to the informational structure of their writing system, in line with statistical learning theories of reading, and that this knowledge facilitates sophisticated information-seeking

oculomotor behavior. The presented approach has allowed for several ongoing investigations relating reading skill to individual differences in sensitivity to orthographic uncertainty.

42	An EF-based multi component word reading intervention for struggling readers: Effects on literacy, metalinguistic, and cognitive skills *Shani Levy-Shimon[1,2], Dana Balisha[1], and Rachel Schiff[1]* [1]Bar-Ilan University; [2]David Yellin College

Based on Connectionist models of reading and the Lexical Quality Hypothesis that highlight the part of orthographic, phonological, morphological, and semantic knowledge in word reading. And considering the connections between EF abilities and word reading, the present study assessed the effects of a multi-component word processing intervention combined with Executive Function (EF) skills on the performance of struggling readers on the literacy, metalinguistic, and cognitive/EF skills learned during the intervention as well as additional reading-related outcomes. Participants were seventy-two Hebrew-speaking 3rd graders, randomly assigned to three groups: a multi-component word processing combined with EF skills (MCWP+EF) group, an MCWP group, and a business-as-usual control (BAU) group. The intervention included 48 sessions, arranged in 6 units, each including 8 modules. Overall, findings indicate that the MCWP+EF group made statistically significant gains in all measures, outperforming the MCWP and BAU groups. In the literacy tasks, larger effect sizes were found in vowelized sublexical, lexical reading and reading comprehension, and smaller effect sizes in unvowelized word reading, text reading, reading comprehension and spelling. Results of the metalinguistic tasks indicate improved performance in both intervention groups with higher effect sizes in the MCWP+EF group. Moreover, better performance was evident only in the MCWP+EF group in cognitive/EF skills and reading motivation and self-efficacy. Taken together, this study supports an understanding that when combined with MCWP instruction, EFs are foundational skills that provide an essential support for literacy, metalinguistic abilities, cognitive skills, and reading motivation and self-efficacy for the advancement of struggling readers.

43	Attention distraction causes reading via the sub-lexical route *Rakefet Lorber-Keidar and Naama Friedmann* Tel Aviv University

This research examined if attention distraction caused normal readers to read via the sub-lexical route (the grapheme-phoneme converter) and affected other types of errors and reaction times. The relation between attention and reading was tested using the manipulation of attention during reading. Attention was manipulated auditorily (the participants heard four bell sounds and were requested to press a button when hearing a specific bell sound), and orthographically (the participant was asked to read a word and when the target word included a specific letter, say the name of the letter after reading the word). Participants were 28 adults, with typical reading, and no known dyslexia or attention deficit disorders. They read aloud 274 words and 40 nonwords presented on paper. Participants were tested twice -- once without and once with the attention distraction. The Bells manipulation (auditorily and orthographically) caused specific error types in reading (as well as reading delay). It caused reading words via the sub-lexical route instead of via the lexical route, as evidenced by the significant increase in the rate of surface dyslexia errors. It also increased the rate of between-word migrations (but not within-word migrations).
This suggests that attention has specific roles in reading aloud, which includes keeping the reading on the lexical route, and attenuating neighboring words.

44	The distinctive roles of attention and memory in reading *Efrat Kotzer and Lilach Shalev-Mevorach* Tel Aviv University

Reading efficiency is related, among other things, to cognitive functions such as attention and memory. Whereas previous studies have focused on clinical populations of Reading Disabilities

and/or Attention Deficit/Hyperactivity Disorder, there is relatively little research on the associations between attention and reading in a typically developing population and moreover the exact nature of this association is less clear. The current research treats both attention and reading as multifaceted constructs and seeks to better understand the role played by attention in reading. To do so, a comprehensive examination of the links between specific attention and memory functions and word reading abilities was conducted. One hundred and thirty-six mainstream 5th and 6th graders participated in the study. The results indicated that after controlling for demographic variables, non-verbal intelligence and linguistic skills, distinct attention and memory functions significantly contributed to word reading skills. Specifically, sustained attention contributed to word recognition, whereas selective-spatial attention and executive attention (conflict resolution) contributed to non-word decoding. The results also showed that distinct attention functions were also related to specific word reading error types. Sustained attention contributed to the prediction of errors in potentiophones and irregular words, whereas selective-spatial attention contributed to the explained variance in word reading errors characterized by letter migration between words. As expected, verbal working memory was found to be a significant predictor of all word reading skills. Understanding the exact nature of how various factors including attention and memory functions affect reading can be instrumental in providing targeted, tailored instruction and intervention.

45	The specific relation between attention deficit and word reading *Liora Toledano, Tom Maayan, Pnina Stern, Lilach Shalev-Mevorach, and Naama Friedman* Tel Aviv University

Adults with ADHD (Attention Deficit/Hyperactivity Disorder) experience difficulties in various aspects of life, including reading. However, the exact relation between reading and attention is yet to be understood, and different studies yield contradicting results, possibly because they often assess text- rather than single word reading. The purpose of this study was to examine and specify the relations between single-word reading and specific attention functions. Fifty adults with and without ADHD underwent testing of reading and attention, including single word (and nonword) reading tests that are sensitive to identifying different types of reading difficulties and computerized assessment of four attention functions. The results of the study show that participants with ADHD made more errors in reading single words compared to participants without the disorder. In addition, we found a relationship between sustained attention and a specific type of reading difficulty: poorer sustained attention correlated with more errors of reading sublexically (i.e., reading existing words as new words). These results indicate that in order to stay on the lexical route for reading, which is the faster and more accurate reading route, it is necessary to maintain consistent levels of attention. With reduced sustained attention, reading diverts to using a sublexical route even for existing words. This finding may contribute to the treatment and prevention of reading difficulties among people with ADHD.

Vision

46	Visual-tracking markers of traumatic brain injury Visual-tracking markers of Traumatic Brain Injury *Shimrit Shani[1], Yaron Sacher[2,3], Yoram Bonneh[1]* [1] Bar-Ilan University; [2] Loewenstein Rehabilitation Medical Center, Ra'anana, Israel; [3] Tel Aviv University

Background: Current practical approaches to the diagnosis of traumatic brain injuries (TBI) are subjective, but the typical disturbances in eye movements may reflect the severity of the disorder. Several studies have used fixation and smooth pursuit accuracy as measures, but with limited

success, especially in patients with mild TBI. In the current study, we assessed the quality of simple smooth pursuit visual tracking with and without occlusion using different oculomotor measures. Methods: 30 TBI patients with different degrees of impairment, and 30 age-matched healthy controls were tested on visual tracking in 3 sessions on different days. Participants tracked a white disc moving from the center outwards in a straight line in different directions for 3s per trial in random order. We added a ring that occluded the tracked target in a second experiment. We computed five oculomotor measures for the quality of tracking. Results: The patients differed significantly from controls on all five oculomotor markers, showing: (1) more non-smooth "saccadic pursuit", (2) larger deviation with occlusion, (3) longer latency of 1st catchup-saccade, (4) larger interocular horizontal deviance, (5) weaker initial pupil dilation. All markers were significantly correlated with the clinical assessment (FIM, R=~0.7, p<0.0005 FDR-corrected) and between each other. They were not correlated with initial clinical severity (GCS). Conclusions: Detailed assessment of short and effortless visual tracking can uncover markers that are highly sensitive to the condition of the patient and can be clinically useful. These markers could be used in the future to uncover deficits specific to the injury.

47 Bottom-up hierarchical agglomeration of driver eye gaze distributions

Ron M. Hecht [1], Omer Tsimhoni [1], Andrea Forgacs[1], Yael Shmueli[1], Gershon Celniker[1], and Nilli Lavie[2,3]
[1]General Motors, [2]University College London, [3]Brain Focus

Eye gaze patterns are often analyzed using supervised learning approach. Usually, data is recorded and manually labeled. The labeled data is then divided into a set of groups based on the categories defined during the labeling process. Later, for each group a model is generated and estimated. Finally, a comparison takes place among the models, identifying models that are significantly different from others. Those significantly different models are reported as the results. This approach works well when the labeling captures all the meaningful groups, and each group is homogenous. In contrast, unsupervised learning approach can reveal additional information, for example classes and sub classes that labelers cannot detect. In this work, we applied unsupervised clustering framework for the analysis of drivers' gaze patterns from a naturalistic driving corpus that recorded both the driver gaze information and images from a forward-facing camera. Our goal was to delineate the gaze distributions span and define dominant directions in it. Following segmentation and extraction of first and second order derivatives (speed and acceleration) each segment's representation was changed to a gaze Gaussian Mixture Model (GMM) distribution. Finally, using information theoretic criteria the segments were merged to larger gaze distributions. Estimations of the Mutual Information of the gaze clusters with different road- environment labels revealed a significant cluster informative of relative location to a junction, thus demonstrating the effectiveness of this approach.

48 Contraction bias in spatial frequency discrimination

Ayelet Gertsovski and Merav Ahissar
Hebrew University of Jerusalem

Judgments in perceptual comparisons were shown to be affected by previously perceived stimuli. In discrimination of two serially presented stimuli, performers tend to 'contract' the first stimulus, whose representation is noisier, towards the mean of recently seen stimuli ('contraction bias'; Ashourian and Loewenstein, 2011; Lieder et al, 2019). We now characterized this bias in visual frequency discrimination. In a series of online experiments, two sinusoidal gratings were shown serially in each trial, and participants were asked to indicate which had a higher spatial frequency (density). To characterize the temporal dynamics of the contraction bias to the most recently seen stimuli, we manipulated the inter-trial interval (ITI) in the range of 1 to 5 seconds. We found that contraction bias was strong in short ITIs, and gradually decayed, until reaching an average of zero in ITIs larger than 4 seconds. A generalized additive model (GAM) analysis of the shape of the bias

as a function of the frequency distance from the recent mean revealed a consistent non-linear form: the magnitude of the bias increased with the frequency distance, peaking at a distance of 2.5 octaves, and then decreased. Compared to previous results in the auditory modality, we found a similarly shaped bias function. However, the auditory function was narrower relative to the hearing range, peaking at a distance of 0.5 octaves. We suggest that the width of the tuning curve of the bias is related to the sensitivity of participants to these discriminations.

49	A novel calibration-free eye-tracking tool in web-cam videos *Shahar Messika, Koby Boyango, Danielle Chason, Amit Zehngut, and Shlomit Yuval-Greenberg* Tel-Aviv University

Recent years, and especially the period of the COVID pandemic, have brought about increasing interest among cognitive researchers in performing online experimentation. One major challenge when studying vision and cognition in the online environment is the tracking of participant's eyes. Therefore, a few attempts have been made to provide tools for acquiring accurate gaze positions based on online-recorded web-cam videos ("appearance-based" eye trackers). These appearance-based solutions vary in their level of performance, but none of them reach anywhere near the performance of existing desktop video-based eye trackers. Rapid advancements in the field of AI in recent years has led to the development of automatic and relatively accurate face and eye feature detection in videos, significantly improving the feasibility of creating an appearance-based eye-tracking tool. In this study, our team presents a novel tool which we are currently developing based on Google's Mediapipe face and iris landmark detectors. We use these landmarks to construct an algorithm for translating raw positional data into gaze estimations, without the need for calibration. We present validation of our tool and its evaluation across different datasets with varying head-poses and illumination conditions, while comparing its performance with similar eye-tracking tools. Our preliminary results show promising performance of the tool in estimation of fixation point and of horizontal positions of the iris, and less promising results in estimation of vertical positions. We discuss how this tool can be improved and advanced.

16:00-18:10 Session 2 (3 parallel sessions in rooms A, B and C)

Room A: Symposium 2: Egocentric and allocentric frameworks in social cognition (Organizer: Shahar Arzy)

16:00-16:20	Transforming social perspectives with cognitive maps *Shahar Arzy* Hebrew University of Jerusalem and Hadassah Medical School

Growing evidence suggests that cognitive maps represent relations between social knowledge similar to how spatial locations are represented in an environment. Novel research assumes associations between social stimuli follow a linear associative mapping from an egocentric viewpoint to a cognitive map. Yet, this form of associative social memory does not account for a core phenomenon of social interactions in which social knowledge learned via comparisons to the self, other individuals or social networks are assimilated within a single frame of reference. I will argue that two systems are crucial for such transformations. The hippocampal–entorhinal coordinate transformations, known to integrate egocentric and allocentric spatial cues, and the retrosplenial cortex, known to translate allocentric to egocentric framework, inform social perspective switching between the self and others. This organization enables flexible assimilation of knowledge about the relationship between the self and social networks of varying proximities. Finally, we will discuss the ramifications of cognitive maps in aiding this social perspective transformation process in states of health and disease.

16:20-16:40	Egocentric to allocentric transformations in the mammalian brain *Dori Derdikman* Technion-Israel Institute of Technology

Part of the generation of the brain's cognitive map is a transformation of coordinates. While the sensory data is acquired by the senses in egocentric coordinates, in order to embed this information into the brain's cognitive map, a transformation to world-based, allocentric coordinates is necessary. Xenia Gofman, Gilad Tolker and colleagues recorded from the postrrhinal cortex, the subicular complex and the entorhinal cortex of rats, and demonstrated that boundary cells in the postrhinal cortex are mostly egocentric, while border cells downstream in the entorhinal cortex are known to be allocentric. During the transformation of coordinates, another class of cells emerged, of conjunctive egocentric boundary cells with head-direction cells. A simple model describes the transformation of coordinates from egocentric to allocentric boundary cells as generated by the conjunction with head-direction cells, suggesting a role for head-direction cells as generators of this coordinate transformation. We are now performing large scale recordings from these structures in complex environments in order to determine the nature of this transformation. Such an understanding will lead to new insights about the generation of the brain's internal cognitive map.

16:40-17:00	It is not what you look at that matters, it is what you see: Take II *Yaara Yeshurun* Tel Aviv University

Recent political polarization has highlighted the extent to which individuals holding opposing views experience ongoing events in markedly different ways. In this study, we explored the neural mechanisms underlying this phenomenon. We conducted a functional magnetic resonance imaging (fMRI) scanning right- and left-wing participants watching political videos before and after the 2019 elections in Israel. As expected, we observed significant differences between left- and right-wing participants in their interpretation of the videos' content. Furthermore, neuroimaging results revealed partisanship-dependent differences in activation and synchronization in higher-order regions. Surprisingly, such differences were also revealed in early sensory, motor and somato-sensory regions. We found that the political content synchronized the responses of primary visual and auditory cortices in a partisanship-dependent manner. These differences were pronounced to the extent that we could predict political orientation from the early brain-response alone. Importantly, no such differences were found with respect to neutral content. Preliminary analysis comparing participants' brain responses before and after the elections revealed differences that depended on changes in participants' interpretation and emotional response to the video clips. These results suggest that political polarization is not limited to higher-order processes as previously thought, but rather already emerges in motor and sensory regions.

17:00-17:10 Break

17:10-17:30	I see you: the contribution of seeing one's social partner to the quality of the interaction *Shir Genzer and Anat Perry* Hebrew University of Jerusalem

Online communication is booming, enabling people to choose how they connect with family, friends, patients, colleagues, and others—and various platforms allow people to both see and hear their social partner if they so choose. This study examines the contribution of seeing the other person during social-emotional communication versus hearing alone. Although past studies have claimed that facial expressions are essential for emotion recognition, more recent studies imply that the audio and semantic information may be sufficient in order to accurately understand the other's emotional state. In two dyadic ecological studies (a total of 478 participants, 239 pairs), we

investigated this effect on the Zoom platform, asking one participant to tell an emotional story, while the other listens, with cameras either on or off. They then both reported on emotional and social aspects of their experience. These studies indicate that seeing the other does not improve accuracy compared to just hearing them, even in a live interaction. However, seeing one's social partner enhances the overall affective experience: the perception of togetherness, being heard, and receiving empathy from the listener. Moreover, the visual layer may even increase emotional sharing between conversation partners. These findings have direct implications for various social-interaction contexts, especially as online communication continues to permeate daily life.

17:30-17:50	The dynamics of physiological synchrony in small human groups *Ilanit Gordon* Bar-Ilan University

Despite the critical importance of groups to achieving goals, shaping identity, and creating social change, little is understood about the biobehavioral foundations of social interactions and social synchronization in groups. Face-to-face interactions give rise to interpersonal synchrony, the spontaneous temporal coordination of actions, emotions, and physiological processes between two or more individuals. Synchrony is a ubiquitous phenomenon thought to function as “social glue”, with a biological basis in neural networks, genes, and physiological markers of social function. One of the main characteristics of synchronization is its dynamical nature, continuously shifting in and out of synchrony throughout social exchanges. Face-to-face interactions have been one of the most important settings in which dyadic synchrony has been researched, and yet they have rarely been utilized when studying synchrony in groups or teams. We will present data from four large studies (N=350) that examined group face-to-face interactions in the lab. We will provide examples of physiological group synchrony and show how these multimodal markers of synchrony predict group outcomes, such as cohesion and efficacy. We will go further to present the dynamics of synchrony during group face-to-face interaction to explore its meaning and emphasize the importance of examining changes in synchrony as predictors of adaptive social function. Our data highlights the theoretical importance of addressing dynamical and multimodal factors in the study of synchronization in face-to-face group interactions.

17:50-18:10	Typicality as a tool for studying domain general social processing *Michal Ramot* Weizmann Institute of Science

Social information is integrated into almost every facet of our lives. Social processing deficits, in disorders such as autism spectrum disorder (ASD) and schizophrenia, afflict a large percent of the population and are a significant societal burden. Social anxiety disorder is the most prevalent anxiety disorder. A better grasp of the mechanisms underlying social processing is thus critical, but they remain poorly understood. Even within the typically developing population, there are profound individual differences in social cognition abilities. A complicating factor is that social processing and social cognition are very broad, poorly defined terms, which are often inextricably tied to other processes, such as language, perception, or memory. Whether there exists a domain general network, or module, in the brain, which is specialized for processing social information regardless of context, remains unclear. To address this question, we designed a large battery of tasks, both with and without social information, spanning different contexts. We introduce the concept of typicality for different behavioral measure, including difficult to quantify metrics such as eye movements, and show that they behavioral typicality is a stable individual trait, which can be tied to neural typicality in relevant brain regions. However, within an individual, we find different behavioral typicality for social vs. non-social tasks, indicating different underlying neural mechanisms.

Room B: Attention and cognitive control

16:00-16:20	Cross-modality imaging of the neural systems that support executive functions *Yaara Erez* Bar-Ilan University
Executive control refers to a collection of mental processes such as attention, planning and problem solving. These functions are essential for everyday life and are supported by a frontoparietal distributed brain network. Differences between individuals in brain structure and function limit our ability to study the mechanisms underlying executive control at the individual level. Additionally, limitations of spatial and temporal resolution of the available neuroimaging techniques pose a challenge on our ability to understand brain function across scales. In the talk, I will present evidence for individual-oriented cross-modality functional mapping in the human brain in health and disease. We used fMRI to reliably localize the frontoparietal control network in healthy individuals, with generalized localization across tasks. We further sought to identify this network in patients with brain tumors in order to improve personalized intervention and prevent cognitive damage following surgery for the removal of the tumor. In a unique setup of awake brain surgery, we investigated electrophysiological properties of executive control regions in the frontal cortex using electrocorticography (ECOG) and showed its convergence with resting-state fMRI data. Finally, I will discuss more broadly the new opportunities and challenges of cross-modality individualized neuroimaging and its implications for both basic science and clinical applications.	
16:20-16:40	Reconsidering the role of the frontoparietal cortex in the Stroop effect *Noga Oren [1], Donna Abecasis [1], Edna Inbar [1,2], Amir Glik [1,2], Israel Steiner [1,2], and Irit Shapira-Lichter [1,2]* [1] Rabin Medical Center; [2] Tel Aviv University
Humans are goal-directed beings, yet goal-unrelated information still affects us, the question is how? The Stroop task is used to answer this question relying on task-irrelevant incongruent information. Frontal regions are typically activated for incongruent stimuli and therefore considered key players in processing task-irrelevant conflicting information. Nevertheless, the so-called task-irrelevant information is actually tightly related to the Stroop task, since it refers to the same dimension as the task. To overcome this, we developed a modified fMRI Stroop paradigm with a conflict involving a different dimension than the task. In spite of its task irrelevance, the conflict still elicited the known behavioral congruency effect, manifested as longer reaction time to incongruent than congruent stimuli. Probing the neural underpinnings of this behavioral congruency effect, two opposite patterns emerged within the frontoparietal regions typically recruited by the standard Stroop task. The bilateral intraparietal sulcus (IPS) responded to the conflict, as manifested by the presence of a congruency effect along with the absence of repetition suppression to repeated stimuli differing in congruency. In contrast, frontal regions showed repetition suppression but no congruency effect. Notably, the congruency effect in the IPS was directly related to the corresponding behavioral effect. Altogether, these results indicate that people cannot ignore information detached from their present goals and point to the IPS, rather than frontal regions, as subserving this effect.	
16:40-17:00	Coping with imposed load versus voluntary investment in dual task performance *Daniel Gopher* Technion-Israel Institute of Technology
Dual task performance is one of the most frequently used paradigms in the evaluation of coping with concurrent task demands. The Breakfast Task presented in this talk, was originally developed as a general indicator of coping ability with high demands, executive control and attention management requirements. It is a computer-based simulation, in which the performer is required to cook several food items while concurrently setting tables for guests. The task was employed in	

different studies, to compare young to old adults, monolinguals to bilinguals, influence of Parkinson disease and brain injury. However, in a closer examination, it is a dual task setting, in which cooking reflects coping with imposed load, while table setting is an indicator of strategy free, voluntary invested effort. Models of workload did not examine the impact of such asymmetric strategic flexibility on concurrent performance. Three experiments with elaborated versions of the breakfast task, show that this difference between the tasks, affects concurrent performance formats in response to manipulations of task difficulty, priority change and practice. The results are discussed with reference to existing capacity and resource models of multitasking. An important, new determinant is proposed. The performer freedom and constraints in the development of alternative coping strategies with task demands.

17:00-17:10 Break

17:10-17:30	Statistical learning and attentional priority *Aidai Golan and Dominique Lamy* Tel Aviv University
There is growing consensus that selection history modulates attentional priority and is distinct from current goals and physical salience. Here, we focus on one of the selection history phenomena, statistical learning (SL). Attentional guidance and suppression induced by SL is thought to be long-lasting, implicit, and inflexible. We examined these claims with regards to SL of target location (4 experiments, total n=146) and distractor color (1 experiment, n=160). We measured search slopes as an index of attentional guidance and distractor interference as an index of distractor suppression. To determine whether SL is long-lasting, we used the two-phase learning-extinction design where a probability imbalance was present in the learning but absent in the extinction. Unlike past research that relied on one-shot awareness tests to determine whether SL is implicit, we examined the correlation between the magnitude of SL and participants' probability estimates. To increase sensitivity, we tested awareness both early (immediately after learning) and late (after extinction). Finally, to determine whether SL is inflexible, we used the between-group comparison where one group was informed of the transition between the two phases of the experiment (and even given an alternative source of attentional guidance) and the other group was not. We found attentional guidance induced by SL of target location to be long-lasting, implicit, and inflexible. However, though suppression induced by SL of distractor color was also found to be implicit, it was short-lived.	
17:30-17:50	Direct attention-independent expectation effects on visual perception *Alon Zivony and Martin Eimer* Birkbeck College, University of London, UK
It is often claimed that probabilistic expectations can affect visual perception directly, without any role for selective attention. However, these claims have been disputed, as effects of expectation and attention are notoriously hard to dissociate experimentally. In this study, we used a new approach to separate expectations from attention. In three experiments (N=45), participants searched for a digit or a letter defined by a low-level cue (color or shape) in a rapid serial visual presentation stream and had to report its identity. Expectations about the alphanumeric category of the target were probabilistically manipulated. Since the target was embedded among many distractors that shared its category and since category membership is a high-level feature, we predicted that targets from the expected category should not attract attention more than targets from the unexpected category. In all three experiments, expected targets were more likely to be identified relative to unexpected targets, indicative of a direct attention-independent expectation	

effect on perception. In Experiments 2 and 3, attention and expectation effects were measured separately using behavioral and electrophysiological measures. Expectation effects did, however, affect processing at later encoding-related stages. Alternative interpretation of the observed expectation effects in terms of repetition priming or response bias were also ruled out. Together, these the results observations provide new evidence for direct expectation effects on perception. We suggest that even when expectations partially overlap with attentional mechanisms, they also uniquely affect the speed with which expected target objects are encoded in working memory.

17:50-18:10	Changes in symptoms, executive functions and neural oscillations following transcranial random noise stimulation (TRNS) and cognitive training in pediatric ADHD *Mor Nahum [1], Itai Berger [2], Roi Cohen-Kadosh [3], and Ornella Dakwar-Kawar [1]* [1] Hebrew University of Jerusalem; [2] Ben-Gurion University; [3] University of Surrey, Guildford, UK

Attention-Deficit/Hyperactivity Disorder (ADHD) is the most common childhood neuro-developmental disorder, characterized by inattention, hyperactivity, and impulsivity, along with executive dysfunction. Despite proven efficacy of available treatment options, they are often associated with side effects, poor adherence and limited lasting effects. This calls for novel treatment options for ADHD. Here we examined whether a new form of non-invasive brain stimulation, transcranial random noise stimulation (tRNS), combined with cognitive training (CT) can benefit unmedicated children with ADHD, in two double-blind randomized controlled trials. In Study 1, participants (N=19; Mage=7.35, SD=1.38) received either tRNS + CT or anodal tDCS + CT in a crossover design. tRNS yielded significantly more reductions in ADHD symptoms compared to tDCS, with effects increasing at a 1-week follow-up. Improvements in working memory following tRNS predicted improvement in symptoms. In Study 2, participants (N=23; Mage=8.94, SD=1.43) were randomized to receive either tRNS + CT or sham + CT for 2 weeks. Significant improvements in ADHD symptoms and increases in RS-EEG power in theta and delta bands were seen following active compared to sham treatment, and changes in symptoms were maintained at a 3-week follow-up. Moreover, the clinical improvements were predicted by post-treatment changes in RS-EEG delta oscillations. These initial results indicate that tRNS + CT has a lasting clinical effect on ADHD symptoms and an immediate effect on RS-EEG slow-wave oscillations. As this study is the first to examine the application of tRNS in paediatric ADHD, the results provide a promising direction towards a novel intervention for ADHD.

Room C: Numerical cognition

16:00-16:20	The interplay between math performances, spatial abilities, and affective factors: the role of task and sex. *Sarit Ashkenazi* The Hebrew University of Jerusalem.

Science, technology, engineering and mathematics (STEM) fields are very important to modern society. Careers in STEM fields involve larger salaries than in all the other domains, and there is underrepresentation of females in STEM related fields. Hence, understanding the cognitive and affective foundation of math abilities, a core part in all STEM related careers, has central educational and social significance. Over the last two decades, many studies have suggested that cognitive and affective factors explain individual differences in math. One of the central cognitive factors is spatial abilities. However, recent studies suggest that spatial abilities (real or spatial anxiety) affect emotional factors such as math anxiety. A large body of research has found stronger math anxiety in females and suggests that inferior spatial abilities in females compared to males are the origin of sex differences in math anxiety. To fully explore the complex relationship among

math anxiety, spatial abilities, spatial anxiety on math performance and sex differences, the current set of studies examined spatial skills, working memory skills, math anxiety, spatial anxiety and math self-efficacy as predictors of math performance in diffrent math contants, in college students. The results showed sex differences in a few domains: math anxiety was higher in females compared to males, males outperformed females in number line performance and spatial skills. The relationships among spatial abilities, math performance, and math anxiety were stronger in males than in females. By contrast, the relationship between math self-efficacy and performance was stronger in females compared to males. Moreover, the results indicated that the interplay between math performances and cognitive and affective factors is related to task demand. Math anxiety and spatial abilities had a direct effect on math performances regardless of task. Spatial anxiety had only an indirect effect on math performances via mathmatical anxiety, regardless of task. Math self-efficacy had an indirect effect on math performances via MA, and in the one case, also had a direct effect on math performances.

16:20-16:40	Space-size vs. Space-number interactions *Tali Leibovich-Raveh* Haifa University

One basic question in cognition is how we process magnitudes, such as the pitch of a sound, quantity, etc. A basic question in numerical cognition is how humans represent magnitudes symbolically. These two questions intersect in (1) the ATOM theory suggesting that a general mechanism for magnitude processing also underlies the processing of space, time, and quantity; (2) the size congruity effect (SiCE) suggesting that one dimension (physical/numerical) triggers the automatic processing of the other; and (3) the assumed left-to-right representation of numbers in space (i.e., the SNARC effect), which is a specific case of the stimulus-response compatibility effect (Simon). A recent study demonstrated a relationship between space and physical size, that is different than that between space and symbolic numbers. In this work, I compared the relationship between space and numerical value with the relationship between space and physical size. Using a numerical Stroop task, I tested stimulus-response spatial compatibility (Simon effect) when the numerical value or the physical size of digits was the relevant dimension, and participants were aware or unaware of the spatial compatibility. The results revealed intricate interactions between the congruity effect, the Simon effect, the relevant dimensions, and awareness of the spatial compatibility. This pattern of results demonstrates some differences between the relationship of space and symbolic number, relative to space and physical size, and suggests that the mechanism underlying such shared representation is flexible and adaptive.

16:40-17:00	Magnitude integration in the archerfish *Assael Raveh, Tali-Leibovich Raveh, Dana Vilker, and Shai Gabay* University of Haifa

Which magnitudes do we consider when making magnitude-related decisions every day? The dominant quantity-focused theory suggests that discriminating discrete numerical quantities is automatic and innate. A competing theory suggests, instead, that non-numerical magnitudes, such as the total area of compared item sets, are what humans mostly rely on, and numerical quantity is derived from continuous magnitudes and used only when required. Since wild animals must make quick magnitude-related decisions to survive and procreate, studying which magnitudes animals spontaneously use in magnitude-related decisions allows us to assess the relative primacy of numerical quantity versus non-numerical magnitudes. We asked whether, in an animal model, performance in a spontaneous magnitude comparison task is modulated by the number of non-numerical magnitudes positively correlated with numerical quantity. Our animal model, Archerfish, hunt insects in the wild by shooting a jet of water at them. The fish can be trained to shoot water at artificial targets presented on a computer screen above the water tank. We tested the Archerfish's performance in spontaneous, untrained two-choice magnitude decisions. Fish tended

to select the group containing higher non-numerical magnitudes and lower quantities of dots. Fish selected the group containing more dots mostly when the quantity of dots was positively correlated with all five non-numerical magnitudes. The current study provides further direct evidence that animals' magnitude-related decisions often rely on non-numerical magnitudes rather than numerical quantity, casting doubt on the claims that numerical quantity perception is the most basic building block of mathematical abilities.

17:00-17:10 Break

17:10-17:30	PONT: Platform for online neuropsychological testing *William Saban [1] and Richard Ivry [2]* [1] Tel Aviv University; [2] University of California, Berkeley, California

A major challenge for neuropsychological research arises from the fact that we are dealing with a limited resource: The patients. Not only is it difficult to identify and recruit these individuals, but their medical condition can limit their ability to participate in research projects. As a result, neuropsychological studies typically include small sample sizes (e.g., n=10), and it can take quite a bit of time to complete a single study (e.g., 2 years). As a step towards addressing these issues, we have developed a Platform for Online Neuropsychological Testing (PONT). PONT addresses challenges neuropsychological researchers are facing with patient recruitment, neuropsychological evaluation, and development of patient-friendly testing. PONT entails four primary steps: (1) contacting community leaders to advertise the project; (2) offering interested individuals the opportunity to initiate contact with us, a requirement set by IRB protocols; (3a) conducting interactive, remote neuropsychological assessments on participants; (3b) administrating automated experimental tasks; and (4) soliciting feedback from participants and providing payment to them. To date, we have developed PONT to accelerate our research program on subcortical contributions to action and cognition, testing individuals with Parkinson's disease or spinocerebellar ataxia. In three years, we have completed ten online experiments with nearly 600 participants. We tested both motor (sequence learning) and cognitive (arithmetic) abilities, with an average of 60 participants (20/group) in each experiment. These results demonstrate that PONT can significantly increase the sample size in neuropsychological studies, make data collection much more efficient, and increase the impact of neuropsychological research.

17:30-17:50	Arrays production reveals knowledge of their shapes distribution *Yoel Shilat, Salti Moti, Katzin Naama and Henik Avishai* Ben-Gurion University of the Negev

Shape and quantity are naturally associated. The exact shapes distribution for each number of randomly placed items was defined by Buchta (2009). The shape of an array is defined as the number of vertices of a convex polygon surrounding the array elements. We have previously shown that observers use arrays' shape to make numerical estimations and comparisons (Katzin et al., 2020; Shilat et al., 2021). In these studies, dot arrays were presented to observers, and they had to make perceptual decisions. In the current study, to further investigate the relations between arrays' shape and perceived numerosity participants have actively generated numerical arrays by scattering dots. We hypothesized that participants have an archetypical representation of the array shapes distributions dissociated from randomly generated distributions. Such that participants' shapes distributions would not fit convex shapes' natural random distribution. On a group level, we found a high fit between participants' produced shapes to natural random distribution. Yet, on an individual level participants' shapes distribution had unique features distinguished from a randomly generated distribution. In comparison to convex shapes' natural distribution, participants' representation displays a higher association between shape and

numerosity as shown by individuals' central tendency measures. Furthermore, participants' shape distributions were more diverse and less archetypical than the natural random distribution. These results suggest that we have a representation of convex hull shape distribution for each numerosity. Furthermore, our results suggest that knowledge of the distribution of shapes contributes to numerosity perception.

17:50-18:10	Dyscalculia arising from selective deficits in working memory *Dror Dotan, Shira Shanny, and Sharon Zviran-Ginat* Tel Aviv University

Math skills and working-memory (WM) are known to be correlated, but the mechanism underlying these correlations is still unknown. Here, we investigated the precise role of WM in multi-digit mental calculation by examining individuals with impaired calculation skills. We detected 3 phenomena. First, the participants had many word-substitution errors (e.g., 23 becomes 73), presumably arising from WM malfunctions. Critically, they made relatively few errors when saying the operands, and more errors when repeating an interim result they said earlier (e.g., answering 27+42 as 20+30=50; 7+2=9; then the error 50 + *6* = 56). We further show that this pattern arises from a selective difficulty in the process that removes items from WM. Second, one participant also erred in saying the operands, and these errors (but not interim-result errors) diminished when we allowed her to visualize the exercise. We conclude that she used visual WM selectively to memorize operands. Third, we examined word substitutions that could be explained as perseverations of words said in earlier calculation stages. Typically these perseverations left the number-word unchanged, but for 2 participants the perseverations were imprecise such that the word's decimal role was changed ("thirty" becomes "three"). We hypothesize they had a selective deficit in a WM mechanism that binds digits to decimal roles. Overall, the study shows how highly specific WM deficits give rise to highly specific subtypes of dyscalculia, and how detailed error analysis can help identifying these dyscalculia subtypes and their cognitive origin.

18:10 – 18:30 : Walk to Knights' Hall

18:30 – 19:30: Keynote lecture

Cognitive Factors Implicated in Language Processes: Data from Typical Aging

Loraine K. Obler, CUNY Graduate Center, City University of New York

In this keynote paper I will review the shift from a Chomskian modular approach to language as distinct from psychology to an interactive approach through the lens of study of language changes associated with typical and atypical aging.

Chomsky's description of the structures of language focused largely on sentence-level grammatical structures –and to a lesser extent phonological ones –and was agnostic about mere 'performance' of language. With the growth of psycholinguistics and neurolinguistics in the later 20th century, however, interest in performance grew against the sterility of study of 'mere' syntax.

When I initiated a program on language changes associated with aging in the mid 1970s, psychology was sure that language was the one aspect of psychology that did not decline with advancing age, as evidenced by older adults' performance on vocabulary tests. Older adults themselves, of course, had a different story to reveal, of increasing difficulty retrieving words they knew well for production; they and/or their interlocutors spoke of increasing difficulties in comprehension associated, it appeared, with age-related diminishment of hearing. In this keynote I will discuss the language-performance changes that can indeed be seen in healthy aging and how evidence for cognitive underpinnings of language are discoverable through study of them.

19:40 : Dinner

Wednesday, February 15th

8:40-10:20 Talk session 3 (3 parallel sessions in rooms A, B and C)

Room A: Symposium 3: Vision and memory (Organizer: Sharon Gilaie-Dotan)

8:40-9:00	The dynamics of attention shifts and spontaneous eye-movements in naturalistic audiovisual environments *Elana Zion-Golumbic* Bar Ilan University
Natural environments are laden with continuous dynamic stimuli that compete for our attention. In a series of Virtual Reality experiments, neural and oculo-motor manifestations of selective attention to a prescribed target speaker and the dynamics of attention-shifts towards other background stimuli in the environment. Converging results from studies conducted in a Virtual Cafe and a Virtual Classroom, demonstrate that even though participants primarily focus their attention on the target-speaker, their neural response and gaze-patterns indicate overt and covert responses to semantic aspects of background stimuli. Moreover, individuals perform frequent spontaneous gaze-shifts around the environment that are unprompted by specific salient events. Importantly, these attention-shifts are associated with reduced memory for speech-content, supporting the importance of looking at a speaker for speech comprehension and memory. Results also emphasize important individual differences in the tendency to remain focused or scan the environment, as well as in the sensitivity to irrelevant background sounds. Together, these data offer a new lens into the complex balancing-act required of listeners as they attempt to focus attention in noisy, realistic environments.	
9:00-9:20	Influences of physical image properties on image memory during naturalistic encoding *Sharon Gilaie-Dotan* Bar-Ilan University
We are constantly exposed to multiple visual scenes, and while freely viewing them without an intentional effort to memorize or encode them, only some are remembered. Visual memory is assumed to rely on high-level visual perception that shows certain levels of cue-invariance, and therefore is not assumed to be highly dependent on physical image cues as size or contrast. However, this is typically investigated when people are instructed to perform a task (e.g. remember or make some judgement about the images), which may modulate processing at multiple levels and thus may not generalize to naturalistic visual behavior. Here I will describe a set of studies where participants (n>200) freely viewed images of different sizes or of different levels of contrast while unaware of any memory-related task that would follow. We reasoned that during naturalistic vision, free of task-related modulations, more physically salient images (e.g. bigger or of higher contrast) will lead to higher signal-to-noise ratio from retina to cortex and would therefore be better remembered. Across studies we find that during naturalistic encoding physical image properties (as size and contrast) influence memory such that bigger and higher contrast images are better remembered. While multiple factors are likely to affect memory, our results suggest that bottom-up and top-down processes may all contribute to image memory.	
9:20-9:40	Memory guided gaze behavior: theoretical and applied implications *Yoni Pertzov* The Hebrew University of Jerusalem
Every waking moment, a human being needs to cope with a tremendous amount of visual information. Most of the visual information is captured by the fovea, located at a small region on	

the center of the retina. Therefore, gaze is shifted approximately three times in a second to gather information from different patches of the visual surroundings. The process of determining where to look, and for how long, is influenced by multiple factors, in the current talk I will describe a relatively neglected factor that guides gaze – the observer's memory. When searching for a familiar face, among unfamiliar ones, gaze could be guided towards the familiar face, even though it was unknown which familiar face will be the target. This finding highlights that an efficient guidance of search could be performed even without an active visual template of the target, challenging all current theories of visual search and encouraging future studies of visual search to examine extrafoveal processing, rather than search templates. Next, I will describe a series of studies, which provides a framework for understanding how people direct gaze towards familiar and unfamiliar objects. I will demonstrate that the mechanism that guides gaze is flexible, affected by both long-term significance and short-term goals and could be only partially controlled. Aside from its theoretical contribution, this framework can be applied to circumstances that require detection of concealed memories, for example, when criminals try to secrete their familiarity with crime related objects.

9:40-10:00	What makes eye movements a memory retrieval cue? *Shlomit Yuval-Greenberg and Keren Taub* Tel Aviv University

We normally move our eyes when we wish to focus our gaze on objects or locations of interest. However, there are also times when we do so even in the absence of visual stimulation. Sometimes we shift our gaze towards places where we remember having seen something. This behavior was previously suggested to reflect the role of eye-movements as retrieval cues, but it is hitherto unknown what are the factors contributing to this role. In a series of studies, we examined this question by contrasting two hypotheses. The motor hypothesis states that a crucial factor contributing to the role of eye-movements as retrieval cues is the match in the pattern of muscle contraction between encoding and retrieval. The visual hypothesis states that the crucial factor contributing to memory, is the encoding-retrieval match of the visual image that falls on the retina following an eye-movement. Our findings show that both the visual and the motor factors of eye movements may contribute to memory performance as retrieval cues, depending on the task. Furthermore, we find that people vary in their ability to gain from eye-movement-related cues, and that the gain from visual cues is tightly linked to the gain from motor cues.

10:00-10:20	Weaker face recognition in adults with autism arises from perceptually based alterations *Bat-Sheva Hadad* University of Haifa

Face recognition has been shown to be impaired in autistic spectrum disorder (ASD). However, it is still debated whether face processing deficits in autism arise from perceptually based alterations. We tested individuals with ASD and matched typically developing (TD) individuals using a delayed estimation task in which a single target face was shown either upright or inverted. Participants selected a face that best resembled the target face out of a cyclic space of morphed faces. To enable the disentanglement of visual from mnemonic processing, reports were required either following a 1 and 6 second retention interval, or simultaneously while the target face was still visible. Individuals with ASD made significantly more errors than TD in both the simultaneous and delayed intervals, indicating that face recognition deficits in autism are also perceptual rather than strictly memory based. Moreover, individuals with ASD exhibited weaker inversion effect than TD individuals, on all retention intervals. This finding, that was mostly evident in precision errors, suggests that contrary to the more precise representations of upright faces in TD, individuals with ASD exhibit similar levels of precision for both inverted and upright faces. These results suggest

that weakened memory for faces reported in ASD may be secondary to the underlying deficit in face processing.

Room B: Emotion and emotional disorders

8:40-9:00	The impact of covid 19 on the mental health of the deaf population in Israel *Rose Stamp[1,2], Svetlana Dachkovsky[2,3], Vered Shakuf[4], Boaz Ben-David[5], and Wendy Sandler[2]* [1] Bar-Ilan University, [2] University of Haifa, [3] Gordon College, [4] Achva Academic College, [5] Reichman University

The COVID-19 pandemic touched upon every aspect of people's well-being, including their mental health. It was found that individuals with a high score on the Fear of COVID-19 scale, also scored high on dimensions of anxiety, stress and depression, measured using the Depression, Anxiety, and Stress Scale (DASS-21) [1]. Studies show that certain populations, like the deaf community, have a higher incidence of mental health problems in general compared to hearing individuals [2-3]. During the pandemic, deaf people faced additional hurdles because of the lack of accessible information in sign language, and difficulties in attaining face-to-face interaction. How might this have affected the mental health of an already vulnerable population? In this study, using a version of the DASS-21 translated into Israeli Sign Language [4], we examined the mental health of (the same) twenty deaf individuals in Israel, before and during the COVID-19 pandemic -- on September 2019 (prior to the pandemic), and in April 2021, during the second wave of the pandemic in Israel. We compared the results with the findings for hearing Hebrew-speaking adults in Israel, prior and during the pandemic [1]. The findings indicate that deaf individuals were more significantly affected by the COVID pandemic in terms of depression, anxiety and stress compared to hearing individuals. This unique comparison has important implications for the provision of mental health care in the deaf community and for the provision of accessible information in sign language during states of emergency.

9:00-9:20	Focused on the negative: visuospatial local processing bias and its role in anxiety and fear *Eyal Kalanthroff* The Hebrew University of Jerusalem

Visuospatial attention is a core mechanism which highly affects the way we experience the world. A lack of global processing bias has been widely associated with psychopathology and specifically with anxiety disorders. However, the causal effect of local processing on fear and anxiety has not been tested before. In Experiment 1 individuals with generalized anxiety disorder (GAD) and healthy controls (HC) completed a global-local Navon- task followed by an emotional version of the task in which each trial was preceded by a negative or neutral valence-picture. Results indicated that while in the non-emotional block and in the neutral-valence condition there were no differences between the GAD and HC, in the negative-valence condition the common global-processing bias was eliminated in GAD participants, but not in HCs. In Experiment 2 participants completed either a global or a local block of the Navon task to prime global vs. local processing before completing a modified fear-conditioning task. We found that local-priming led to higher levels of threat assessment. In Experiment 3 we used the same priming manipulation as in Experiment 2, and had participants watch a short horror video. The results indicated that participants in the local-priming grope exhibited more negative intrusive thoughts related to the video, even 24 hours later, compared to participants in the global-priming group. Our results provide the first demonstration for a bidirectional relationship between anxiety and local-

processing style. Accordingly, negative situations eliminate global processing bias in GAD patients, which in turn results in a tendency for exaggerated threat assessment.

9:20-9:40	Repeated retrieval from memory: the role of verbalization in the attenuation of negative emotion *Orly Adler, Assaf Kron, and Ainat Pansky* University of Haifa

Whereas numerous studies have documented beneficial effects of disclosing unpleasant experiences on wellbeing, other studies have yielded apparently discrepant findings of memory enhancement for details of an event following its recollection–an enhancement that is usually accompanied by a strong sense of re-experiencing the original event. In two multi-session experiments, employing different retrieval modes of a controlled traumatic event, we tested (and found support for) a cognitive account of this discrepancy. Accordingly, even when no social factors are involved, and even without relating to emotions, repeated recounting creates verbal representations upon which rememberers may rely when re-retrieving memories. This reliance on previous descriptions, rather than mentally traveling back in time to the original perceptual event, seems to impair the sense of re-experience and attenuate negative emotion. Our findings highlight the effects of verbalization involved in repeated recounting, underscoring the operation of a cognitive mechanism that may explain the seemingly discrepant findings in the literature.

9:40-10:00	The effect of peripheral information on the intensity of affective responses in depression *Tamar Amishav and Nilly Mor* Hebrew University of Jerusalem

The context in which a stimulus occurs greatly impacts emotional response to the stimulus. Contextual theories of emotion (Mesquita et al., 2010) have yet to address the impact of external peripheral information (PI) which is unrelated to the stimulus on emotional responses. PI may assist in understanding how people with varying symptoms of depression differ in their responses to stimuli. Drawing from theories of attention (Keller et al., 2019) depressed people may have amplified negative responses to stimuli that occur with negative PI. Furthermore, positive PI may not assist depressed people diminish responses to negative stimuli. We assessed the effects of PI on emotional responses to target pictures in two studies using an emotional evaluation task. Participants rated their emotional responses to neutral or negative pictures that were presented alone or flanked by negative and neutral pictures (study 1), or negative and positive pictures (study 2). Depression levels affected emotional responses, only when considering the context in which the pictures were presented and not in response to target pictures alone. Specifically, in both studies, as depression levels increased, participants tended to rate neutral targets as more negative when flanked by peripheral negative pictures as compared to peripheral neutral pictures. Contrary to our predictions, although positive peripheral pictures diminished responses to negative targets, this effect was unrelated to depressive symptoms. These results emphasize the ill effect negative context plays in emotional responses of people with depressive symptoms and has potential to assist in designing interventions, to modify affective responses.

10:00-10:20	Response inhibition as a potential maintenance mechanism of anorexia nervosa *Meital Gil and Noam Weinbach* University of Haifa

Anorexia nervosa (AN) is characterized by severe food intake restriction leading to significant weight loss. It has been suggested that superior response inhibition (i.e., the ability to inhibit dominant, automatic, or prepotent responses when necessary) may underlie the ability of patients with AN to restrict eating and endure prolonged starvation. However, studies that assessed response inhibition among adolescents with AN commonly report inconsistent findings. It has been

hypothesized that environmental factors such as negative affect and exposure to food stimuli may modulate response inhibition in patients with AN. The current study is the first to examine the causal influence of affective state and exposure to food stimuli on response inhibition among adolescents with AN. Thirty-one adolescents with AN and 41 healthy adolescents completed an emotion-food stop signal task in which they categorized food and non-food images as quickly as possible and withheld their response when a stop signal appeared. Additionally, participants were exposed to negative or neutral images in each trial before the target appeared. The results indicated that following negative images, adolescents with AN were better able to stop their response to food compared to non-food items. This pattern was not observed among healthy controls or following exposure to emotionally neutral images. The results indicate that negative emotions trigger stronger activation of response inhibition to food stimuli among adolescents with AN compared to healthy adolescents. The study provides the first empirical evidence showing a causal influence of negative affect on response inhibition to food in patients with AN.

Room C: Judgment, decision-making and metacognition I

8:40-9:00	When relying on knowledge increases interpretation bias: insights from aging *Dorit Segal and Gitit Kave* The Open University of Israel

The ability to judge what other people know is essential for human communication, but our own knowledge can limit this ability and bias our interpretation. The current study aimed to examine the effects of aging and language dominance on interpretation bias. Compared to younger adults, older adults have been shown to rely more heavily on their own knowledge. In addition, using a dominant rather than a non-dominant language can increase intuitive processing and thus enlarge the interpretation bias. We sampled 72 younger (aged 19-39), 82 middle-aged (aged 40-59), and 83 older (aged 60-80) Russian-Hebrew bilinguals. Participants read short and ambiguous text message correspondence between two people and judged whether the recipient would interpret the message as sincere or sarcastic. Half of the texts contained information that suggested that the message was sincere, and half the texts contained information that implied that the message was sarcastic. The information that implied sincerity or sarcasm was available to the reader but not to the described recipient. Thus, this information should not have affected the interpretation of the recipient. Half of the texts were in Hebrew and half were in Russian. In both languages, older adults judged the recipient's interpretation as more sincere or as more sarcastic than did younger adults, based on their own privileged knowledge. The findings suggest that younger adults are better than are older adults at inhibiting their own knowledge. Language did not moderate the age effect, most likely because participants were similarly proficient in both Russian and Hebrew.

9:00-9:20	Risk taking in hide-and-seek and hide-and-avoid games *Yaakov Kareev and Alonit Lahat-Rania* Hebrew University of Jerusalem

We used novel two-person, hide-and-seek and hide-and-avoid games to study risk taking, patterns of hiding, and search and avoidance behaviors. In the hide-and-seek game, hiders – defenders in a loss frame – first decided how to divide 16 coins belonging to them and then chose which of 16 compartments to hide the bundles in. Seekers opened eight compartments and were rewarded with the coins found; hiders kept the unfound coins. In the hide-and-avoid game, the coins initially belonged to the seekers. Hiders – attackers in a gain frame – had 16 damage-inflicting thumbtacks to bundle and hide; thumbtacks encountered by seekers rewarded the hiders. In two complementary variations of the games, it was the seekers who determined the bundling. We focused on the risk taken in bundling. Creating 16 one-unit bundles entailed no risk, placing all units in a single bundle entailed maximum risk, and other bundlings fell in between. We also measured bundlers' optimism and actual gains. In four experiments (N=320), we found that

seekers took greater risks than hiders, and players in a loss frame took greater risks than players in a gain frame. Participants were optimistic, expecting to earn more than eight coins. Hiding was nonrandom: certain locations were over- or underused irrespective of the desired outcome; seekers apparently expected hiders' pattern of hiding, thereby earning significantly more than hiders. Introducing a device that performed one or both roles randomly reduced the effect of role on risk taking. Optimism remained high irrespective of agency.

9:20-9:40	The bird's-eye view of cue integration (BEVoCI): an efficient methodology for exposing multiple sources for biases *Rakefet Ackerman* Technion—Israel Institute of Technology, Israel

Heuristic cues underlying subjective judgments may be misleading. Metacognitive research allows comparing judgments to actual success for exposing biasing cues. Identifying cues is typically done one-by-one, by manipulating each cue and demonstrating the bias. Recent research efforts have uncovered sets of cues whose integration underlies metacognitive judgments, but the weight balance among the integrated cues has remained opaque. The present study offers the Bird's-Eye View of Cue Integration (BEVoCI) methodology, which exploits and extends Brunswik's lens model. This is an efficient methodology for identifying novel cues, exposing double dissociations, uncovering a detailed picture of the weight balance among integrated cues, and comparing cue integration across situations. To demonstrate use of the BEVoCI methodology, I introduce two non-verbal reasoning tasks, not previously used in metacognitive research, with known and novel underlying cues for confidence—the Comparison of Perimeters (CoP) and Missing Tan Task (MTT). Four experiments allowed uncovering double dissociations, reliable and biasing cues for confidence, relative weights of the integrated cues examined, and the malleability of these weights across task variations and populations. The BEVoCI methodology can be applied to planned studies as well as to existing data sets with various types of judgments in cases where each participant faces several dozen items.

9:40-10:00	Trust repair in advice relationships *Ilan Torgovitsky and Uriel Haran* Ben-Gurion University of the Negev

Decision making processes often involve seeking external information, such as advice. Advice reduces cognitive effort, spares time to reach the decision, and even increases judgment accuracy. However, decision makers use advice only when they trust the source providing it (i.e., the advisor). Because trust is fragile, it is unclear whether violated trust can be fully repaired following violations. In four preregistered experiments, we investigate trust repair in advice relationships. Participants completed a multi-block estimation task with several rounds. In each round, participants indicated an initial estimation, then received advice and an opportunity to revise their estimates. We manipulated trust violation either by the frequency of inaccurate advice or the intent behind it. Participants received summary feedback of the advisor's performance in the end of Block 1. In Block 2, we manipulated trust repair either via the advisor's improved performance (Experiments 1 and 2) or increased time invested in determining the advice (Experiment 3). Although violations of trust decreased the reliance on the advice following the summary feedback, improved performance (but not invested time) gradually increased the use of advice in the second block. In Experiment 4, we added an additional block of estimations without providing information on the advisor's performance or effort. Advice use remained high in the third block, suggesting that its increase in the repair period was not just a result of enhanced monitoring but a long-term repair of trust. Taken together, the results offer an optimistic view on the possibility of repairing trust between decision-makers and advisors.

10:00-10:20	How beliefs shape reality: from information processing to well-being

	Liron Rozenkrantz[1], Bastien Blain[2], Moshe Glickman[2], and Tali Sharot[2] [1] Bar-Ilan University; [2] University College London, UK
Our beliefs construct a template through which we perceive ourselves, other people, and the world around us. As such, beliefs shape the way we process information and guide our behaviors. In this talk, I will explore how beliefs shape reality through two examples: superstitions and unexplained physical symptoms. First, I will discuss superstitions, biased associations between actions and outcome, which fail to extinct despite ample disconfirming evidence. Building on computational models from reinforcement learning and placebo research, together with our own overarching framework for beliefs as higher-order predictions (HOP), I will propose a model for the maintenance of superstitious beliefs in the face of reality. Next, I will examine the role of beliefs in the development of unexplained physical symptoms. Psychosomatics and nocebo research show that believing one will develop symptoms makes the experience of such symptoms more likely. Applying the HOP framework to physical symptoms, I will present findings from a study conducted during the COVID-19 pandemic, , wherein we isolated a specific health belief and showed that it is predictive of the development of unexplained symptoms. Overall, our research aims to shed light on how beliefs shape the reality we experience in various aspects, including information processing and well-being. A better understanding of the influence of beliefs can help us better understand the connection between the mind, brain, and body, and may lead to ways to improve well-being by harnessing these effects.	

10:20 - 10:40 Coffee break

10:40 - 12:20 Session 4 (3 parallel sessions in rooms A, B and C)

Room A: Symposium 4: Cognitive processes in self-other blurring (Organizer: Inbal Ravreby)

10:40-11:00	Building a self to construct a world: cognitive and neurobiological models of "self" and "reality" *Roy Salomon* Haifa University
An outstanding feature of our psyche is the sensation of being a separate and discrete physical and mental entity or a "Self". "Self" models are present at several distinct levels of cognition and underlie essential phenomenological aspects of the human experience, from the feeling of being an embodied agent in this world to our personal autobiographical narrative. Despite the critical role the of the "Self" in our psychology, the cognitive and neural mechanisms underlying this construct are not well understood. In this talk I will show how the brain integrates interoceptive, sensory and especially motor signals to form the fundamental model of the bodily self, allowing us the corporeal experience of "being" in this world. Combining results from fMRI, EEG and physiological measurements I will show distinctions between explicit and implicit levels of self-processing. We will then discuss how blurring of self-boundaries occurs in neurological, psychiatric and psychedelic conditions and appraise the relation between the delineation of the self and sense of reality.	
11:00-11:20	Shared experience as a window into the nature of neuronal coding of human perception *Rafi Malach* Weizmann Institute of Science
A fundamental aspect of human experience, so obvious it is often taken for granted, is the fact	

that we all experience the world in a similar manner. Exceptions to such common basis are interesting and have been amply studied- but they are rare deviations from a largely common consensus. This inter-subject synchronization is an essential pre-condition for any effective communication and cooperativity among individuals. A particularly striking example of such shared neuronal processing is demonstrated by the finding of specific activations of high order somato-sensory body representations when observing another individual's movements. Importantly, the fact that human experience is largely shared across different individuals offers a unique opportunity to examine a fundamental, yet unresolved, question concerning the nature of the neuronal code underlying sensory perception. The rational is rather straightforward: given that our experiences are shared- we would expect the neuronal coding that truly underlies these common experiences to also remain invariant across individuals. By contrast, coding schemes that vary substantially and unpredictably across different individuals are likely to be non-essential as mediators of sensory experience. In the presentation – inter-subject similarities in neuronal activations will be examined across scales and modalities. Insights about possible coding schemes derived from such neuronal inter-subject synchronizations will be discussed.

11:20-11:40	Internal rhythms and external drivers - rhythmic cognition as a bridge between the self and the external world *Leah Snapiri [1], Yael Kaplan [1] Nir Shalev [2] & Ayelet N. Landau [1]* [1] Hebrew University of Jerusalem, [2] Oxford University

In our daily experience, rhythmic temporal structure originates from various sources. It can be generated endogenously, as observed in rhythmic patterns of neural activity and self-generated motor behavior. It can also be generated exogenously, for example when we attend to the motion and speech of other individuals. How do our endogenous rhythms interact with the ability to attend and adjust ourselves in line with external rhythmic structure? In this talk we first show that individuals have a spontaneous rhythmic preference for motion, that is consistent over time and across tasks. Then, we show that the degree to which external rhythms can shape perceptual performance is influenced by individuals' spontaneous rhythmic preference. Finally, we show that when individuals performed a task together, two complementary patterns emerge. First, joint motor action is characterized by a reduction in the rhythmic range of spontaneous motion. This suggests that individuals adapt their behavior to support optimal dyadic synchronization. Complementary to this pattern, we found that individuals in the dyad presented a bias towards their personal rhythmic preference. Our findings provide an integrated view on cognition, encompassing both low-level sensory processes and joint motor action, and posit that individual differences in rhythmic preferences can impact performance in both personal and interpersonal scenarios.

11:40-12:00	We tend to click with others *Inbal Ravreby[1], Yuval Ritsker[2], and Yaara Yeshurun[2]* [1] Weizmann Institute of Science; [2] Tel-Aviv University

Sometimes people meet and immediately click, such that there is rapid and strong social bonding from the very first moment of the interaction. People tend to perceive click as a mutual and rare phenomenon, but is this the case? Moreover, is clicking limited to daily spontaneous interactions? Last, is a click of a click a click, similar to a friend of a friend being a friend? To answer these questions, first we tested the common intuition for the prevalence of clicking. Next, we tested how frequent it is to feel a click within a group of people in a limited and well-defined social interaction: the Mirror Game. During the game the participants had to move their hands as coordinately as possible when standing in front of each other without talking. Across six datasets, we found that the clicking rate was about ten times the rate people intuitively assumed. Moreover, in contrast to the notion that click is mostly mutual, we found that click is many times unidirectional, and is

mutual only about half the times. Finally, it seems that a click of a click is not likely to be a click, implying that clicking may be more about the interaction than the individuals. We suggest that synchronization may lead to blurring between the self and the other and accordingly increase the tendency to click. However, the degree of this feeling of blurring may not be shared as is thought to be.

12:00-12:20	Inter-brain plasticity underlies empathic interactions *Simone Shamay-Tsoory* University of Haifa

Although empathy occurs in social interactions, research on empathy have largely focused on covert mechanisms of empathy in the observer (empathizer), without exploring how empathic reactions affect the distress of the target. In a set of experiments, we examined a feedback loop model that describes the participation of empathy-related brain regions in the interpersonal emotion regulation cycle. A central role in the empathy feedback loop is played by inter-brain coupling between regions in the observation-execution system (including the inferior frontal gyrus and inferior parietal lobe) of interacting participants. Given that empathic interactions develop over time, the question remains whether inter-brain coupling can increase over the course of one or multiple interactions. We recently suggested that inter-brain plasticity, the ability of interacting brains to modify the coupling between brains in reaction to repeated interactions underlies learning in social interactions (Shamay-Tsoory, 2021) . We examined this approach in a study on psychotherapy and demonstrate gradual increase in inter-brain coupling between the client and psychotherapist over three therapeutic sessions. These findings indicate that as the therapist adapts her response to the client, the inter-brain networks between them reconfigure. This framework may explain how empathic responses may improve over time and how we learn to mutually adapt our responses during social interactions.

Room 2: Language

10:40-11:00	Cognitive control in language processing: evidence from neural oscillations *Tal Ness [1], Valerie Langlois [2], Jared Novick [1], and Albert Kim [2]* [1] University of Maryland, College Park; [2] University of Colorado, Boulder

In everyday language, we routinely encounter linguistic conflicts – situations in which multiple incompatible representations of the linguistic input are simultaneously activated. Evidence from fMRI, lesion studies, and individual-differences suggest that cognitive-control is involved in the resolution of such conflicts. However, these methodologies are limited in what they can tell us about the time-course of cognitive-control engagement during language processing. We sought to test whether theta-band EEG oscillations, associated with cognitive-control in tasks like Stroop and Flanker, can provide a real-time neural marker of cognitive-control engagement in language processing; and, what we can further learn, using this marker, about cognitive-control in language. We conducted time-frequency analyses of four datasets (originally analyzed as ERPs), examining different types of linguistic conflict (e.g 'role-reversal' sentences such as "This is the waitress that the customer served", where the syntax dictates that the customer is the server, but event plausibility suggests that it is the waitress). Our results show increased theta-band activity elicited exclusively by conflict, and not by other types of linguistic processing difficulties that are not expected to engage cognitive-control (e.g. lexical retrieval difficulty, integration difficulty). This indicates that theta activity can be used as a specific marker for cognitive-control engagement in language processing. The theta effects started as early as 300ms from encountering a linguistic conflict, indicating rapid, reactive, cognitive-control engagement during real-time sentence processing. The timing and size of theta increase varied depending on conflict type and strength, providing more insights into the operation of cognitive-control during language processing.

11:00-11:20	Morphology-based treatment for hebrew speaking individuals with aphasia *Tammar Truzman [1], Michal Biran [2], Eugene Soikher [3], Nachum Soroker [4], Tamar Levy [4], Swathi Kiran [5] and Tali Bitan [1,6]* [1] University of Haifa; [2] Ezra Lemarpe organization; [3] Samson Assuta Ashdod University Hospital; [4] Loewenstein Hospital; [5] Boston University; [6] University of Toronto
Anomia is a common characteristic in all types of aphasia. Despite the extensive knowledge that has been accumulated on aphasia therapy, there are no naming treatments developed specifically for Hebrew, a Semitic language with rich morphology. The aim of our study is to examine the effects of a new root-based treatment on naming of Hebrew speaking individuals with aphasia and its brain correlates.The treatment was composed of three steps: 1) Increasing morpho-phonological awareness to the morpho-phono-semantic relations between words sharing a root. 2) Identification of morphological relations among words sharing a root; 3) Picture naming in a sentence completion task containing a morphological clue. Twelve adults with chronic post-stroke aphasia and significant anomia following a single left hemisphere (LH) stroke participated in the study. Following screening and naming assessments, each participant received twenty bi-weekly treatment sessions, followed by post-treatment naming assessments, and a follow-up assessment 10 weeks post-treatment. Four participants were also scanned using fMRI before and after the treatment, while performing a picture naming task.Results. All participants but one (11/12) demonstrated significant improvement in naming treated items following the treatment. Six participants also showed generalization to untreated items. Preliminary analysis of the fMRI data of the four scanned patients shows post-treatment increased activation in rMFG and rIPL for treated items. These regions are homologous to left hemisphere regions that were found to be involved in root processing among Hebrew-speaking adults. The mechanisms underlying the behavioral improvement and the neural reorganization will be discussed.	
11:20-11:40	Is this the real life? The language of reality monitoring *Avi Gamoran [1], Talya Sadeh [1] and Michael Gilead [2]* [1] Ben-Gurion University; [2] Tel Aviv University
Reality monitoring is the process of attributing the source of a memory to an internal or external source, allowing to separate imagination from memory for real events. Reality monitoring relies on cues from the different experiences of recollection vs. imagination. Our research explores reality monitoring using Natural Language Processing (NLProc). This project involves training a language-based classification model for real and imaginary texts. To this end, we collected texts of participants recounting real and recombined events, and trained classification model using several different approaches, including finetuning a neural network (BERT), a custom model based on interpretable psycholinguistic features, and employing human raters. We further used linguistic analysis to explore the phenomenal differences between imagination and recollection.Results demonstrate the feasibility of using NLProc in cognitive research, the differences between human raters and language models, and the degree of overlap/distinction between these separate approaches. Our language based reality-monitoring model can serve as a useful tool for research of state and trait reality monitoring via text analysis.	
11:40-12:00	Linguistic and cultural effects on word choice in speech about emotions: code switching is motivated by emotional processes *Reem Dallasheh Khatib [1], Zohar Eviatar [1] and Hamutal Kreiner [1,2]* [1] Haifa University; [2] Ruppin Academic Center.
Code switching (CS) occurs when bilinguals use more than one language in the course of conversation. The factors that govern word and language choice may be related to various factors.	

To study the relationship between these factors, we examined 25 active multilingual female Arabic speakers (ASP) and 25 female Hebrew speakers (HSP). Participants were presented with ambiguous, negative and positive pictures, and instructed to speak about their thoughts and emotions for at least one minute about each picture (20 pictures total). Results showed no differences in total number of words or in the number or proportion of emotional words between the groups. Both groups spoke more about the negative pictures than about the others. However, the distribution of emotional words differed between the groups. Among ASP, there were more emotional words for ambiguous pictures, whereas HSP had more emotional words for positive pictures. As HSP had a very low CS rate, we focused on ASP. ASP had about 10-12% of CS in general, slightly more for negative compared to neutral or ambiguous pictures. Interestingly, however, the proportion of CS in emotional words was about 25%. The results further show that ASP prefer to switch to Modern Standard Arabic more than to Hebrew or English. Emotional processes are suggested to moderate language choice, suggesting that code switching is used to distance from negative feelings. These findings are discussed with reference to the role of CS as a marker of multilingual identity (MacSwan, 2016), and the status of Arabic speakers in Israel as multilinguals living in a complex social and emotional context.

12:00-12:20	A cognitive model of primary progressive aphasia *Yuval Z. Katz [1], Ophir Keret [2], and Naama Friedmann [1]* [1] Tel Aviv University [2] Rabin Medical Center

Primary Progressive Aphasia (PPA) is language impairment due to dementia. Three major variants have been previously described for PPA: a non-fluent agrammatic variant, a semantic variant, and a logopenic variant (Gorno-Tempini et al., 2011). Since language is highly modular, as shown by the numerous presentations of post-stroke aphasia, we hypothesize that a closer look at PPA will reveal similar variability when using tests informed by cognitive modeling of language. 21 patients (20 Hebrew-speakers, 1 English-speaker) with PPA were tested on a wide variety of tasks: syntax (6 tasks sensitive to 3 known impairments), lexical and semantic abilities (4 tasks; 10 impairments), object knowledge (2 tasks), phonological working-memory (7 tasks; 2 impairments) and reading (6 tasks; 23 dyslexias). The outcome of our assessment for each patient is their exact loci of functional impairment within a cognitive model of language. All patients were found impaired in some language domain. Comparing this to the traditional classification, nine of the 21 patients (~43%) did not match the criteria for any of the variants, even though all patients had language impairment according to their own reports and in our tests. The 12 patients who did match a variant were all classified as non-fluent agrammatic (two also as logopenic). Our diagnostic procedure out-performs existing diagnostic criteria in both specificity and sensitivity. This demonstrates the importance of deploying cognitive modeling and linguistic theory for classification and testing. Clinically, results are promising for early detection of dementia since language symptoms are often the first to appear.

Room C: Learning and working memory

10:40-11:00	Spatial features in human social interaction: emerging spatial patterns in academic poster sessions on proximity chat platforms *Maya Danoch, Yuval Kassif, and Shachar Maidenbaum* Ben Gurion University of the Negev

Human social interaction naturally includes spatial elements. For example, we can approach people of interest or move away from others, we can turn to talk to specific people, talking volume is modulated by direction and distance etc. . These aspects were unfortunately limited during covid restrictions as video based platforms such as Zoom which became the main mode of group communication do not include such features. One area where many academics have felt this

difference is in academic gatherings. Poster sessions are an important part of academic conferences. They are an opportunity to present early work in a manner tailored to the individual visitor, serve as an opportunity to receive personal feedback, to strengthen social and collaboration networks and get a wider view of the status of the field. Can these behavioral elements emerge virtually by the addition of spatial features? To do so, we compare large multi-person interactions via video based platforms which lack these features (e.g. Zoom), with platforms which offer spatial features (e.g. Gather). We observed several poster sessions of medium sized crowds (N=200-300 per session, including previous ISCoP conferences), and test: (1) users subjective preference and comparison to zoom based poster sessions (2) spatial behavior emerging during the use of these platforms. We find that users were highly enthusiastic about the platforms which included spatial features, and we show the emergence of a series of spatial behavioral patterns which exist in real world poster sessions but are missing in video-conferencing based platforms.

11:00-11:20	Fast and obligatory updating of items in declarative and procedural working memory *Yoav Kessler, Shalva Kvitelashvili, Nitzan Zilberman, and Maayan Rozanis* Ben-Gurion University of the Negev

It is commonly held that attending to items facilitates their encoding into working memory (WM). This implies that the content of WM is updated with new input as part of directing attention to it. On the other hand, abundant research shows that WM updating is rather slow and effortful, suggesting that shielding WM representation against incoming input, rather than its updating into WM, is the default. To resolve this discrepancy, we suggest that while updating item-to-context associations is costly, updating a single item is fast and is automatically carried out as part of directing attention, for example, as part of response selection. Participants performed a choice-RT task in which stimuli appeared within frames and needed to update their WM with the most recent red item that appeared in each frame. The need for updating was manipulated so that some trials required updating and others did not. Two lines of experiments, using both declarative (letters) and procedural (task cues) materials, showed that updating a single item is quicker than not-updating. This slow-down of the not-update condition is explained by the need for a time-consuming removal process in this condition.

11:20-11:40	Computational mechanisms underlaying advice taking behavior: disentangling the role of non-informed and informed advice taking *Maayan Pereg [1], Uri Hertz [2], Ido Ben-Artzi [1], and Nitzan Shahar [1]* [1] Tel Aviv University; [2] University of Haifa

Social-learning involves learning from other individuals by means of observation, imitation, or compliance. Previous studies have shown that individuals tend to follow advice, but the computational mechanism underlying advice-taking is still largely unknown. Here, we aim to add to this literature by showing we can disentangle two types of advice-taking; informed advice-taking (learning the value of following advice), and non-informed advice-taking (a fixed and constant bias to follow advice regardless of experience) using a single reinforcement-learning task. Here, 153 participants completed a reinforcement learning task across two sessions, where they were asked to make choices to gain rewards. An artificial teacher's advice was revealed on 60% of the trials, allowing us to sample choice behavior both with and without the presence of advice. First, we found a strong and reliable tendency to follow advice above any individual value-learning. This tendency was consistent on the level of the single individual, with a good test-retest reliability between sessions, suggesting that conformity bias is akin to trait. Computational modeling was then used to explore the contribution of different learning strategies to the observed effect. Modeling results and regression signatures in simulated and empirical data suggested that the observed behavior is necessarily influenced by three distinct processes: (a) individual-learning (i.e., learning action values independent of advice), (b) informed advice taking (learning value of

following advice), and (c) non-informed advice-taking (a fixed and constant bias to follow advice regardless of choice and outcome history).

11:40-12:00	Investigating statistical learning in more ecological settings: predictive eye movements reveal sensitivity to regularities across different levels of noise *Naama Schwartz[1], Yaara Loyfer [1], Louisa Bogaerts[2], Amir Tal[3] , Noam Siegelman[1,4], and Ram Frost[1,4,5]* [1]The Hebrew University of Jerusalem; [2]Ghent University; [3]Columbia University [4]Haskins Laboratories; [5]The Basque Center on Brain and Language(BCBL)

Statistical learning (SL), the ability to extract regularities from sensory input, underlies a range of cognitive functions such as segmentation, categorization, and language learning. SL is typically measured by short tasks, which include only fully-regular patterns (with transitional probabilities (TP) of 1). Real-world inputs, however, are quasi-regular, and their learning occurs over much longer timescales. To examine learning in more realistic 'noisy' environments, we tracked predictive eye-movements (PEM) toward predictable vs. unpredictable stimuli before they appear on the screen, in a "Whack-a-mole" computerized game. The game included transitional regularities in mole locations, with different levels of noise (from TP=0.9 to TP=0.4). Each participant was exposed to all TP levels, once from high to low level and once from low to high. Learning was measured by the difference in the distance of the predictive fixation location from target in predictable vs. unpredictable trials, and by RT difference in responses to the two target types. First, we showed that PEM have high reliability both across and within testing sessions, and high convergent validity with the RT measure. However, with time, the learning effects in the RT measure shrinks (since participants' motor responses become faster overall), while in the PEM measure learning effects increase over time. Lastly, participants' SL performance in different levels of noise was modulated by the direction of TP changes, with early exposure to high noise (vs. high-regularity) impacting learning outcomes. We will discuss how these findings inform the nature of SL computations and measurements beyond simplified typical experimental settings.

12:00-12:20	'I see it in the eyes': oculomotor expectations track prediction errors better than explicit responses *Yonatan Stern [1,2], Ophir Netzer [1], Amir Gilad [1], Oz Mashiah [1], Gabriella Panishev [1]; Yair Zvilichovsky [1,2]; Danny Koren [2], and Roy Salomon [1,2]* [1] Bar-Ilan University; [2] University of Haifa

Contemporary Bayesian theories of the mind highlight the role of prediction errors in driving the learning and updating of our models of the world. This is postulated to manifest both at explicit (e.g., subjective responses) and implicit (e.g., eye movements) levels of behavior. Nonetheless, the interplay between these levels, their underlying computations and respective accuracy is unclear. We examined these questions using an associative learning task in immersive virtual reality, in which a cue probabilistically predicted the subsequent location of the target. In a pilot study (N = 30) and an ongoing replication (N=30) study we found that: (1) Gaze dwell time was significantly greater in the expected location of the upcoming target ($p < .001$, Cohen's $d = 1.57$), linking explicit and ocular expectations. (2) Following erroneous trials, explicit responses were more likely to be switched ($p < .001$, Cohen's $d = 2.96$) and ocular expectations' reliance on the cue was significantly decreased ($p < .001$, Cohen's $d = 1.12$). Modeling trial-by-trial prediction error demonstrated that ocular expectations' reliance on the cue closely tracks prediction error magnitude, both at a single-subject and group level ($p < .001$, Cohen's $d = 1.48$). (3) Finally, preliminary evidence found ocular expectations are more predictive of the target's actual location than the participants' responses ($p = .01$, Cohen's $d = .48$), implicit knowledge was superior. This unique relationship between implicit and explicit predictions, provides a novel behavioral marker of prediction error, that may be altered in various psychopathological conditions.

12:20 – 14:00: Lunch

14:00 – 15:30: Poster Session 2 (and coffee break)

Posters 1-34: Main Lobby

Working memory

1	Workload classification using deep neural network and eye-tracking data *Hagit Shaposhnik, Lior Rokach, and Boaz Ben David* Ben Gurion University of the Negev
Developing a real-time interruption management system (IMS) that postpones interruptions when they occur at an inconvenient moment remains a challenge. Our objective is to develop an online IMS that detects high and low workloads and postpones interruptions accordingly. Previously, we have developed such a system using Gradient Boosted Tree (GBT), with an area under the curve (AUC) of 0.82. Here we present a new framework with better classification performance. We developed two neural network architectures, a bidirectional long short-term memory (LSTM) with Attention-based Recurrent Neural Network (RNN) architecture, and 1D Convolution Neural Network (CNN) architecture, that were compared to the XGBoost model using raw eye data as input in our final model. Furthermore, we introduced a novel approach for data representation that captures two important aspects of our data: the temporal nature of our data and the sequential characteristic. Results show that the 1D CNN model reached an AUC of 0.89 using a 20 samples window, XGBoost 0.89 AUC using 60 samples window, and RNN- BLSTM-Attention showed similar results. Comparing these results with our previous classifier (GBT), we conclude that our new approach significantly improved the prediction performance. We evaluated the models on an independent dataset. Results showed a prediction performance of an average of 0.74 AUC for all three models. This shows the potential of our model to predict workload moments with high accuracy. To provide a more generalize approach using different eye trackers to develop a real-time IMS, in our future study, we are applying transfer learning approach.	
2	Consolidation processes after working memory training – a functional near-infrared study *Neta Weitzman [1] and Tali Bitan [1,2]* [1] University of Haifa; [2] University of Toronto
New memories and skills require time to consolidate and become stabilized. In our previous study, we studied the effect of interval length between sessions and prior working memory (WM) ability on consolidation after n-back training. We found that the optimal interval between training sessions that affords enough time for consolidation depends on the difficulty of the task, and on participants' prior abilities. In the present study, we examined changes in brain activity during training and following the consolidation of a WM (n-back) task. Brain activity was measured by functional near-infrared spectroscopy (fNIRS). We focused on bilateral dorsolateral and ventrolateral prefrontal cortices (DLPFC and VLPFC). 30 participants performed two training sessions on the n-back task and were tested before and after each training session on 0-back and 3-back tasks. fNIRS was measured during testing, training, and during rest before and after each session. Beta weights were extracted from the GLM analysis of task-based measurements, and resting state connectivity was analyzed using Wavelet Transform Coherence (WTC). Preliminary results from the first session showed significant improvements in accuracy and reaction-time from pre- to post-test, along with a significant decrease in brain activity, in right and left vLPFC at the group level. Similar results were found when channels were individually selected in right and left dLPFC. These results suggest that n-back training can lead to online task improvements along with	

brain activity decreases in lateral prefrontal areas. We expect offline changes in brain activity and connectivity to be correlated with changes related to online learning.

3	Working memory capacity utilization in free behavior: the effects of load and individual differences *Shalva Kvitelashvili and Yoav Kessler* Ben Gurion University of the Negev

A vast amount of research in recent decades indicates that the upper limit of human working memory capacity (WMC) is 3-4 items. However, we know very little of how much individuals normally utilize their WMC when they are given the option to freely do so. To answer this question, we have developed a 'free-choice' visual array reconstruction task. In this task, participants are required to reconstruct a target memory array that is composed of colored squares. Critically, they can review the memory array at any given time without any limitations, thus, giving them full control over how much they utilize their WMC. We can track the participants WMC utilization by counting the number of items they place in a row without reviewing the target array. Our results indicate that on average participants tend to operate well below the known WMC limits, although it was highly beneficial to maximize WMC usage in the given task settings. Moreover, individual WMC limits, as they were measured in an unrelated task, were uncorrelated with individual WMC utilization. Contrary to that, the accuracy of item reconstruction (in both position and color) was positively correlated with individual WMC.

4	Feature binding in working memory is task dependent *Ruoyi Cao and Leon Deouell* The Hebrew University of Jerusalem

There is a long-standing debate on how the visual working memory (VWM) retains objects, either as separate features or as bound items. Seemly conflicting evidence have been obtained. For example, Luck and Vogel (1997; extended in Vogel, Woodman, & Luck, 2001) observed that the ability to detect a change in a stimulus array of a given set size is the same regardless of the number of features. Wheeler and Treisman (2002) obtained contradictory results. In this study, we tested a hypothesis that formats of objects in VWM is dependent on task. We compared two conditions, where either the conjunctions are tested with low or high frequency. Through three behavioral experiments on color-location binding, color-color binding, and color-orentation binding separately, we found that conjunctions were better maintained when it was tested more often, confirming our flexible maintenance hypothesis. However, this study cannot fully explain the contradictory results in the literature.

5	The effect of masking on pointer allocation *Shani Friedman and Roy Luria* Tel-Aviv University

Visual working memory (VWM) is responsible for storing and updating online representations. To access its' representations VWM relies on a pointer-system: a unique mapping between the object in the environment and the corresponding representation in memory. VWM can access and modify a representation using an "updating process", but when the pointer is invalidated, VWM can replace the no longer relevant representation using a "resetting process". Past studies used the Contralateral Delay Activity (CDA) to differentiate between updating and resetting by using the drop in the CDA amplitude as a marker for resetting and the slow increase in the CDA amplitude as a marker for updating. The purpose of the current study was to examine whether masking the object for a short time, invalidates the object's pointer and triggers resetting. In experiment 1 subjects observed a single polygon-half that appeared for 500ms, disappeared for 100ms and then either reappeared, reappeared with another polygon-half or was replaced by a full polygon. The last condition is known to trigger resetting. Importantly, in half of the trials, an occluder appeared

masking the change in the object status (occlusion condition). The results showed evidence for resetting in all three conditions only in the occlusion condition, suggesting that masking triggered resetting. In experiment 2, we used the same occlusion condition, but in half of the trials, the occluder appeared behind the object, meaning that it was not masking it. The results show a larger drop when the object was masked. These results suggest that interrupting the continuity of the object invalidates the pointer and triggers resetting.

Emotion and Empathy

6	Involvement of subcortical regions in affective empathy processes Involvement of subcortical regions in affective empathy processes *Aya Morshed-Sakran, Simone Shamay-Tsoory, and Shai Gabay* University of Haifa

Social processes are considered a hallmark of human ability. Studies examining the neural mechanisms of cognition in humans are biased to emphasize cortical regions, neglecting subcortical ones. The aim of the present study was to establish a theoretical and conceptual evolutionary framework for understanding the origins of empathy. To do so, we used a technique that enabled us to explore the contribution of the monocular/subcortical portions of the visual system to affective empathy. Previous studies has demonstrated that negative emotional cues delay reaction time for a following target discrimination. In the current study, we examined the influence of empathy-eliciting images compared to neutral images on target detection when both image and target are presented to the same eye or when they are presented to different eyes. Results demonstrated a delay in responding after an empathy-eliciting image (negative image) only when both image and target were presented to the same eye, pointing to the involvement of monocular (mostly subcortical) regions in this process. These results have major implications for our understanding of the neuro-evolutionary origins of empathy. As a broader conceptual framework, these findings suggest that we must shift from a modal view of the neocortex's exclusive role in high-level cognition to a view that emphasizes subcortical networks' interactions with cortical ones.

7	I (actually) feel your pain: vicarious pain experience and its relation to empathic processes Yoad Ben Adiva and Anat Perry The Hebrew University of Jerusalem

Intellectual humility (IH) is a relatively understudied trait that enables individuals to recognize their potential fallibility when forming and revising attitudes. Research on IH has been thriving in the last few years. It is associated with an attitude change, forgiveness in a conflict, religious and political tolerance, and positivity towards outgroups. However, research is still lacking on objective outcomes of IH and possible mediators and moderators. We hypothesize that intellectually humble people are objectively better empathizers, especially towards those from a disadvantaged group, are more empathically concerned, less distressed when listening to people from a disadvantaged group, and are more motivated to engage in empathy with others. We investigated our predictions in three studies (one pilot and two pre-registered studies). Across these studies (N = 382), we show that IH is associated with three paradigms of empathic accuracy and that this relationship is particularly substantial towards the disadvantaged group. Moreover, we find a positive relationship between IH and empathic concern, particularly towards the disadvantaged group, and no relationship with distress. This work sheds light on relationships involving cultural and power differences and factors that promote true understanding between groups of people from diverse backgrounds.

8	I don't understand it all, but i understand you: intellectual humility and empathic accuracy in understanding diverse *Michal Lehmann and Anat Perry* The Hebrew University of Jerusalem

Our ability to share others' painful experience has a viable part in social and empathic processes, it is believed to allow better understanding of others state and to promote altruistic behavior. While most of us tend to share the affective aspect of other's pain, some report experiencing a Vicarious Pain (VP) response, i.e., actually feeling some of the sensory aspects of the other's pain. Vicarious pain responders' empathic capacities and prosocial behavior have rarely been researched, and the existing findings are inconsistent and based on self-report questionnaires. This study examines whether individual differences in VP experience can predict empathic capacities and prosocial behavior measured in more ecologically valid behavioral tasks. We conducted a two phased study. The first phase included an online VP experience screener. The second phase included a lab session in which participants underwent: (1) an empathic accuracy task - assessing accuracy in understanding others; (2) an affective synchrony task - assessing how well participants match with others' emotions (3) a prosocial motivation task, and (4) a prosocial behavior donation task, including donation to pain and non-pain related causes. We will present preliminary results revealing the effects of VP on empathy and prosocial behavior, their implications on the relationship between sensory and affective aspects of experience sharing and on the relationship between sharing sensory pain of others to other empathic processes and prosocial behavior.

9	"In a week, we'll laugh about it" –temporal construal's impact on empathic abilities " *Matan Rubin and Anat Perry* The Hebrew University of Jerusalem

Reality seems to us as a unified stream of experiences. However, we only experience reality a single moment at a time. Anything that is not within that present moment is construed and interpreted at a level of psychological distance (Liberman et al., 2007). Different temporal construal levels have been shown to influence emotional and cognitive processes, such as concern about climate change or recognition of others' faces in social situations. However, the effect of increased temporal distance on different empathic capacities has yet to be explored. This is the purpose of our current study. The study examines the influence of increased perceived temporal distance on people's ability to accurately infer the emotional state of the storyteller (empathic accuracy), or to share their emotions (emotional synchrony). Participants watched two videos of people sharing emotional personal experiences, one framed as having been filmed last week, and the other as having been filmed five years ago. Participants continuously rated either the perceived storyteller's emotions, or their own emotions, as well as measures on specific emotions and motivation for pro-social behavior. We hypothesized that as perceived temporal distance is increased participants will show less intense emotional reactions but no difference in cognitive ability to understand emotions of others. Results will be discussed in the framework of construal level theory and psychological distance, with implications for therapy, as well as for communication, and the arts.

10	Multidimensional adaptive empathy: empathic response selection in a complex environment *Elena Kozakevich Arbel, Simone Shamay-Tsoory, and Uri Hertz* University of Haifa

Empathy allows us to respond to the emotional state of another person. Considering that an empathic interaction lasts beyond the initial response, learning mechanisms are involved in this dynamic adaptation. Yet, how empathic response adapts in complex, multidimensional, real-world environments is currently unknown. Here we address this gap by focusing on adaptive empathy, defined as the ability to learn and adjust one's empathic responses based on feedback, in multidimensional environment. For this purpose, we developed an empathic-learning

experimental paradigm. During instant messaging communication, participants observed a distress situation, and chose an empathic response (reappraisal or distraction). After each choice, participants received feedback about the success of their chosen strategy which they could use to inform their future decisions. Distress situations were multidimensional in regards to the person in distress (who), the mood of the target (what), and the reason for the distress (why). Unbeknown to the participant, only one dimension of the interaction was relevant to predicting reward.
Our initial results show that the participants tended to learn mostly from the person (who) dimension, i.e. they assumed that the success of their adaptive response in alleviating distress was person dependent and not mood or reason dependent. We also found that participants had a strong prior regarding the effectiveness of reappraisal compared with distraction as an emphatic response. Our findings provide a lab-based model for studying the dimensionality of adaptive empathy and help to understand how learning is done based on the dimensions of an interaction.

Emotional disorders

11	What is high rumination? *Liel Shlomit Lask, Ilona Glebov-Russinov and Avishai Henik* Ben-Gurion University of the Negev

Recent literature suggests that rumination is considered to be a transdiagnostic process leading to a variety of consequences. But, what is prominent ruminative tendency? Are there agreed-upon specifications or cutoff points that distinguish between high and low tendency to ruminate? In an attempt to answer these questions, we reviewed 25 works that compared people characterized as high or low in rumination. We found numerous inconsistencies in the characterization criteria and a great variability in cutoff points. Most studies did not provide enough information about the cutoff criteria, or specify the cutoff values. The current paper tries to illuminate the need for standard cutoff points. We examined a sample of 454 participants using the RRS (Ruminative Response Scale), from which we tried to identify standard cutoff points. Results showed: 1) distributions of RRS, brooding and reflective pondering; 2) most studies used median split, which might explain the differences among studies; 3) examination of standard scores for the various cutoffs presented big variability among the studies; and 4) women had higher scores of rumination and brooding than men, but there was no difference in reflective pondering. In conclusion, we suggest addressing the RRS, brooding and reflective pondering distribution as references for future studies, and consider gender differences. In order to produce homogeneity, we recommend using standard cutoff points and to specify: cutoff criteria, cutoff values, range of each group, group means and standard deviations. Importantly, researchers should consider the implications of their choice of cutoff points and apply their criterion accordingly.

12	Relationships between media multitasking, executive functions, depression and anxiety across the lifespan *Ayala Matzkevich-Carmon and Hagit Magen* The Hebrew University of Jerusalem

In recent years, the time that individuals spend using media, and especially using different types of media simultaneously (media multitasking (MMT)) has increased dramatically. Excessive MMT has been associated with deficits in executive functions and with emotional aspects of depression and anxiety, but these two aspects of behavior and their association with MMT were never examined within the same sample. Furthermore, studies mostly investigated young adults, although middle-aged and older adults use of technology has also increased. The current study examined the relationships between MMT and self-report measures of executive functions in everyday life, depression and anxiety across the lifespan. The participants were 137 adults, between the ages of 18 and 90 years. The results demonstrated that while age was not associated with the overall

number of hours spent using media, MMT decreased as age increased. Additionally, higher rates of MMT were associated with higher levels of depression and with deficits in executive functions related to inhibition and shifting between tasks and cognitive sets. Thus, the present study showed that as individuals age, their overall media use is the same as younger adults, but they prefer to focus on each media individually, rather than simultaneously. Consistent with previous studies, MMT was associated with increased depression (but not anxiety) and with deficits in everyday executive functions.

13	The connection between trauma symptoms and deficits in inhibitory control: the case of Israel's war zone *Mor David, Elad Horowitz and Eyal Kalanthroff* The Hebrew University of Jerusalem

Previous studies have shown a connection between the development of trauma symptoms and deficits in cognitive abilities. The Israeli-Palestinian conflict in the Gaza strip provides an opportunity to explore the effect of continuous threat and living under ongoing trauma on the hallmark of cognitive abilities – inhibitory control. One-hundred and forty-five participants were recruited for the current study, one-hundred and fifteen of them from different settlements that are under the constant threat of rockets (up to 40 km from the Gaza Strip). Participants completed a battery of questionnaires examining the level of psychopathological symptoms, and cognitive tasks testing their inhibitory control. The results of the study indicated a negative correlation between inhibitory control and the level of traumatic symptoms, mediated by the residence proximity to the threat border and the number of years living under threat. These findings add to the literature as they suggest a link between living in a war zone, trauma, and reduced inhibition. Furthermore, the results inform the research on the connection between the frequency of exposure to a traumatic factor and the detrimental effect on inhibitory control. We suggest that the connection between continuous trauma and inhibition might be an important component in the circuits that lead to psychopathology.

14	Extrinsic emotion regulation choice: the role of depression symptoms *Atheer Massarwe and Noga Cohen* University of Haifa

Extrinsic emotion regulation (EER) is the provision of emotion regulation support to another person. An important question is what factors influence peoples' choice of EER strategy. The present study examined the role of depression symptoms in EER strategy use. Fifty-one women who reported high levels of depression symptoms and 48 women who reported low levels of depression symptoms participated in the study. They were asked to read texts that described negative emotional situations ostensibly written by another participant. They were then asked to help the other participant by writing a supportive letter. They reported the degree to which they believe the other person feels bad, how much they are similar to that person, and the degree to which they used two emotion regulation strategies: distraction and reappraisal. They rated their emotions before and after providing support. Results showed that depressed and non-depressed participants reported more positive and less negative mood after providing support. Furthermore, depressed and non-depressed participants reported higher use of reappraisal compared to distraction when providing support. The level of depression symptoms was positively correlated with the perceived negativity of the events and the perceived similarity to the other person. These findings are consistent with previous findings showing that EER benefits support providers. Together, these findings imply that EER may be a good way to improve mood and that people choose to provide support to others using reappraisal more than distraction. These findings have implications for understanding the role of EER in depression and other psychopathologies.

15	Preventing postpartum depression and post-traumatic stress disorders: analysis of cognitive biases during pregnancy to predict the development of psychiatric disorders following delivery *Cywiak Vanessa [1], Solt Ido [1], Yaacobi Ayelet [2], Fruchter Eyal [1], and Okon-Singer Hadas [2]* [1] Technion Institute-Rambam Hospital; [2] University of Haifa

Postpartum Depression (PPD) and Postpartum Post-Traumatic Stress Disorder (PP-PTSD) are psychiatric disorders, which result in severe difficulties and, in extreme cases, may even provoke suicide or neonatal murder. Women in High-Risk Pregnancy (HRP) are more vulnerable to developing these disorders. In this study, which is still in progress, we employ Structural Equation Modelling (SEM) to predict the chances of developing PPD and PP-PTSD. The cohort includes HRP women during the third stage of their pregnancy (HR Group), pregnant women without diagnosis HRP (Normal Pregnancy), and non-pregnant women matched for age (Control Group). All participants performed three tasks examining attentional, and interpretation biases and filled in questionnaires assessing their level of current anxiety and intolerance of uncertainty. The Pregnant Groups took part in a second session, two months after delivery, when they filled in questionnaires assessing their levels of PPD and PP-PTSD and attachment to the child. Preliminary findings show that women in the Pregnant Groups exhibited an attention bias towards happy faces compared to controls. Furthermore, the HR Group experienced higher arousal for happy babies and neutral pictures and rated all the babies' pictures as more positive. The cognitive biases may result in difficulties for the mothers to react to the different emotions. These support the hypothesis that cognitive and emotional features can predict the future development of those disorders. We hope that this research can allow us to scan possible future mothers who may develop these disorders.

Inter-personal and inter-group relations

16	Learning to accept in the context of intergroup conflict *Nur Kassem, Tamar Avichail, Anat Perry, Maya Tamir, and Eran Halperin* The Hebrew University of Jerusalem

Addressing discrimination and inequality among disadvantaged group members is threatening for advantaged group members. Thus, encounters with the disadvantaged group member trigger negative outcomes such as guilt, shame, and avoidance among the advantaged group. We present a novel intervention based on emotional acceptance to increase support for equality. Emotional acceptance is defined as an active willingness to experience thoughts, emotions, and sensations fully in an open and non-judgmental manner without attempting to change or avoid them. In the current research, Jewish Israeli participants underwent a brief acceptance training session before presumably meeting a disadvantaged group member to discuss inequality. The acceptance intervention was effective in reducing contempt as compared to the control. Moreover, among those who wished to experience high levels of contempt in the meeting, the intervention increased openness toward the disadvantaged, support for equality, and support for conciliatory policies, thus indicating that acceptance can bypass aversive emotions and effectively increase support for equality. This is the first acceptance intervention to demonstrate its effectiveness in an intergroup conflict context. Also, this intervention serves to promote equality and social justice as it mobilizes the negative emotions of the advantaged group to more open and tolerant actions. Acceptance intervention holds promising potential applications due to the minimal emotional motivation and effort it requires and due to its effectiveness in promoting equality among a resistant population.

17	Covid-19 pandemic has changed the way distance is perceived, but not the distance actually maintained

	Nur Givon-Benjio, Hili Sokolover, Idan Aderka, Bat-Sheva Hadad, and Hadas Okon-Singer University of Haifa
Since COVID-19 is easily transmitted in close physical proximity, the focus of the epidemiological policy during COVID-19 crisis included restrictions on the distance people maintained from one another (i.e. interpersonal distance). People were obligated to comply with these restrictions, which included using extreme measures to restrict proximity such as quarantine and lockdown. Nevertheless, the long-term psychological effects of COVID-19 on preferred interpersonal distance are still largely unknown. In the current study, we examined COVID-related changes in preferences and perception of interpersonal distance. Specifically, we conducted two analyses: first, we compared data that was collected two years following the COVID-19 outbreak with data collected just before the outbreak, in order to examine the average change in distance preference and perception. In the second analysis, we coded each individual according to the infection rate that day (R value) and according to the number of days that had passed since the outbreak, in order to examine changes in interpersonal distance preference and perception as the pandemic evolved. Contrary to what we expected, COVID-19 was not associated with an increase in preferred interpersonal distance. However, COVID-19 was associated with an overestimation of interpersonal distance (i.e., perceiving other people as further away than they actually are). In other words, individuals perceive the distance from others as larger but in practice, do not keep larger distance. Furthermore, these effects were stronger among individuals with social anxiety disorder. To the best of our knowledge, this is the first evidence showing COVID-related changes in distance perception, hence providing insight into the pandemic's impact on spatial processing and behavior.	
18	The effect of social closeness on brain processing of people *Moshe Roseman [1] and Shahar Arzy [1,2]* [1] Hebrew University of Jerusalem; [2] Hadassah Hebrew University Medical School
The quality and number of close friendships have a significant impact on human health and well-being. Resources devoted to social endeavors, such as time and cognitive effort, are not evenly distributed among all social network members; to maximize the potential social reward, these resources are differentially distributed between discrete, hierarchically inclusive layers of people, preferring individuals to whom we feel more close. These layers, termed "social scales", have been long studied by psychologists, but evidence from the brain is lacking. Here we attempted to supply neuroscientific evidence for differential cognitive mechanisms that are dedicated to different social scales. To this aim, we used an individually-tailored social closeness task for participants to complete during functional neuroimaging. Social scale-selective activity showed a striking distinction between the closest social scale and more distant scales. This closest scale, that contains in an average network only five individuals, extended over 78% of the related cortical regions while all other scales shared the remaining 22%. Moreover, the closest social scale encompassed egocentric representation related regions, while other scales involved allocentric cognitive mapping related regions. Interestingly, this division is similar to the one between processing of small and larger spaces, and processed by different subregions of the default mode network. We also explore possible variations of the cortical social scales distribution in a population whose social behavior deviates from the norm: hyper-altruists, represented by individuals who donated their kidney to a stranger. Overall, our study emphasizes the importance of close relationships in our social lives.	
19	Better together? Shared experience effect on enjoyment and facial expressions *Argaman Bell Meir [1], Liron Amichai [1], Inbal Ravreby [1,2], and Yaara Yeshurun [1]* [1] Tel Aviv University [2] Weizmann Institute of Science
Sharing experiences with others is a prominent part of people's social life. It was shown that sharing an experience with close others amplifies one's emotional response to the experienced	

event. In this work, we tested how friend's virtual (Zoom) presence shapes individual's enjoyment and explored the role of facial expressions in driving this effect. In Study 1 participants (n=184) listened to short audio-clips of different (humoristic and non-humoristic) contents alone or with a friend. We found that enjoyment was affected by the presence of a friend in a content-dependent manner; one type of humor (knock-knock jokes) was more enjoyable with a friend than alone, whereas another type (live stand-up) was less enjoyable with a friend. However, listening together with a friend amplified the intensity of happy facial expressions participants expressed, regardless of how much they enjoyed the clip. Moreover, friends were synchronized in their happy facial expressions during the joint listening. Intriguingly, those effects of co-experiencing on enjoyment and facial expressions disappeared when participants listened to the audio clips with their eyes closed. In Study 2, we tested whether different expectations of enjoying the two humoristic contents led to these opposite enjoyment patterns. Participants (n=152) rated their expectations of enjoying knock-knock jokes and live stand-up. We found that the presence of a friend served as a "social feedback loop" – amplifying the gap between enjoyment expectation and experienced enjoyment. Overall, our results highlight the communicative role of facial expressions, and its role in shaping enjoyment during shared experiences.

20 Mothers' cross brain synchrony patterns selectively track social cues

Ortal Shimon-Raz [1], Yaara Yeshurun [2], Adi Ulmer-Yaniv [1], Ayelet Levinkron [2], Roy Salomon [3], and Ruth Feldman [1]
[1] Reichman University; [2] Tel Aviv University; [3] Bar-Ilan University

Cross-brain synchrony is a relatively new area of research that taps the similarity of neural response across individuals to a shared ongoing event, typically a movie or story. Whereas infant stimuli and attachment reminders have shown to trigger activations across the "parental caregiving network" (PCN), no study to date examined whether it exposure to attachment reminders elicits cross-brain concordance. The current fMRI study explores cross-brain synchrony to attachment reminders among mothers. We asked: Do mothers synchronize their neural response to attachment reminders in the PCN; Does social conditions (mother and infant together) trigger a more wide-spread neural synchrony compared to alone conditions (infant/mother alone); As oxytocin is a modulator of the social brain, we examined its impact on cross-brain synchrony within an OT/placebo-administration design. Participants observed 4 daily ecological video vignettes showing a mother and an infant apart (Alone) and together (Social). Two analysis approaches were used to examine differences in inter-subject correlation (ISC): a theory-driven approach that focused on 7 preregistered ROIs within the PCN, and a data-driven approach that tested the entire brain. Results of both approaches demonstrate widely-spread cross-person synchrony, including limbic, paralimbic, and cortical regions of the PCN in response to mother-infant videos. In PCN regions such as the insula, ACC, STG, PFC and striatum, the "Social" context triggered significantly greater ISC compared to the "Alone" context. The degree of cross-brain synchrony in the ACC dynamically followed moment-by-moment variations in mother-infant coordination, suggesting that moments of behavioral synchrony elicited greater cross-brain synchrony. Our findings support the importance of the PCN in facilitating mammalian affiliative bonds and highlight its role in the formation of shared neural response within two-person biobehavioral synchronization.

21 If i were you: Imagination and group membership

Dalit Milshtein, Achmad Serhan and Simone Shamay-Tsoory
University of Haifa

The ability to understand others and predict their actions is essential for social communication. However, humans are prone to cognitive biases, especially when interacting with ingroup versus outgroup members. These biases may stem from difficulties in empathizing with outgroup members, known 'ingroup empathy bias'. Here we propose that imaginative abilities are at the

heart of intergroup conflict related biases. Focusing on the unique Israeli-Palestinian conflict, we examined whether Jews and Arabs share the same ability of taking the perspective of the other side. In two experiments, Jewish and Arab students were asked to imagine themselves in 120 alternative states of affairs that characterize the lives of Jews or Arabs in Israel. Following each script, participants imagined that they are in the described situation from a first-person perspective, and rated several factors regarding emotional intensity, relevancy, and feasibility of finding themselves in such situations. Results show that Arab students rated feasibility and relevancy of negative situations that typically characterize Jews as higher than Jewish regarding Arabs. Given that Israeli Arabs are a minority in Israel, these findings indicate that minorities are more able to generate representations of the outgroup's perspective in their minds compared to the majority group. This may explain the minority's readiness to generate future states of affairs that are typically associated with the outgroup. Notably, the majority participants were more anxious, mainly when the collective identity was salient. These findings indicate that biases related to intergroup relations may strongly correlate with basic imaginative abilities.

Judgment and Decision-making

22	Persuasion and accuracy in geopolitical forecasting *Yhonatan Shemesh [1], Hilla Shinitzky [1], David Leiser [1], and Michael Gilead [2]* [1] Ben Gurion University, [2] Tel Aviv University

In trying to apprehend the future, people often rely on the opinions of others. But how do they know who they can rely on? We investigate this question using a two-phase study design. First, forecasters (n = 153) predicted a series of global events and explained the rationale behind their predictions. Next, evaluators (n = 488) read these rationales and provided their own predictions for the same events. We analyzed the linguistic features of forecaster rationales, focusing on cues evincing scientific thinking: cognitive complexity, probabilism, and dispassion. We found that forecasters who employed a scientific mindset were more accurate and tended to be more persuasive to evaluators. Though evaluators were persuaded by the scientific mindset, they were not equally calibrated on all cues, suggesting ways in which rhetoric leads people astray, and cues for accuracy that go unnoticed. We argue that in the forecasting context, people retain the ability to listen to the language of reason.

23	Penalties for wrong answers increase the socioeconomic achievement gap in academic aptitude tests *Shai Nimrodi [1], Esin Tureci [2], Britt Hadar [1,2]* [1] Reichman University; [2] Princeton University

Performance on academic aptitude tests (AAT) has become a common and important milestone in determining one's academic track and financial future. However, individuals from low socioeconomic (SES) backgrounds tend to score lower than individuals from more affluent backgrounds. The current research examined whether a common practice in scoring AATs, imposing penalties for wrong answers, disproportionately disadvantages examinees from low SES, due to risk aversion. We used a computational modeling approach to better understand the role of risk aversion and skill level on performance (Study 1). We then tested the model's predictions in a large corpus of real-world data from a university selection test (Study 2, N = 1,498,692). We found that removing penalties decreased the SES achievement gap compared to a policy that did impose penalties and that this effect is greater for high-achieving examinees. We also found that removing penalties reduced the overall reliability of the test scores.

24	The violation of choice-transitivity depends on “within attribute” vs. “within alternative” processes *Gilad Pessach* Tel Aviv University

Violations of choice transitivity break one of most central the axioms of rationality (von Neumann & Morgenstern, 1947). Violating transitivity is relatively an extreme behavior because humans tend to maintain the consistency of their preferences and decisions with piety. At present, the evidence in support of such violations is subject to controversy (Tversky, 1969; Regenwetter, 2011, Tsetsos et al., 2016). Therefore, confirming whether humans indeed violate choice transitivity is a fundamental question for decision-making research. If humans indeed may violate transitivity, another essential research challenge is understanding the conditions that promote intransitive choices, and the mechanisms that support this. The present study provides a confirmation of the presence of choice transitivity violation. To show this, we use a) a strict data analysis method that meets the most stringent requirements presented to determine whether a preference violation was indeed violated (Regenwetter, 2011, Tsetsos et al., 2016) and b) a novel experiments design where choices are presented in each trial on a single visual display, which avoids averaging artifacts (Davis-Stober et al., 2016). The two experiments conducted provide strong evidence for human intransitivity choices. In addition, this study demonstrates a dependence of the degree of "choice transitivity violation" on grouping processes. When the choice stimuli are presented grouped by attribute, more transitivity violations occur than when the same stimuli are presented grouped by alternative.

25	Choosing between human and algorithmic advisors: the role of responsibility sharing *Lior Gazit, Ofer Arazy, and Uri Hertz* University of Haifa

Algorithms are increasingly employed to provide highly accurate advice and recommendations across domains, yet in many cases people tend to prefer human advisors. Studies to date have focused mainly on the advisor’s perceived competence and the outcome of the advice as determinants of advice takers’ willingness to accept advice from human and algorithmic advisors and to arbitrate between them. Here we examine the role of another factor that is not directly related to the outcome: the advice taker’s ability to psychologically offload responsibility for the decision’s potential consequences. Building on studies showing differences in responsibility attribution between human and algorithmic advisors, we hypothesize that, controlling for the effects of the advisor’s competence, the advisor's perceived responsibility is an important factor affecting advice takers’ choice between human and algorithmic advisors. In an experiment in two domains, Medical and Financial (N = 806), participants were asked to rate advisors’ perceived responsibility and choose between a human and algorithmic advisor. Our results show that human advisors were perceived as more responsible than algorithmic advisors and that the perception of the advisor’s responsibility affected the advice takers’ choice of advisor. Furthermore, we found that an experimental manipulation that impeded advice takers’ ability to offload responsibility affected the extent to which human, but not algorithmic, advisors were perceived as responsible. Together, our findings highlight the role of responsibility sharing in influencing algorithm aversion.

26	Social learning from advice and observation *Atil Mansour [1], Nichola Raihani [2], and Uri Hertz [1]* [1] University of Haifa [2] University College London

Socially transmitted information can accelerate learning and allows accumulation knowledge. Social learning can be carried in two main ways: by observing others’ behavior, or by following explicit advice. Previous works indicate that learning from advice may be privileged, as advisers may be wary of the reputational cost they may incur in case their advice is not accurate. Here we studied the way such privilege may affect learning about the accuracy of social information

sources. We used a horse-race task, in which participants had to bet on one of nine horses to win a race on each trial. Before each race, participants received social information, either by observing a bet placed by another player, or by receiving advice from another player. The accuracy of advice and observation changed throughout the experiment to sometimes indicate a winning horse and other times a losing horse. We used a set of computational reinforcement learning models to characterize social learning in the task. Our models used information about social information accuracy to predict compliance with social information, and to estimate participants' learning rates and prior expectation about advice and observation accuracy. In our pilot study (N=21) participants were faster when complying with advice and were overall more likely to follow advice than to an observed decision. Our models indicated that participants had higher prior accuracy expectations from advice than from observed actions. Our initial findings suggest that asocial information source evaluation process may depend on the source – advice or observation.

27	Curiosity in the age of information explosion: how urge and interest determine epistemic choices *Ohad Dan, Maya Leshkowitz, Ohad Livnat, and Ran R Hassin* The Hebrew University of Jerusalem

Modern information consumers display a seemingly paradoxical behavior, presenting a gap between the knowledge they want to gain and the information they end up consuming. In our new model of curiosity, this paradox is a natural outcome of two psychological factors shaping epistemic curiosity. One factor is the urge to approach information, and the other is an evaluation of how interesting it might be. Different temporal dynamics characterize the two factors; interest is relatively stable in time, while urge quickly rises and decays. These dynamics can lead to a time-dependent reversal in epistemic choices. In a series of experiments, we demonstrated that people prefer high-urge over high-interest information for immediate consumption, and this pattern is revered or weakened when choosing for future consumption. Furthermore, we discovered that saliency-based manipulations elevate urge but do not contribute to long-term interest. Our results shed light on the cognitive constructs underlying curiosity and suggest nudges to better align long-term preferences with short-term actions. Moreover, these results tell a cautionary tale about the perils of public discourse in the modern economic setting that monetizes attention.

28	The interplay between goal-orientation and social cohesion in group foraging decisions *Lior Lebovich [1,2], Yossi Yovel [2,3], and Iain Couzin [1,2]* [1] Max-Planck Institute of Animal Behavior, Konstanz, Germany; [2] Tel Aviv University; [3] University of Konstanz; [4] Tel Aviv University

Collective decision-making is a daily task in the lives of many group-living animals. As group cohesion has critical consequences for the fitness of individuals, group-living animals must balance their tendency to progress directly toward an identified target of interest with the risk of remaining isolated. However, how animals balance these two opposing forces in making their movement decisions and while ensuring group cohesion remains largely unknown. Here, we study the interplay between these two forces and its effect on the group dynamics in a large herd of goats (Capra hircus, n=178). Using a novel experimental setup, goats were locally divided into separate sub-groups of different size and their choice behavior - either advancing the herd's union or, rather, favoring direct progression towards a water source - was tracked using drone footage. We report complex and non-monotonous spatiotemporal collective dynamics, in which sub-groups often switch from progressing towards the target (water source) to going back to rejoin with a sub-group that was left behind. Preliminary results of this study show that the cease in progression significantly depends on group size: it appears frequently when the group is small, but not when the group is large. In further analyses we found that moving away from a sub-group is accompanied by increased vocalizations of the sub-group that was left behind. This implies that group cohesion may be achieved by cross-modal audio-visual range-dependent social force.

Language, multilingualism

29	Ecological validity and bilingual language control: voluntary language switching between sentences *L. Maria Sanchez, Esli Struys, and Mathieu Declerck* Vrije Universiteit Brussel

In everyday life conversations, bilinguals spontaneously switch languages with no apparent effort, and yet few language switching studies have found conditions under which there is no significant cost to switching languages in the lab. Since language-switch costs are a measure of language control, this could be seen as evidence for the ubiquity of this process in bilingual language production. However, one claim is that more ecologically valid bilingual contexts lead to small or even absent switch costs. To further investigate this, we examined voluntary language switching between sentences using a network description task. This arguably more ecologically valid setup (compared to the more prominent involuntary language switching setup with single word production) resulted in switch costs for sentences produced in the second language, but no significant switch costs for sentences produced in the first language, whereas involuntary language switching between sentences resulted in substantial switch costs across both languages. These results indicate that more ecologically valid contexts can lead to circumstances that might require little to no language control.

30	Working memory and morphosyntactic comprehension and production in bilingual patients with aphasia *Natasha Dvorina [1], Alina Bihovski [2], Michal Ben-Shachar [1], and Natalia Meir [1]* [1] Bar-Ilan University; [2] The Sheba Rehabilitation Hospital

The current study investigates the morphosyntactic abilities of bilingual L1-Russian – L2-Hebrew speaking patients with aphasia (biPWAs) in the comprehension and production of a wide range of morphosyntactic structures. Furthermore, it evaluates the associations between the deficit in verbal working memory (WM) and language impairments. Twenty chronic-stage biPWAs due to left hemisphere stroke were assessed using the bilingual aphasia test (BAT, short versions) in L1-Russian and L2-Hebrew. Verbal WM was evaluated through the backward digit span, listening span [1] and modified listening span tasks [2] in each language separately. Visuospatial WM was measured through the Corsi block-tapping task. Significant difficulties were observed in both languages when processing passive constructions and negation (both in active and passive forms). In Hebrew, relative clauses with a past participle posed difficulties. Also, due to the late age of L2-Hebrew onset, its morphosyntactic accuracy was lower than in L1-Russian. A more pronounced deficit was observed in verbal WM in both languages than in visuospatial WM abilities. Verbal WM was shown to be related to processing morphosyntactic structures. The study contributes to the understanding of the specific difficulties in the two languages of biPWAs based on the inherent properties of each language. Finally, it expands the link between language processing and WM to bilinguals with aphasia.

31	L3 morphosyntactic sensitivity: online versus metalinguistic processing *Nawras Abbas, Anat Prior, and Tamar Degani* University of Haifa

The question of how non-native morphosyntax processing is manifested in online versus offline measures has been investigated thoroughly in second language (L2) research, but is relatively underexplored in third language (L3) research. Here we examine offline and online measures of L3 morphosyntactic processing, and possible differences between them. Comparing different processing measures allows for a more understanding of morphosyntactic processing. Specifically,

online measures reflect real-time, automatic processing, whereas offline measures are open to conscious inspection and reflect overt metalinguistic decision making. We also examine how language proficiency may modulate morphosyntactic processing. In the current study, 104 Arabic-Hebrew-English trilingual university students read sentences in their L3, English. Online morphosyntactic performance was measured using recording of eye-movements during reading grammatical (n=20) and ungrammatical sentences (n=20), and offline performance was measured using a separate grammaticality judgment task on the same stimuli. In addition, participants' proficiency in English was assessed using subjective and objective measures. Results show that grammatical sensitivity was evident both in grammaticality judgments, and in late eye tracking measures. However, early eye tracking measures were not sensitive to grammaticality, suggesting reduced sensitivity during the initial stages of automatic morphosyntactic processing in L3. Further, higher English proficiency was associated with greater morphosyntactic sensitivity across both measure types. These findings support the distinction between automatic and metalinguistic components of morphosyntactic processing in a non-native language.

32	What source language do we rely on when speaking in l3? Investigating the modulating role of executive control on cross linguistic interference in l3 syntax production *Razan Silawi, Anat Prior and Tamar Degani* University of Haifa

The current study examined cross linguistics influence (CLI) in L3 syntactic production, and asked what source of previous linguistic knowledge do we rely on when speaking in L3, is it the L1, the L2, or both? The study also explored the potential modulating role of executive control abilities to CLI in L3 production, by asking whether individuals with better executive control abilities are better at managing CLI in L3 syntax production. Sixty Arabic-Hebrew-English trilingual undergraduate students completed an elicited imitation task, in which they were required to repeat sentences that they heard in L3. The stimuli were grammatical and ungrammatical sentences eliciting different syntactic structures within four conditions of CLI (interference from L1 and L2, interference from L1, interference from L2, control). Target structures were coded as sensitive/insensitive to violations in ungrammatical sentences, and as preserved/not preserved in grammatical sentences. In addition, participants completed a battery of executive control tasks including inhibition, shifting, and working memory. The results showed a significant interaction between condition and grammaticality of the sentence. In ungrammatical sentences, participants were least sensitive to violations when the interference was from L2 compared to other conditions. In grammatical sentences, both conditions, interference from L1 and interference from L2, were significantly different than control. Regarding the second research question, preliminary analysis using shared variance between all measures of executive control showed no significant modulating role of executive control to CLI in L3 production. The results demonstrate transfer from both sources of previous linguistic knowledge during L3 production and suggest that the interplay between L1 and L3 and L2 and L3 is dynamically modulated by task demands.

33	Cross-linguistic influences in visual word processing: evidence for cognate effects in different-script trilinguals *Mariana Elias, Anat Prior and Tamar Degani* University of Haifa

We examine lexical cross-linguistic influences (CLI) among trilingual speakers of non-overlapping orthographies (Arabic/Hebrew/English), testing whether influences are limited to overlap with the L1, the L2, or both. Sixty-three university students who are native Arabic speakers (L1), are partially immersed in a Hebrew speaking environment (L2), and who learned English (L3) in a formal setting, performed a visual semantic decision task in their L3 on 168 prime-target pairs. Prime types included L1-L3 and L2-L3 double cognates, L1-L2-L3 triple cognates and control non-cognates. Results demonstrate that targets preceded by cognate primes were responded to

significantly more quickly than targets preceded by control primes, and marginally more accurately, irrespective of cognate type. These findings suggest that lexical CLI is not limited by script overlap or typological similarity across languages. Specifically, although none of the language share the same script, and the Semitic Arabic and Hebrew are typologically different from the Indo-European English language, CLI was observed. Moreover, the lack of a difference across cognate types (L1-L3, L2-L3, and L1-L2-L3) supports the proposal that CLI is not limited to the L1 or the L2. Instead, the priming evident in the Hebrew-English double cognate condition as well as in the Arabic-English double cognates, emphasizes the role of CLI from L2 or the L1, in the absence of CLI from the other language. To conclude, our findings demonstrate how CLI in L3 processing is driven by phonological form and meaning similarity across all languages of the multilingual speaker, irrespective of typological and orthographic differences.

34	Bilingual novel word learning as a function of language of instruction: is learning better through l1 or l2? *Zoya Hirosh and Tamar Degani* University of Haifa

When learning vocabulary through translations in the first-language (L1), bilinguals may have more available cognitive resources compared to when learning through the second-language (L2), and may enjoy increased experience in L1 regulation. To test Language of Instruction (LOI) effects, 59 Hebrew-English bilinguals auditorily learned 55 German words over two-sessions, including three word-types: Cognates, overlapping in form and meaning between English and German; False-cognates (FC), overlapping in form but not meaning; and Controls, with no form overlap. Critically, half of the participants learned the novel words in association with their translations in the L1 Hebrew, and half in association with their translations in the L2 English (which is also more similar to German). Participants performed a translation recognition task on both experimental sessions and a translation production task on the second session. Results showed a significant LOI effect for both tasks, with better learning through the (less similar) L1, especially for control items. Cognates were learned better in both LOIs, but a FC advantage over controls was more prominent for participants learning through English. Together, the results highlight the importance of LOI and item-based language similarity during multilingual novel word-learning.

Posters 35-50: Upper Lobby

Numerical cognition II

35	Cognitive control among primary and secondary school students and their relations to math achievements *Moran Farhi [1,2], Yarden Gliksman [3] and Lilach Shalev [2]* [1] David Yellin College, Jerusalem, Israel; [2] Tel Aviv University; [3] Ruppin Academic Center

Math achievements are an important predictor of academic success and life quality in modern society. While many studies on math achievements were conducted with young children, the ages of end of primary and secondary school were neglected. The aim of the current cross-sectional study was to examine domain specific and domain general cognitive control mechanisms and their associations with math achievements in students at sixth, eighth and nineth grades. One-hundred and twenty-two participants (62 6th graders and 60 8-9th graders) performed two versions of a cognitive control task: a numerical Stroop-like task, manipulating numerical and physical size of Arabic numerals; a location-direction Stroop-like task, manipulating location and direction of an arrow. In addition, participants performed a Go-No Go inhibition task, a math fluency test, and a math curriculum test. Results demonstrated that older students presented reduced congruency effect in both tasks comparing to younger students, and better inhibition ability, in line with

previous findings. Moreover, older students presented similar congruency effects in both Stroop tasks whereas younger students showed larger congruency effect in the numerical Stroop-like task. Our results emphasize the importance of domain general cognitive control in the context of math performance during middle childhood and adolescence and call for considering the implementation of domain-general cognitive control activities as a potential approach to support the successful development of math achievements.

36	Evidence for stimulus-driven automatic arithmetic processing of single-digit multiplication problems *Eldad Keha [1,2] Daria Klotsvog [1], Sarit Ashkenazi [1], and Eyal Kalanthroff [1]* [1] The Hebrew University of Jerusalem; [2] Achva Academic College

Different stimuli tend to trigger different behaviors automatically. In the present study, we focused on multiplication equations and asked which processes are automatically triggered by the presence of verification equations as an irrelevant task. To that end, we employed a novel task in which participants had to name the ink color in which the following stimuli were presented: mathematical equations (e.g., 5 X 4 = 20), neutral words (e.g., building), or same-number strings (e.g., 111111). We found that math equations and neutral words triggered more conflict from the irrelevant dimension as compared to same-number strings and math equations triggered more conflict than neutral words. In addition, we found evidence for automatic activation of different arithmetic processes such that large equations (e.g., 7 X 9 = 63) triggered more conflict than small size equations (e.g., 3 X 2 = 6), and that for small size equations same parity incorrect equations (e.g., 3 X 2 = 8) triggered more conflict as compared to different parity incorrect equations (e.g., 3 X 2 = 7). Our results suggest that arithmetic and mathematical processing can be triggered in a stimulus-driven manner. Such automatic processing of mathematical equations occurs even when the equations appear in the irrelevant dimension (thus requiring no action).

37	The core syntax of numbers and its dissociation from language syntax *Noa Handelsman and Dror Dotan* Tel-Aviv University

Humans process complex sequences of information, such as numbers, sentences, or music, using syntactic representations. A pending question involves the architecture of such syntactic representations: are they implemented by domain-general mechanisms, i.e., a general architecture that governs the syntactic processing of numbers, language, music, and more, or by separate domain-specific mechanisms for each cognitive system?
We examined RD, a 30-year-old woman with a selective deficit in the core syntax of numbers. In numerical tasks, her performance indicated that the locus of her impairment was in the core syntax of numbers. She performed poorly (? 40% syntactic errors) in tasks that required the generation of number core syntax, such as number transcoding or verbal merging of single digits into multi-digit numbers. Her percentage of errors diminished (? 5%) in tasks that did not involve the core syntax, even if they involved syntactic processing at peripheral levels (visual input of multi-digit strings and verbal output of multi-digit number words). In contrast, in tasks that tap into language syntax, such as sentence reading, elicitation and repetition, RD's performance was intact (? 5% errors), indicating that her language syntax is intact.
This dissociation between number core syntax (impaired) and language syntax (intact) shows that the two syntactic mechanisms are separate from each other.

38	Cancelling the syntactic association between number length and value: learning a new single-symbol set for representing multi-digit numbers *Ami Feder, Mariya Lozin, and Michal Pinhas* Ariel University

An inherent syntactic feature of the place-value structure of the Arabic number system is that the larger a number is numerically, the longer it is as well. The present study explored the processing of multi-digit numbers from ten to one trillion, while cancelling the perceptual saliency of the numbers' lengths. In two experiments participants were trained to associate an unfamiliar single-symbol set with multi-digit numbers in two notations: standard (e.g., 1,000) or an exponential expression (e.g., 103). After the training phase, we tested for intentional and automatic processing of the new learned symbols, using the numerical and physical comparison tasks, respectively. Our findings show that: (a) in the numerical comparison task, scale and global distance effects emerged in both experiments, indicating a successful learning of the ordinal relations between the multi-digit numbers and their represented symbols; (b) in the physical comparison task, there was a reversed congruity effect only where the numbers were comprised of a single lexical entry (i.e., one word in Hebrew) for both notation groups, indicating automatic processing of the number values; (c) participants who were trained on exponential expressions notation displayed overall slower RTs in both numerical and physical comparison tasks, but achieved similar effects, suggesting that they transcoded the expressions into their whole number meaning. These novel findings show that intentional and automatic processing of "large" multi-digit numbers and exponential expressions can be achieved even when the visual cue of number length is not present.

39	From nine hundred and two to 90,02: syntactic processes in number writing and their impairment *Zohar Cohen and Dror Dotan* Tel Aviv University

Writing numbers to dictation is a fundamental aspect of numerical literacy and a main predictor of math skills. Previous studies reported dissociations between verbal input and digit production processes; and between lexical processes, which handle single words/digits, and syntactic processes, which handle the relation between lexical elements. However, the precise cognitive organization of number writing is still poorly understood – in particular, whether a syntactic/lexical distinction exists only in specific processing stages or in all. Here, we report 4 women with dysnumeria, a number-processing disorder, who had many syntactic errors when writing numbers to dictation. For 2 of them, the origin of these errors was a selective deficit in syntactic processing at the verbal-input level, with spared digit output mechanisms: they had syntactic errors in tasks involving verbal input (e.g., number repetition), but showed good performance in digit production tasks (e.g., elicitation of digit strings). The 2 other women showed an opposite pattern, indicating a selective deficit in syntactic processing at the digit-production level, with spared verbal input. This double dissociation shows that both the verbal input mechanisms and the digit-production mechanisms are divided into lexical and syntactic processes. Based on this and previous findings, we propose a comprehensive cognitive model for number writing.

Social cognition

40	The interaction between political attitudes, gaze behavior and interpretation of conflictual situations *Nitzan Guy, Liat Refaeli, and Yoni Pertzov* The Hebrew University of Jerusalem

When two people observe an identical scenario they do not necessarily perceive it the same. Understanding the factors involved in reaching different interpretations is especially important in conflictual situations with political relevance. We hypothesize that individuals' unique

characteristics relate the way they interpret situations by modulating their scanning patterns, leading to accumulation of different visual information. To this end, Arab and Israeli-Jewish participants' eye movements were recorded while watching a short 360-degrees clip. The scenario shown in the clip included a Palestinian couple who encounter two soldiers while wishing to cross an Israeli military checkpoint. The clip ends without knowing what the soldiers or the Palestinian couple will do next. Our results showed that Israeli-Jewish participants looked more at the Palestinian couple compared to Arabs and that Israeli-Jewish expected a less violent reactions from the soldiers, compared to Arab observers. Furthermore, we found that gaze behavior was related to participants' expectations of the soldiers' reactions. Overall, this study demonstrates that political attitudes lead to different scanning patterns and different interpretations of identical situation.

41	Synchrony underlies romantic attraction *Matan Cohen, Maayan Abargil, Merav Ahissar, and Shir Atzil* Hebrew University of Jerusalem

Imagine a first date, where partners feel an immediate bond, versus an awkward date, where partners feel disconnected. Is there a biological mechanism that is set to differentially favour bonding with specific individuals over others? Classic evolutionary theories focus on static features such as physical appearance. However, recent theories on social bonding emphasize the importance of behavioral and physiological co-regulation during social interactions in bonding with others. Specifically, us and others recently discovered that successful romantic dates, where partners are attracted to one another, are characterized by increased electro-dermal synchrony. We further hypothesized that the individual ability to synchronize can determine romantic attractiveness. We tested this hypothesis with two experiments: (a) In a speed-dating experiment, we demonstrate that individuals who can better synchronize, either during social interactions or in a non-social sensory-motor task, are rated as more attractive. (b) In an online experiment we show that people are rated as more attractive when in synch, compared to when the same people are out of synch, providing causal evidence that attractiveness is determined by controlling the level of synchrony. Together, this shows that increased attractiveness is rooted in the ability to synchronize. Moreover, the complex social skill of synchrony builds on a domain-general process of sensory-motor adjustment. Altogether, this research points to a potential mechanism of synchrony in mate selection, where sensory-motor adjustments are applied during interactions as means for social regulation.

42	What do your eyes tell me: the orienting effect of other people's eye movements depends on the mental state attributed to them *Amit Zehngut and Shlomit Yuval-Greenberg* Tel Aviv University

Studies of the gaze cueing effect (GCE) show that observers pay more attention to targets in locations cued by other people's gaze direction, compared to uncued targets. This effect is thought to help individuals focus on what seems to interest others. However, we hypothesize that the attentional effect of eye movements largely depends on the interpretation given to the cognitive process they represent. Specifically, when people engage in effortful cognitive processing, they often avert their gaze away. We propose that this type of gaze aversion signals to observers that the performer's attention is oriented inward – their thoughts, rather than a specific location. This study aimed to investigate whether gaze aversions which are thought to be performed during thinking, produce less GCE than other gaze cues. Two groups of participants (N=25 each) were presented with a video of a person gazing sideways, followed by a peripheral letter discrimination task. One group (thinking group) was led to believe that the gazing person is thinking (solving an arithmetic question). The other group (control group) was not provided with meaningful context. Findings revealed that, while both groups responded faster to cued relative to uncued targets, this

effect was lower in the thinking group. Consequently, we found a reduced GCE for the thinking group compared to the control group, suggesting that GCE is indeed modulated by the interpretation of the gazing person's mental state. Furthermore, it supports the hypothesis that gaze aversions serve as social signals indicating that attention is directed inward rather than outward.

43	Privileged mental representation of initial filters *Yohay Zvi, Nitai Kerem and Yaara Yeshurun* Tel-Aviv University

Individuals experience the world through the lens of their subjective filters: their attitudes, beliefs, previous knowledge etc. In this fMRI study we tested whether there is something privileged in the mental representation of one's initial filters in the context of change in religious beliefs. To do so, Secular (N=21), Religious (N=21) and Ex-Religious (ExRe, N=20) participants were scanned while watching 3 short videos: one presenting a secular narrative, one presenting a religious narrative, and one neutral narrative (in terms of religiousness). We hypothesized that the ExRe explicit responses (e.g., ratings of agreement with the message of the video) will be more similar to the Secular group (congruent with their current lifestyle), whereas their neural responses will be more similar to the Religious group (congruent with their initial lifestyle). The behavioral results suggest that indeed the ExRe group explicit responses were more similar to the Secular group. These results were mainly driven by the video presenting a religious narrative. Preliminary neuroimaging results suggest that the overlap in the neural response between ExRe and Religious participants was higher than the overlap between ExRe and Secular participants: 3,451 vs 1,010 voxels (neutral video), 2,201 vs 539 (secular narrative video), and 10,628 vs 1,186 (religious narrative video). Regions of similarity between ExRe and Religious participants included regions within the Default Mode Network, as well as bilateral dorsolateral PFC. Thus, our preliminary results suggest a privileged mental representation of individuals' initial views and beliefs, even when the explicit views and beliefs have changed.

44	United we stand: effects of external political processes on brain activity and stimuli interpretation *Gal Boiman, Noa Katabi, Yohay Zvi, and Yaara Yeshurun* Tel Aviv University

Political in-group affiliation, often manifested through ideological beliefs, is a major predictor of preferences, opinions, perceptions and even brain activity. As politics in western countries become increasingly polarized, growing literature indicate that the differences between individuals among distinct political groups become more and more noticeable. In our previous study, we conducted fMRI scanning of 36 right- and left-wing participants while watching six political videos, a few weeks before 2019 elections in Israel. The videos included four parties campaign ads, as well as two political speeches. Behavioral and neuroimaging results demonstrated significant differences between left- and right-wing participants. In 2021, after two years of ongoing Israeli political crisis with four elections rounds, an internationally precedent setting coalition was formed, containing eight parties with significant ideological differences. Two months after the coalition was formed, we reproduced the original study, using the same political videos and participants, to test whether the current Israeli political highly diverse coalition, has influenced participants' interpretation of the videos and subsequently their brain activity. Behavioral results revealed that participants' interpretation of the political videos has (dramatically) changed during the two and a half years that passed from the first scan to the second scan, regardless of their political affiliation. Moreover, preliminary neuroimaging results suggest that these changes in interpretation altered the response in several brain regions, including the amygdala . These results suggest that perceptions and interpretations toward stimulations, once filtered by in-group affiliation and identity, can relatively easily change as a function of external and independent processes.

45	Demographic determinants of spatial, temporal and social orientation *Lidor Gazit ,Elad Yundler and Shahar Arzy* The Hebrew University of Jerusalem

Orientation is defined as the relation between oneself and its own world, including spatial surrounding (places), life events (time) and social network (people). Spatial orientation has been shown to be modulated by number of factors, including age, gender, education, and socioeconomic status. However, it is not known how temporal and social domains are affected by demographic determinants. Furthermore, as orientation is personal, its evaluation must be personally tailored to one's own world – the places around him/her, the events experienced and the people one encounters. Methods: 614 participants from five countries were measured using Clara, a tool for personalized orientation assessment. Efficacy scores were calculated (ES, success rate/reaction time) and compared to find modulating determinants. Results: Our results show highest orientation performance in late 20's for both men and women, then a gradual decline with age in all three domains. Orientation performance is modulated by country's life expectancy and retirement age. Gender is not found to affect orientation. Interestingly, Israeli Arabs' performance in social orientation is higher than Israeli Jews' performance. Conclusion: Our findings suggest that demographic determinants modulate not only spatial orientation, but also temporal and social. Orientation, unlike previous findings on spatial navigation, does not seem to be affected by gender. Determinants may differentiate selectively in between orientation domains.

Development, interpersonal

46	Evidence for cultural differences in affect during mother-infant *Miada Abu Salih [1], Maayan Abargil [1] , Saja Badarne [1] , Nathalie klein-Selle [2] , Merav Irani [1] , and Shir Atzil [1]* [1] The Hebrew University of Jerusalem; [2] Bar Ilan University

Maternal care is considered a universal and even cross-species set of typical behaviors, which are necessary to determine the social development of children. In humans, most research on mother-infant bonding is based on Western cultures and conducted in European and American countries. Thus, it is still unknown which aspects of mother-infant typical behaviors are universal and which vary with culture. Here we test whether typical mother-infant behaviors of affect-communication and affect-regulation are equally represented during spontaneous interaction in Palestinian-Arab and Jewish cultures. 30 Palestinian-Arab and 43 Jewish mother-infant dyads were recruited and videotaped during free interaction. Using Affect-Regulation-Coding-System (ARCS), we behaviorally analyzed the second-by-second display of valence and arousal in each participant and calculated the dynamic patterns of affect co-regulation. The results show that Palestinian-Arab infants express more positive valence than Jewish infants and Palestinian-Arab mothers express higher arousal compared to Jewish mothers. Moreover, different cultures show different strategies to regulate their infant: increased arousal in Palestinian-Arab dyads and increased mutual affective match in Jewish dyads. Such cross-cultural differences in affect communication and regulation indicate that basic features of emotion that are often considered universal, are differentially represented in different cultures. This suggests that affect communication and regulation patterns can be transmitted across generations in early-life socialization with caregivers.

47	Postpartum depression attenuates mother-infant brain-to-brain synchrony *Olga Hayut, Linoy Schwartz, Moran Influs, Shiran Lifshin, and Ruth Feldman* Reichman University

Maturation of the infant's social brain occurs in the context of bio-behavioral synchrony between mother and child. Brain-to-brain synchrony is one mechanism of social connectedness that

facilitates early socioemotional development. While recent advances in social neuroscience report brain-to-brain synchronization in parent-infant dyads, little is known about brain-to-brain connectivity in conditions involving substantial impairment to maternal caregiving. Postpartum depression (PPD) is a prevalent psychiatric disorder that disrupts the mother's capacity to attune to the infant's signals, engage in positive synchronous interactions, and provide optimal opportunities for socioemotional learning. The current study aims to examine brain-to-brain synchrony between mother and infant in maternal postpartum depression and examine whether behavioral deficiencies that characterize interactions between depressed mothers and their infants translate to reduced brain-to-brain connectivity. We recruited 40 mothers to infants 3-8 months old that answer clinical criteria for postpartum depression and 40 mothers for control group (total 80 dyads, N=160). Dual EEG is measured while mother and infant engage in different situations (free play, mother unavailable, reunion). Preliminary analysis of dual EEG in 34 mother-infant dyads (17 mothers with PPD and 17 mothers from control group) indicated significantly higher brain-to-brain connectivity during social interactions between mother and infant in control group as compared to PPD dyads. Reunion after mother's unavailability elicited multiple cross-brain links in control group but not in PPD group. Our findings begin to chart the ways in which maternal depression may impair maturation of the child's social brain during its sensitive period, leading to long-term social deficits.

48 Parent-child interaction vs. synchronization: understanding the bigger picture from a hyperscanning and joint attention point of viewing

Carmel Gashri and Tzipi Horowitz-Kraus
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Parent-child interactions are the basis for future social interactions and language development, which can be quantified using methods of parent-child synchronization. One of the methods to facilitate such interaction is Dialogic Reading (DR); a shared-interactive reading method involving communication between the parent and the child while reading a book. Whether this method is also associated with greater brain-to-brain synchronization compared to book reading that does not involve interaction is the question of the current study. Twenty-seven mother-child dyads (toddlers aged 24-42 months, 21 girls) participated in the current study. Using a hyperscanning electroencephalography method and joint attention tagging, parent-child interaction was examined during DR contrasted with the storybook reading to Control condition without interaction. Results: The DR condition was associated with a lower number of synchronized electrodes (11 electrodes as compared to 62 in the Control condition). However, higher percentages of gazes at each other (DR=13.74% ±12.42; Control=3.81% ± 5.86; $p<0.05$, $t=4.04$, $df=31.72$) rather than towards the book (DR=73.58% ±15.43, Control=88.73% ±10.55; $p<0.05$, $t=-3.91$, $df=38.68$). Conclusion: Despite greater eye contact associated with parent-child interaction in the DR condition, higher brain synchronization was achieved for the control condition. This might be because the brain waves are entrained to the same external signal, which is higher in the Control condition. These results call for a shift in the field of parent-child interaction and hyperscanning while looking at the bigger picture of defining interactions. Higher-quality interactions should be characterized while including additional modalities and not only brain-to-brain data.

49 Functional connectivity changes in the social cognition network of congenitally blind individuals

Shubham Kaushal [1], Hila Gvirts [1], Amir Amedi [4,5], and Daniel-Robert Chebat [1]
[1] Ariel University; [2] Reichman University

Social Cognition is linked via resting state functional connectivity (RSFC) to the default mode network, and is highly dependent on visual information. Vision provides social cues related to social cognition, for people who are congenitally blind information must be derived from other

modalities. Several studies show a delay in the development of social cognition in CB. In terms of RSFC, there is an increase between visual and non-visual networks in people who (CB), in addition to a cascade of volumetric and structural changes. We compare the RSFC of networks associated with social cognition between sighted controls and CB. Eleven CB and fourteen sighted controls underwent four sessions of resting state fMRI. Seed to voxel, ROI to ROI, and ICA (Independent Component Analysis) with CoNN (https://web.conn-toolbox.org) were used to compare CB and sighted networks. Results: Seed-to-voxel analysis shows higher RSFC in the inferior frontal gyrus (IFG) for sensori-motor-network on the right side in CB compared to the sighted group. The ICA identifies seven networks from whole brain comparison showing that CB has higher RSFC in the IFG and dmPFC cortex. CB had lower RSFC in the ventrolateral and ACC cortex than sighted people. Conclusion: Our findings support CB brain plasticity and compensation studies. The higher connectivity in dmPFC and IFG suggests CB benefit from compensatory brain plasticity that optimizes and expands neural networks while pruning others, such as the vlPFC and ACC, which reduces RSFC. Future research should correlate CB social cognition behaviour with RSFC changes.

50	Pathways from kangaroo care intervention to premature neonates to adult hormonal, immune, and mental health outcome *Adi Ulmer Yaniv, Karen Yirmiya, Orna Zagoory-Sharon, and Ruth Feldman* Reichman university

Preterm-born adults are more prone to exhibit poor mental health, particularly anxiety and depressive symptomatology. This vulnerability stems from neural and physiological immaturity at birth, which renders preterm infants highly sensitive to rearing conditions. Kangaroo Care (KC), involving skin-to-skin contact between the infant and the caregiver, has been shown to improve well-being and outcomes in premature infants throughout development. We followed a cohort of preterm infants and their mothers from birth to adulthood, including infants who received KC intervention versus a control group, who received standard incubator care. In adulthood, we measured mental health, oxytocin (OT), and secretory-IgA (s-IgA), an immune marker. Using structural equation modeling, we examined mother-child synchrony across development, maternal mental health, and child executive function in adolescence as mediators of the three adult outcomes, comparing a direct model, which proposed that KC directly impacts adult outcome to a mediated model, suggesting that relational, psychiatric, and cognitive pathways mediate the effects of a neonatal intervention on outcome in adulthood. Results revealed that whereas no group differences were found in mental health, OT, and s-IgA levels, adult outcomes were mediated by the maternal, dyadic and cognitive factors. KC affected both mother-child synchrony and maternal mental health, which, in turn predicted higher OT levels and better mental health of the child in adulthood. Finally, KC directly predicted children's executive function score but was not directly associated with adult outcomes, but with maternal mental health. This model, which takes the child's social environment across development into consideration, provided a significantly better fit to the data compared to the direct model. Our results suggest that maternal-newborn contact impacts long-term outcome in premature infants through both altering the child's social environment as well as improving the maturation of regulatory outcome and accords with models on developmental continuity.

15:30 - 16:50 Session 5 (3 parallel sessions in rooms A, B and C)

Room A: Symposium 5: Similarities and differences in L1 and L2 reading: Novel approaches and insights (Organizer: Anat Prior)

15:30-15:50	Re-thinking l1/l2 similarities and differences in English proficiency: insights from the English reading online (ENRO) mega study *Noam Siegelman [1,2] and Victor Kuperman [3]*

	[1] The Hebrew University of Jerusalem; [2] Haskins Laboratories; [3] McMaster University
Most studies into second language (L2) reading have employed targeted experiments designed to detect how the behavior of L2 readers differs from that of their native language (L1) counterparts, potentially leading to an over-emphasis of differences rather than similarities between these two participant groups. The goal of the current work is to re-consider L1/L2 similarities and differences within the broader empirical context offered by "mega-studies" of language and reading behavior. Specifically, we present our recent English Reading Online (ENRO) project, which includes a sample of N=7,338 L1 and L2 speakers of English, with data tapping into participants' English reading comprehension and rate, listening comprehension, multiple key component skills, and demographic and language background. We present analyses of ENRO data that examine (1) whether and on which skills L1 and L2 readers differ on average, and (2) whether and in what ways the inter-relations between different English skills vary between L1 and L2 readers. Key findings indicate a generally minor impact of the L1/L2 distinction on key reading and language outcomes and highly similar correlational patterns between facets of English proficiency in the two participant groups. More broadly, across all analyses, we observe substantially more overlap than differences between L1 and L2 participants. Together, these findings suggest that instead of following a binary L1-L2 distinction, English reading proficiency is better considered across a continuum of skill, ability, and experiences which spans L1 and L2 speakers alike.	
15:50-16:10	Eye movement traces of linguistic knowledge *Yevgeni Berzak [1,2] and Roger Levy [2]* [1] Technion-Israel Institute of Technology; [2] MIT
Eye movements in reading offer a rich, detailed picture of how language understanding unfolds in real time. Decades of research have demonstrated the sensitivity and quantitative functional form of how readers' eye movements are influenced by the linguistic characteristics of the words being read and their relationship with context. However, most of this work has examined only reading by native (L1) speakers, even though much of the world's population is multilingual, and non-native (L2) reading is a ubiquitous everyday activity. Here we present an analysis of eye movements in reading in a dataset containing a large and linguistically diverse sample of English L2 readers, including a quantitative characterization of the shape of the relationship between linguistic word properties and eye movements, and how this relationship relates to the reader's independently measured L2 proficiency. Our key result is that while many of the same qualitative effects are found in L2 readers as in L1 readers, we also find a "lexicon-context tradeoff" that is sensitive to a reader's L2 proficiency. L2 readers' eye movements are generally less sensitive to a word's relationship with its context and more sensitive to the word's intrinsic properties. However, the most proficient L2 readers' eye movements approach an L1 pattern. This tradeoff supports an experience-dependent account of the speed and efficiency with which context-driven expectations can be deployed in L2 language processing, with a proficiency driven gradual shift away from lexicon-dependent processing and towards contextual processing.	
16:10-16:30	Reader centric and language centric approaches to studying L1 and L2 reading: Evidence from children and adult Hebrew readers *Anat Prior[1], Billy Mor[2], Daphna Shahar-Yames[3] and Tamar Michaly[1]* [1] University of Haifa; [2] Mofet Institute; [3] Beit Berl College
The question of whether and how reading in a first language differs from reading in a second language can be addressed by two main approaches. The within-reader approach compares individuals' reading performance in their L1 and their L2, and allows us to identify language and cognitive skills of the reader that might support reading across the two languages. The within-language approach compares readers for whom and target language is either the L1 or the L2, and enables us to ask how language and script characteristics influence L1 and L2 reading. Here we	

illustrate the utility of both approaches in several recent studies. In two studies of adult readers of Hebrew (L1) and English (L2) we found that these readers were more sensitive to word frequency and word predictability in their L2 than they were in their L1. We also found that measures of language proficiency were strong predictors of reading performance in both languages, and we found no cross-language associations in performance. In two studies of elementary school child readers of Hebrew as an L1 or an L2, we identified both similarities and differences in reading efficiency and comprehension. Importantly, L2 readers showed a greater discrepancy between reading pointed and unpointed Hebrew than did L1 readers. We will discuss the challenges inherent in the reader centric and the language centric approaches and stress the unique insights that can be reached by combining designs using either the reader or the language as the point of departure.

16:30-16:50	Differential effects of multilingualism and language proficiency on reading patterns *Tamar Degani* University of Haifa

Reading behavior may vary as a function of different aspects of readers' language background. Specifically, in the case of multilingual reading, one may need to consider not only the readers' proficiency in the target language, but also the potential effect of merely knowing more than one language. The present study aims to dissociate these two sources of variability, by comparing reading patterns of 30 English-Spanish (ES) bilinguals, 30 Spanish-English (SE) bilinguals, and 30 English monolingual (EM) controls, as they read English sentences while their eye-movements were monitored. Differences associated with language proficiency should be reflected by directly contrasting first-language (L1) vs. second-language (L2) reading (ES vs. SE), whereas differences associated with multilingualism should be reflected by focusing on L1 reading among monolingual (EM) vs. bilingual (ES) readers. Complementing this group comparison approach, we also examined continuous effects of language proficiency and multilingualism on reading patterns by computing individual scores on each dimension. Overall, the findings suggest that language proficiency modulated early measures of reading, whereas multilingualism affected regressions, indicative of later processing stages and integration. Together, the findings highlight the relevance of readers' prior linguistic experience in modulating reading behavior, and suggest that even L1 reading may be affected by multilingual experience.

Room B: Symposium 6: Psychological inflexibility in depression and anxiety (Organizers: Nilli Mor and Gil Burg)

15:30-15:50	Difficulties in positive social updating are associated with social anxiety and interpersonal difficulties in cross-sectional and multi-wave longitudinal designs *Reut Zabag, Einat Levy-Gigi, and Eva Gilboa-Schechtman* Bar-Ilan University

Recent theory and research suggest that social anxiety (SA) is associated with difficulties and biases in updating information. However, the specificity of these biases and their sensitivity to the valence of new information and the completeness of the provided feedback -- is only now beginning to emerge. Moreover, the temporal role of these updating biases in SA is understudied. In the present series of studies, we addressed these gaps. Study 1 investigated the specificity of the positive updating deficit. Participants (n=590) were randomly assigned to one of two structurally identical novel reversal-learning tasks with social (faces of individuals) and non-social (geometric shapes) information. Participants first learned that some stimuli were associated with positive outcomes and other stimuli -- with negative outcomes. Later, these stimuli-outcome pairings were reversed. SA was associated with a selective deficit in positively updating negative

social information. Study 2 (n=191) examined updating social information given full (factual and counterfactual) information. During this task, the outcomes of both the chosen and unchosen options were displayed. Results revealed that SA was associated with reduced positive updating. Study 3 (n=275) examined the prospective association between positive updating and interpersonal difficulties. Using a multi-wave longitudinal design, we found that better positive updating at Time 1 predicted more social engagement and enhanced positive affect 1, 16, and 53 weeks following the initial assessment. Taken together, findings suggest that reduced positive updating of social information may contribute to impairment in interpersonal functioning and the maintenance of SA.

15:50-16:10	Unpacking emotion regulation use in depression: the role of affective working memory *Noa Vardi, Lior Ronn, Eva Gilboa-Schechtman, and Shimrit Daches* Bar-Ilan University

The habitual use of emotion regulation strategies has been associated with depression risk. A higher tendency to brood over negative affect and a lower tendency to savor in response to positive affect pose a risk for depression. In addition, information processing biases and, specifically, the ability to manage positive and negative affective content in working memory (WM) have been suggested to play a role in depression risk. The current study aimed to examine whether biased maintenance of affective information (positive and negative) in WM has a unique association with depression risk above and beyond the contribution of brooding and savoring. Participants (N = 219) took part in an online experiment in which they completed the Affective Maintenance Task (AMT) and self-report forms assessing brooding, savoring, and depressive symptoms. A hierarchical linear regression model revealed that habitual brooding and savoring, as well as maintaining affective information in WM, are independently associated with depression risk. In particular, difficulty in maintaining positive affective information in WM, but not a bias in maintaining negative affective information in WM, had a unique contribution to the prediction of depressive symptoms. Thus, specific information processing biases toward positive affect may play an additional role in understanding depression risk.

16:10-16:30	Can exposure to emotional spider videos affect attention and consequence biases in high spider fearful individuals *Areen Khatib, Elinor Abado, and Hadas Okon-Singer* University of Haifa

Spider fearful individuals display biased attention and expectancies toward spiders. In previous studies, we found that attention bias can be modulated using a manipulation of contexts. However, it is yet unclear whether this modulation of fear symptoms was due the mere exposure to spiders or due to changes in expectancies and attention. In the current study, a group of high fear participants was exposed to positive spider-related contexts without performing a cognitive task, in order to examine how consequence manipulations affect attention bias toward fearful stimuli. Participants were asked to identify spider or bird deviants in a visual search array. The array was preceded by a cue which stated the likelihood of the appearance of the deviant. To manipulate consequence bias, participants were exposed randomly to one of three different contexts: (1) only visual search task; (2) only positive context; (3) combined visual search – positive context condition. Participants reported their fear of spider levels before and after the experiment, as well as in a follow-up three weeks later. Results showed that participants benefited from the cue and demonstrated a congruency effect between cue and target in all conditions. More importantly, while participants in all conditions showed a reduction in phobic symptoms following the experiment and in the follow-up examination, this reduction was stronger in the combined condition. These findings suggest that using new information presented by the environment,

while simultaneously activating attention-expectancy mechanisms, enables us to flexibly adapt and reduce fear symptoms.	
16:30-16:50	Shifting away from negative inferences for negative events and its effect on mood and rumination *Gil Burg, Baruch Perlman, Noa Avirbach, and Nilly Mor* Hebrew University of Jerusalem
Making negative inferences for negative events and ruminating following negative events are associated with increased risk for depression, but little is known about the effects of shifting from a negative to a positive inference for a specific event. In a series of studies, we assessed the effects of an inferential shift on mood, state rumination, and next-day inferences, and whether people's tendency to ruminate moderates these effects. We found instructed inferential shifting to be beneficial in decreasing negative mood and state rumination following a negative inference, and lasting effects of the inferential shift were observed on inferences made the next day. In addition, ruminators were found to be as successful as non-ruminators in an instructed inferential shift, and showed similar benefits in mood and state rumination following their shift. Ruminators that were less successful in shifting showed more persistent negative mood and state rumination compared to non-ruminators. When a spontaneous (uninstructed) inferential shift was examined, higher brooding levels were linked to less success in making an inferential shift. These findings demonstrate the beneficial effects of inferential shift. In addition, they demonstrate ruminators' difficulty in spontaneously shifting from a negative to a positive inference, but also their ability to reap the benefits of instructed inferential shifting.	

Room C: Face perception

15:30-15:50	A signal detection-based confidence-similarity model of face-matching *Daniel Fitousi* Ariel University
Face-matching consists of the ability to decide whether two face-images (or more) belong to the same person or to different identities. Face-matching is crucial for efficient face recognition, and plays an important role in applied setting such as passport control and eyewitness memory. However, despite extensive research, the mechanisms that govern face-matching performance are still not well understood. Moreover, to-date, many researchers hold on to the belief that match and mismatch responses are governed by two separate systems, an assumption that thwarted the development of a unified model of face-matching. The present study proposes a signal-detection-based model of face-matching performance, one that facilitates the use of receiver operating characteristics (ROC) and calibrations curves analyses to better understand the relations between match and mismatch responses, and their relations to factors of confidence and similarity. The model can explain a myriad of face-matching phenomena, including the match-mismatch dissociation. The model is also capable of generating new predictions concerning the role of confidence and similarity and their intricate relations with accuracy. The new model was tested against six alternative competitors models (some postulate discrete rather than continuous representations) in three experiments. Data analyses consisted of hierarchically-nested model fitting, ROC curve analyses, and calibration curves analyses. All the analyses provided substantial support in the signal-detection-based confidence-similarity model.	
15:50-16:10	Fine-scale dynamics of functional connectivity in the face processing network during movie watching

	Galia Avidan [1], Olaf Sporns [2], and Gidon Levakov [1] [1] Ben-Gurion University of the Negev; [2] Indiana University
Faces are naturally dynamic, multimodal, and embedded in a rich social context. However, mapping the face processing network in the human brain and its relation to behavior is typically done during rest or with isolated, static face images. Using such stimuli might result in overlooking widespread cortical interactions obtained in response to naturalistic context and the temporal dynamics of these interactions. We examined large-scale cortical connectivity patterns measured in response to a dynamic movie in a sample of typical adults (n=517), to determine how inter-subject functional correlation (ISFC) relates to face recognition scores. We found a positive correlation with recognition scores in edges connecting the occipital visual and anterior temporal regions and a negative correlation in edges connecting attentional dorsal, frontal default, and occipital visual regions. These ISFC patterns resembled previous findings comparing individuals with congenital prosopagnosia to normal controls and the viewing of inverted compared to upright faces. To further probe these connectivity patterns, we developed a novel method that allows the analysis of inter-subject stimulus-evoked edge responses at a single TR resolution. We demonstrated that co-fluctuations in face-selective edges observed here and in previous work are related to local activity in core face-selective regions. Finally, correlating this temporal decomposition of the ISFC patterns to the movie content revealed that they peak during boundaries between movie segments rather than during the presence of faces in the movie. Our novel approach demonstrates how the visual processing of faces is linked to fine-scale dynamics in attentional, memory, and perceptual neural circuitry.	
16:10-16:30	Social encoding improves face recognition in prosopagnosia *Yuval Navon [1], Linoy Schwartz [2], Yiyuan Zhang [3], Brad Duchaine [3], and Galit Yovel [1]* [1] Tel Aviv University; [2] Reichman University [3] Dartmouth College
Prosopagnosic individuals suffer from severe difficulties in face perception and recognition. Interventions that improve their face recognition abilities are scarce and mostly involve extended training on perceptual information. Most individuals with developmental prosopagnosia appear to make trait judgments about faces normally. In the current study we took advantage of recent reports on a social encoding benefit in face recognition and examined whether social encoding will also improve face recognition in developmental prosopagnosia (DP). Recent studies show that making trait inferences about faces (e.g., how intelligent does the face look like?) during encoding improves face recognition relative to perceptual inferences about facial features (e.g., how round is the face?) or no evaluations. This social encoding was shown to improve face recognition for other race faces, suggesting that it can enhance poor recognition abilities. Thus, we ran a group of DPs (N = 17) on a face recognition task in which participants evaluated faces socially, perceptually, or made no evaluations during the study phase. During the test phase they were presented with different images of the learned identities and were asked to decide whether the face was old or new. Results show a robust social encoding benefit that was comparable to in prosopagnosics and controls. These findings are the first to show that a non-perceptual, social manipulation can enhance face recognition in prosopagnosia. This may be consistent with a previous report that oxytocin enhances face recognition in prosopagnosia, suggesting that social processing mechanisms may help DPs to alleviate their face recognition difficulties.	
16:30-16:50	Refinement of face representations by exposure: typical and atypical development of face specialization *Marissa Hartston [1], Tal Lulav-Bash [1,2], Galia Avidan [2], and Bat-Sheva Hadad [1]* [1] University of Haifa; [2] Ben Gurion University of the Negev
Experience modulates face processing abilities so that face recognition improves with development, especially for more frequently experienced faces (e.g., own-race faces). Although	

advanced models describe how experience generally modulates perception, the mechanism by which exposure refines internal perceptual representations of faces is unknown. To address this issue, we investigated face processing both in typical development and in autism. Participants performed same-different judgments in a serial discrimination task where two consecutive faces were drawn from a distribution of morphed faces. Utilization of stimulus statistics was measured by testing the gravitation of face representations towards the mean of a range of morphed faces around which they were sampled. In adults, the results demonstrated regression of face representations towards the experienced mean. The dynamics of the perceptual bias, probed by trial-by-trial performance indicated different timescales of the bias, depending on perceptual expertise: "typical" internal representation of the averaged face was formed for own-race faces, constantly updated by more recently encountered faces. For other-race faces, the internal representation was based on recent exposure, with minimal reliance on the overall statistics. Interestingly, at age 9-10, perceptual biases were similar for own- and other-race faces, with overall and recent exposure similarly biasing performance. In autism, performance was substantially weaker and mostly biased by recent exposure, with weak representation of the average face for both face races. The findings suggest a mechanism by which exposure refines face representations and reveal strong associations between levels of specialization and the extent to which perceptual representations become narrowly tuned.

16:50-18:40 Poster Session 3 (and coffee break)

Posters 1-33: Main Lobby

Attention

1	Debiasing research on threat and attention *Zohar Weinstein [1,2], Eran Chajut [1], and Daniel Algom [2,3]* [1] The Open University; Raanana, Israel; [2] Tel-Aviv University; [3] Achva Academic College

Threat stimuli have long been considered to play a role in guiding people's attention. Attention has been found to be attracted to threat instantaneously, although sometimes the opposite tendency of avoidance was reported. The great bulk of research is based on a pair of tools, the emotional Stroop task and, more recently, the dot-probe task. Both are plagued by serious problems. Since the former has already much discredited, in the current presentation we analyze the inadequacy of the dot-probe task. Given the problems, one is forced to conclude that We conclude that, at the present time, we not have credible evidence for a directional effect of threat on attention.

2	The effect of voice familiarity on attention to speech in a cocktail party scenario *Paz Har-shai Yahav, Aviya Sharaabi, and Elana Zion Golumbic* Bar-Ilan University

Understanding speech in multi-speaker environments can be difficult, due to the competition for processing resources. In such 'Cocktail Party' scenarios, top-down attention operates to selectively amplify one voice ('to-be-attended') and suppress other competing voices. This selection process is primarily task driven, but may be also affected by acoustic and semantic properties of the voices themselves. Here we focus on an ecologically important feature of human voices – familiarity – and ask how it affects the ability to attend-to or ignore speech in Cocktail Party scenarios. We test two hypotheses: (1) is it easier to attend to a familiar voice vs. an unfamiliar one? (2) Do familiar

voices that are outside the focus of attention serve as 'attention grabbers', leading to interference with the main task? To test this, we measured Magnetoencephlograph (MEG) from N=34 volunteers in a dichotic listening paradigm where two narratives, spoken by different voices, were presented to each ear. Participants were asked to attend to the content from one ear ('to-be-attended') and ignore the other ('task-irrelevant'). Critically, participants were familiarized with one particular voice during the week prior to the MEG experiment, rendering this voice 'familiar' to them. The familiar voice could either be designtated as 'to-be-attended' or 'task-irrelevant', allowing us to test the interaction between voice familiarity and attentional status on the neural speech tracking response. Studying this interaction allows us to better understand the mediating role that voice recognition (and by extension auditory-semantics) plays in the complex goal-driven top-down biasing of auditory sensory processing.

3	Neural decoding of selective attention to speech from real-space recorded acoustic mixtures *Eshed Rabinovitch, Paz Har-Shai Yahav, Adi Korisky, Renana Vaknin-Harel, Roi Gueta, Sharon Gannot, Elana Zion-Golumbic* Bar-Ilan University

The human ability to focus on a single speech stream out of many is often studied in laboratory settings where participants sit still and are asked to listen to concurrent, well controlled, speech stimuli, that are presented through earphones (often dichotically). Participants are instructed to selectively attend to one speaker and ignore another, and the neural signatures of this selective attention can be extracted from their neural response. This project strives to pave the way towards investigation of selective attention to speech under more ecological conditions. One challenge in pivoting to real-world studies is that researchers will not have access to the "clean" audio of each speaker, but rather this will need to be inferred from the mixture (just as done by the auditory system). We present data from a selective-attention paradigm to concurrent speech where speech was presented over loudspeakers rather than headphones. We compare auditory attention decoding using both linear (TRF) and non-linear (DNN) approaches, applied using either the clean speech audio of the two speakers (known a-priori to the researchers), or a derivation of the speech audio of both speakers after segregating them using a beamforming approach. We show comparable results for both methods, demonstrating the feasibility of applying attention-decoding techniques in real-life contexts outside the lab.

4	Investigating the influence of cognitive-emotional trainings on pain sensitivity in healthy adults *Einav Gozansky, Hadas Okon-Singer, and Irit Weissman-Fogel* University of Haifa

Cognitive-emotional trainings (CETs) for pain are new promising interventions targeting core mechanisms related to pain processing and modulation. However, as in the research field of CETs for enhancing well-being in mental problems, CETs for pain show inconsistency in their ability to modify pain sensitivity. Thus, our research goal is to shed light on pain modulation mechanisms underlie CETs for pain, and examine factors mediating trainings efficacy. Here we present our first study, evaluating experimental pain modulation in healthy individuals by using two single-session trainings. Methods: Participants underwent a baseline evaluation containing questionnaires, attention bias towards pain task, and baseline pain assessment using quantitative sensory testing (QST) including ratings of suprathreshold heat pain stimuli and cold pressor test (CPT). Next, participants completed either pain acceptance or pain attention bias modification (P-ABM) active training or their matching control conditions and were assessed again using QST.
Results: Preliminary findings from 33 participants demonstrate they experienced a reduction in sensitivity to suprathreshold pain stimuli following active acceptance and P-ABM trainings. Further, only participants in the active acceptance training reported an increase in pain threshold and tolerance in the CPT. Conclusions: To the best of our knowledge, this is the first study that

directly compares two different CETs for pain. Our preliminary results support the claim that CETs can reduce experimental pain sensitivity and increase pain tolerance. Therefore, our future studies will further investigate the mechanisms underlying pain sensitivity reduction induced by each training, by employing multidimensional assessment including emotional, cognitive, and physiological measures.

Cognitive control

5	Oculomotor inhibition markers of stimulus predictability: what, where, and when *Yahel Shwartz and Yoram Bonneh* Bar-Ilan University

Making predictions about when and what comes next is a central brain function. We have previously found that the phenomena of Oculomotor Inhibition (OMI), in which microsaccades and eyeblinks are inhibited in response to perceptual events, is sensitive to violations of statistical regularities. Here we tested the dependence of the OMI on the history of preceding events. Method: In a set of experiments, observers passively viewed and silently counted sequences of 90 stimuli, briefly presented in ~1 Hz repetition rate at fixation. For testing the prediction of "what" we used separate pairs of stimuli presented in random order: faces-houses, color, auditory-pitch, and contrast. For testing the prediction of "when" and the buildup of temporal anticipation, we used two randomly interleaved inter-stimulus intervals that differed by 100-500 ms. Results: We found that repetition of the same stimulus shortened the OMI for the corresponding stimulus, while a change of stimulus increased it, with a magnitude that changed systematically with the number of recent (4-6) preceding events. We further found a similar OMI pattern for testing prediction for "when". Conclusion: When perceiving a sequence of visual stimuli, the eyes freeze (OMI) for a shorter time for repeating stimuli (~10 ms per repeating item) and longer time for change, reflecting a serial dependence of the OMI. We interpret the results as reflecting a priming effect which implements an ongoing process of computing implicit predictions based on the recent past. This interpretation fits the data for predicting "what", as well as "where" and "when".

6	ERP indications of task conflict *Ilona Glebov Russinov, Aviv Avitan, Moti Salti, Andrea Berger, Avishai Henik* Ben-Gurion University of the Negev

Many researchers discuss the Stroop task as characterized by one conflict – the information conflict; namely, the conflict between the information conveyed by the color and the information conveyed by the meaning of the word. This is indicated by computing a general congruency effect (i.e., RT incongruent minus RT congruent) and by treating the congruent condition as a non-conflict condition. However, it has been suggested that the Stroop task is characterized by the two conflicts rather than one; one conflict is between the information provided by the color and the information provided by the meaning of the word, and another conflict is between the two tasks to be performed – naming (or manually responding to) the color or reading the word. Whereas the information conflict appears only in the incongruent condition, the task conflict appears in the congruent condition as well. Task conflict is due to the fact that stimuli are strongly associated with specific tasks (e.g., word stimuli affords the task of reading). The existence of two rather than one conflict, has been discussed by various researchers throughout the years. More recently it was documented in several pupillometry studies. The current research seeks evidence for these two conflicts in an ERP study. Our preliminary results show that task conflict appears earlier than the information conflict.

7	The emotional day-night task: assessing the multi-facet construct of inhibition in adults and children *Maor Yeshua and Andrea Berger* Ben-Gurion University of the Negev

One of the main executive functions related to cognitive control is inhibition. Several aspects of it have been defined and studied, including response inhibition and interference control. The questions of whether the different aspects of this construct have a common factor, and of what is the developmental cascade of the different aspects, are still under debate. Moreover, it is not fully clear how and which aspects of inhibition are affected by emotionally-loaded stimuli. Two main types of paradigms are usually used in the literature for studying different aspects of inhibition: the Go/No-Go family of paradigms and the Stroop-like family of paradigms. Moreover, many tasks have been designed in order to test these facets of inhibition in different emotional contexts. However, there is a need for a task that would enable assessing them all at once, and at different ages. The combination of these paradigms in one complex task, also enables assessing a third type of inhibition: the ability to respond to a Go stimulus that was a No-Go stimulus in previous blocks, which define as Delayed Disinhibition. In this study we present a novel task, within which three types of inhibition, and their interaction with emotional valence can be measured at the group and individual levels. We tested two samples of adults, as well as one sample of kindergarten children, as this is a critical age period for inhibition development. Our study contributes to the understanding of the relation between the different aspects of inhibition from a developmental perspective.

8	The effect of delay on credit assignment *Noa Shen and Nitzan Shahar* Tel-Aviv University

Natural environments often impose delays between actions and outcomes. Most previous studies that examined the influence of action-outcome delay on value-based decision-making were conducted with an inherent methodological problem; temporal proximity to the outcome also includes temporal proximity to the subsequent trial and the need to take another action. In addition, due to the lack of use of computational tools, the studies that investigated delayed feedback were unable to differentiate two psychological mechanisms, learning rate, and decision temperature. Our task design allowed us to differentiate the influence of delayed outcome on credit assignment, from delayed trial termination. 30 participants performed a reinforcement learning task that included delay manipulation. Delay duration was random and could be between action and outcome or between the outcome to the next trial. We found indications for asymmetric delay effects on value-based learning; for the delay between action and outcome, longer duration predicts higher credit- assignment. However, longer waiting for trial termination predicts lower credit assignment. We found that both learning rate and noise estimates are affected by the delay, but the results indicate that a mechanism of the learning rate, and not of noise estimates, is what affects the asymmetric delay effects. Our results describe learning gains for delayed feedback and learning impairment for trial termination delay. It is possible that unexpected delay duration created prediction errors for the waiting time itself and thus power the positive delayed feedback effect that previous studies were unable to observe.

9	Exploring the role of curiosity in attention control *Seema Prasad[1] and Bernhard Hommel[1,2]* [1] TU Dresden, Germany; [2] Shandong Normal University, China

Most cognitive psychological studies assume that participants in a lab-based tasks maintain a single goal based on task instructions. Any behaviour not in alignment with those instructions is considered to indicate a failure of goal-driven control. People can be motivated by factors other than task-related instructions, such as curiosity. Our objective was to examine if people attend to

seemingly task-irrelevant information out of curiosity. We manipulated curiosity through stimulus uncertainty in a version of the Posner cueing paradigm. Participants (n = 40) were presented with an abrupt-onset cue followed by a single letter target (E or H). The letter target was followed by either a mask at the target location (low uncertainty) or masks at all four locations in the display (high uncertainty). Cueing effects were greater (p = 0.014) in the high uncertainty condition compared to the low uncertainty condition. In Experiments 2 (n = 41) and 3 (n = 41), we temporally separated the masks from the target to examine if general uncertainty not pertaining to the target was sufficient to influence attention capture. We found that keeping the target-specific uncertainty constant and only varying the uncertainty in mask presentation did not influence attention capture. Further research is required to examine the factors that can trigger curiosity in such paradigms. We discuss the implication of these findings in understanding the role of motivation on attention control.

10	Circadian rhythm and inhibitory control: evidence for the role of time of day in modulating cognitive control *Hadar Naftalovich and Eyal Kalanthroff* The Hebrew University of Jerusalem

Inhibitory control enables us to stop unwanted or irrelevant behaviors, emotions, and thoughts. However, certain factors can influence the effectiveness of our inhibitory control and can contribute to whether we succeed in controlling our behavior. One such factor may be alertness, which is highly affected by time of day. Recent lab studies have shown that cognitive control may be impaired during “nonoptimal” times of day based on one’s biological clock. Chronotype, the behavioral manifestation of one’s biological clock, indicates when an individual is most alert (e.g., morning for morning types). The current talk outlines how examining the chronotype and time of day interaction can help us overcome unwanted thoughts and behaviors. Using a sample of 26 patients with obsessive-compulsive disorder (a disorder that is characterized by unwanted thoughts and behaviors), we hypothesized that obsessive-compulsive symptoms would be less severe during one’s “optimal” time of day based on their individual chronotype, when, presumably, their inhibitory abilities are also optimal. Participants underwent a week of daily monitoring wherein participants reported on their obsessive-compulsive symptom severity throughout the previous day. Participants also completed a questionnaire regarding their Morningness/Eveningness preference (MEQ; Morning/Evening Questionnaire). A general estimating analysis (AR1) indicated that the MEQxTime interaction was significant (Wald Chi-Square= 8.22, p=.04), so that an evening person was more likely to experience worsened symptoms in the morning, and vice versa. Overall, results indicate that time of day plays a role in modulating inhibitory control and, thereby, unwanted thoughts and behaviors.

11	When inflexibility meets real life experiences and expectations: the role of anxiety *Shimrit Daches, Noa Tsuk–Ram, and Shachar Rozalis* Bar–Ilan University

Findings suggest that anxiety features not only negative interpretations of social scenarios but also an inflexibility pattern with which negative interpretations are maintained. Adaptive functioning involves the ability to update expectations for future events in light of new incoming evidence. The purpose of the current study was to examine the role anxiety and its manifested negative interpretation inflexibility play in the ability to update expectations for future events based on their reported past occurrence. We predicted to find greater prediction error, a mismatch between expected future events and past occurrence of similar events among anxious individuals, and those showing negative interpretation inflexibility. We recruited 200 participants via Amazon's Mechanical Turk who completed an online experiment three weeks apart at three different time points. At each time point, participants completed the Emotional BADE task, the TENSE

assessment of the occurrence and expectations of negative social events, and symptomatic self-report scales. Results will be presented at the time of the conference.

Cognitive control, addiction

12	I smell it, i (do not) want it - the influence of food odor on successful inhibition in restrained eaters and unrestrained eaters *Yuval Seror, Shir Berebbi, and Eyal Kalanthroff* The Hebrew University of Jerusalem

Restrained eaters tend to control their food intake to prevent weight gain and promote weight loss. Studies have found that in restrained eaters, exposure to visual food cues reduces eating and enhances inhibitory control, which is the ability to successfully execute a goal-directed behavior. Eating, or inhibition of eating can be encouraged by external food cues, such as odor, and so may be considered a stimulus-driven behavior. In the current study, we aimed to check whether food odor cues increase the inhibitory control of restrained eaters and decrease the inhibitory control of unrestrained eaters. Fifty-three female participants completed two stop signal tasks, a behavioral measure for inhibitory control. Participants were asked to perform a choice reaction task and to inhibit their response when a sound cue was heard. During the task, the participants were primed with both food odor and neutral odor conditions. As predicted, restrained eaters exhibited enhanced inhibitory control in response to food odors when compared to unrestrained eaters, who showed reduced inhibitory control. Our results are consistent with the extant knowledge about restrained eaters, which indicates enhanced inhibitory control when such individuals are primed with photos of food. Our findings extend the current knowledge of the influence of the olfactory system on the inhibitory control of restrained eaters compared to the general population.

13	Response inhibition to food stimuli reduces the desire to eat, but also increases negative emotionality *Maram Saad and Noam Weinbach* University of Haifa

Response inhibition (RI) represents the cognitive ability that allows us to inhibit or suppress prepotent, automatic responses when necessary. Studies have demonstrated that training participants to exert RI while viewing images of food stimuli results in reduced food consumption. However, the mechanism through which response inhibition influences eating behaviors is unclear. Previous studies have suggested that RI and emotion processing are closely linked. This study assessed if implementing RI while viewing food images can modulate negative emotionality and the desire to eat on a trial-by-trial basis. The study included 59 women aged 18-35 with no eating pathology. In this study, participants were required to withhold their response when a stop signal appeared. Then, participants were exposed to emotionally negative or neutral images and rated their negative emotionality and their desire to eat the previously depicted food item. The results showed that participants rated lower desire to eat food items that were coupled with a stop signal compared to go trials (without a stop signal), and it was also found that when participants had successful inhibition toward food, they rated lower desire to eat compared to unsuccessful inhibition. In addition, the results showed that participants rated the emotional images as more negative in trials where there was a stop cue compared to go trials. These results support the notion that RI can be used to influence food craving by showing that the desire to eat can be modulated by RI, but at a cost increases a negative emotional experience.

14	The effect of cognitive control on delay discounting among young adult smokers Rola Wakid and Noga Cohen University of Haifa

Cigarette addiction is an interesting and complex area of research that has been extensively studied by neuro-behavioral researchers. Cigarette dependency was found to be directly related to impulsive behavior, which may lead to more nicotine dependence. Because cognitive control contributes to self-regulation capacity, cognitive control may affect smoking behavior and reduce the desire to smoke. The current study examined whether training smokers to employ cognitive control would reduce impulsivity. A total of 99 participants were randomly assigned to one of two training groups. In the training group, activation of cognitive control was followed mostly by the presentation of smoke-related pictures, whereas in the control group it was followed mostly by neutral pictures. Following the training, participants performed a delay discounting task, which measured impulsivity rates, and filled emotion regulation questionnaires. The results showed no difference in the degree of cognitive control they exhibited in the flanker task. Opposite to our prediction, participants in the control group showed no difference in reaction time between the smoke-related and the neutral pictures, while the training group showed slower RT for neutral vs smoke-related pictures. Furthermore, we did not observe any difference between the groups in impulsivity, as measured using the delay discounting task. However, a higher tendency to use suppression was associated with a lower impulsivity rate in the training group, but not in the control group, while a higher tendency to use reappraisal in daily life was associated with lower impulsivity in the control group, but not in the training group.

15	Priming inhibitory control increased positive attitudes toward high-calorie foods in restrictive eaters *Shir Berebbi and Eyal Kalanthroff* The Hebrew University of Jerusalem

Restrained eaters limit their food intake using restrictive diets to control their weight. To maintain their restrictive diets, restrained eaters often employ the use of strict rules. Adhering to such rules requires the active use of inhibitory control, which leads to a strong connection between food and inhibition. Behaviorally, previous studies in our lab have shown that restrained eaters exhibit better inhibition when food stimuli are presented and worsened inhibition when stimuli were neutral. Cognitively, restrained eaters show more negative thoughts about eating, weight, and shape than healthy controls. The current study included three groups, each performing a different version of the stop-signal task. In the first (food-response) and second (food-inhibition) groups, food stimuli were associated with either response or with inhibition, respectively. In the third group, the food-response/inhibition group, food stimuli were not associated specifically with response or inhibition. For all groups, implicit attitudes were measured by an implicit association test, and food intake was measured by a bogus taste test. The results showed that the food-response/inhibition group exhibited more positive attitudes toward high-calorie food after the priming task. Additionally, the highest food intake group was in the food-response group, which was significantly higher than the food-inhibition group but not from the food-response/inhibition group. Our results indicate that the food-response/inhibition task led to a more positive attitude toward food and led a small increase in food intake. The combination of those findings can lead to more healthy eating patterns.

Face perception

16	The combined contributions of visual experience and social motivation to face recognition *Maayan Trzewik, Nira Liberman, and Galit Yovel* Tel Aviv University

Face recognition is typically better for familiar than unfamiliar faces. However, when recognition requires retrieval of the learned image, such image recognition is worse for familiar than unfamiliar faces. In this study, we asked whether these effects are due to previous exposure to various appearances of familiar faces, social motivation to encode them, or both. In two experiments, participants learned identities from 1 or 5 images and were tested on person recognition ("did this person appear in the learning?"), or image recognition ("did this image appear in the learning?"). In Exp. 1 participants learned familiar and unfamiliar faces. We found that exposure to multiple images of an identity during learning improved person recognition but impaired image recognition for unfamiliar faces, similar to effects found for familiar faces learned from a single image. In Exp. 2 we presented only unfamiliar faces and manipulated motivation by labeling them as doctors (high social status) or cleaners (low social status) during encoding and test. We found that doctors were overall recognized better than cleaners. Additionally, the benefit of visual experience for person recognition that we found in Exp 1 was stronger for doctors than for cleaners. Similar to Exp 1, visual experience did not improve image recognition. We conclude that both visual experience and motivation are involved in the generation of an abstract representation of face identity, leading to a better recognition of their identities than their images. We conclude that visual experience is necessary for this process, and that social motivation enhances it.

17	The role of experience in shaping normal and impaired face representations *Tal Lulav-Bash [1,2], Galia Avidan [2], and Bat-Sheva Hadad [1]* [1] University of Haifa; [2] Ben-Gurion University of the Negev

Experience modulates face-processing abilities so that face recognition improves with development, particularly for more frequently experienced faces (e.g., own race faces). However, the mechanism by which exposure refines internal perceptual representations of faces is still unknown. To address this issue, we studied the effects of short and long-term experienced stimulus history on face processing. Participants performed same-different judgments in a serial discrimination task in which two faces, drawn from a distribution of morphed faces, were presented in each trial. Utilization of stimulus statistics was measured by testing the gravitation of face representations towards the mean of a range of morphed faces around which they were sampled (regression-to-the-mean; RTM). In the first experiment, we found that in typically developed individuals (TD), the statistics accumulated across a set of presented faces, served as a reference for face discrimination. These RTM biases were seen across trials and sessions, demonstrating the retention of the accumulated statistics over trials and days. Additionally, the dynamics of the perceptual bias, further indicated different timescales of the bias depending on perceptual expertise. In the second experiment, we examined whether individuals with congenital prosopagnosia (CP, congenital impairment in face processing) are able to collect statistics when processing faces. Like TDs, CPs' face representations were biased by RTM, with lower face recognition abilities in CP associated with stronger RTM. Finally, despite poorer performance on face processing, CPs exhibited the other race effect. Together, these studies reveal the intricacies in which experience shapes perception under normal and congenitally impaired visual processing.

18	Can facial mimicry predict decision making? *Liron Amihai, Elinor Sharvit and Yaara Yeshurun* Tel Aviv University

Facial expressions are one of the most prominent non-verbal cues revealing individual's mental states. During face-to-face interactions people tend to mimic each other's facial expressions. This mimicry plays an important role in successful social communication and has been shown to be linked to cognitive and emotional empathy, as well as in theory of mind (ToM) and emotional contagion. In the current study, we set out to test whether facial expressions, and specifically facial expressions mimicry, can be used to predict individual's subsequent decision? Sixty dyads will participate in a social naturalistic decision-making task. In each trial, participants will read or listen to short synopses describing movies and choose which of the movies they would like to watch. We will measure their facial expressions using sEMG printed electrode arrays. We hypothesize that (i) listener's facial expressions while listening to the synopses will predict listener's subsequent decision; (ii) speaker-listener's facial expressions synchronization will predict listener's subsequent decision; (iii) there will be higher dyadic synchronization when an individual tries to predict the decision of their partner (vs when they need to choose their own preference) and (iv) increased dyadic synchronization will be associated to better social interaction.
Preliminary data analysis (N=8 dyads) suggest that for most participants, happy facial expressions (smiles) were not predictive of the subsequent decision. In additional analyses we will test other facial expressions to further test hypothesis (i) as well as measure facial expressions synchronization to test hypotheses (ii), (iii) and (iv).

19	Information in perception and memory is retrieved in reversed order *Adva Shoham, Yuval Navon and Galit Yovel* Tel Aviv University

It is well-established that visual information is processed hierarchically from low-level percepts to high-level concepts. However, considerably less is known about the order of processing of retrieval of information from memory. It has been suggested that the retrieval stream used in the reconstruction of visual information from memory also operates in a hierarchical stream, but it does so in the reversed direction of the processing stream used for perception, from concepts to percepts. In this study, we investigated whether this reverse reconstruction hypothesis occurs when retrieving visual and semantic information about familiar identities. We asked participants to make visual decisions (i.e., hair color) or semantic decisions (i.e., occupation) about famous politicians and entertainers, based on their images (perception) or their names (memory). We found that during perception, reaction times (RTs) for visual questions were shorter than RTs for semantic questions, supporting a feedforward processing of information, from percepts to concepts. Consistent with a reversed reconstruction hypothesis, a reversed pattern, from concepts to percepts, was found during retrieval, where RTs for semantic decisions were shorter than for visual decisions. We conclude that information is retrieved in reversed order in memory and perception.

Developmental disorders, language I

20	Motor skill learning across toddlers with differing language skills *Mona Julius [1,2], Shirly Dotan[1], Yael Frishman[1], Inbal Weberman[1], Hadas Hess [1], Shari DeVeney [3], and Esther Adi-Japha [1]* [1] Bar Ilan University; [2] The Levinsky- Wingate Academic College; [3] University of Nebraska at Omaha

In 2-year-olds, 10-15% exhibit late language emergence (LLE) and are identified as late talkers due to small, late-developing expressive vocabularies in the absence of known developmental disorders. Some children with LLE (approx. 20-30%) are likely to be later identified with developmental language disorder (DLD). Motor impairments frequently co-occur with language

impairment such as DLD. Individuals with DLD are slow to learn motor sequences and do not consolidate and retain sequence knowledge as effectively as peers. Although most late talkers develop appropriate language skills eventually, the question of what is in common between later talkers and children diagnosed with DLD has attracted recent interest. Since difficulties of children with DLD are not limited to the linguistic domain and many show motor impairments, the present study was designed to investigate whether deficits in motor skill learning that exists in 5- and 6-year-old children with language disorder also appeared in 2-year-old children. Here we report on 12 late-talkers and 23 typically developing 2-year-olds who studied how to skillfully insert a specific non-symmetric shape to a shape sorter. The children had 12 trials on Day 1, 12 Trials on Day 2, and 12 trails on Day 3 that were followed by 4 transfer trails to a different non-symmetric shape. Our findings revealed a deficit in the accuracy of initial performance and transfer to a new non-symmetrical shape. These findings suggest that motor skill learning deficits of 2-year old's who are late talkers are different than those of kindergarten children with language impairment.

21	Impaired incidental learning of complex sound categories in children and adults with developmental dyslexia *Hadeer Derawi [1], Lori L. Holt [2], Avi Karni [1], and Yafit Gabay[1]* [1] University of Haifa; [2] Carnegie Mellon University

Procedural learning mechanisms subserve the acquisition of speech categories especially under incidental learning conditions. We examined how child (10-11 years old) and adult (18-30 years old) participants with dyslexia and age-matched control participants, incidentally learn complex non-speech auditory categories. Participants performed a visual location detection task in which, unknown to them, sound categories predicted the visual target. Dyslexic adults gained less in practicing the visual task but developed as large a performance dependence on the sound categories, indicating incidental auditory category learning, as their typical peers; they were less adept in generalizing to novel sound exemplars. Dyslexic children showed no evidence for category learning, unlike their typical peers, despite intact perceptual acuity for similar sound exemplars. These results suggest a reduced propensity to generate nonlinguistic sound categories in incidental learning conditions in children with dyslexia. This reduced propensity may impact the resolution of phonological representations and, in turn, reading ability.

22	Letter position dyslexia in sign language *Neta Haluts, Doron Levy, and Naama Friedmann* Tel Aviv University

We present two cases of a specific type of dyslexia – Letter Position Dyslexia (LPD) in two deaf signers of Israeli Sign Language. LPD is an impairment in the visual-orthographic analyzer in letter position encoding. Hearing individuals with LPD make transpositions of letters, mainly in the middle letters of the word in migratable words (in which this creates another existing word, e.g., slime>smile), and errors with reduplicated letters (e.g., follow>flow) (Friedmann & Gvion, 2001; Friedmann & Rahamim, 2007). LPD has never been reported in deaf signers. Testing LPD in a sign language is especially interesting – thanks to fingerspelling – a system of handshapes representing the orthography of the surrounding spoken language, used for spelling out words that do not have a corresponding sign (Padden & Gunsauls, 2003). Because fingerspelled words are signed letter-by-letter, with a temporal separation, signers with LPD might make letter transposition only with written words, when the letters are presented together, but not with fingerspelled words. In reading-then-signing written words, the participants with LPD made significantly more transposition and reduplicated-letters errors than the controls. When they read a migratable word and had to choose between the target picture and the result of letter migration (e.g., the word ‘files’ followed by pictures of files and flies), they made significantly more errors and had longer RTs than the controls. Interestingly, they also made significantly more transpositions and reduplicated-letters errors when the words were fingerspelled to them, which shows the process

of letter position encoding is crucial for both modes of reading, and suggests that the letters of the fingerspelled words are held together in some buffer prior to their position encoding.

23	Impaired cross-situational statistical learning in developmental dyslexia *Nitzan Kligler and Yafit Gabay* University of Haifa

Although statistical learning has been studied extensively in developmental dyslexia (DD), less attention has been paid to other fundamental statistical learning challenges in language acquisition, such as cross-situational statistical learning. Such investigation is important for elucidating whether and how statistical learning processes are affected in DD at the word level. In the present study, typically developed (TD) adults and young adults with DD were exposed to a set of trials which contained multiple spoken words and multiple pictures of individual objects, while no information about word-referent correspondences was given within the trials. Nonetheless, over trials cross-trial statistical relations could be exploited in the service of learning word-referent mappings. Different learning conditions varied the degree of within-trial reference uncertainty and learning was tested using unnamable objects (Experiment 1) and namable objects as referents (Experiment 2). Results show that young adults with DD were significantly impaired in their ability to exploit cross-trial regularities in co-occurring visual-auditory streams for discovering word-referent mappings. Using namable objects as word referents did not resolve the learning gap between the two groups. Binary confidence measures revealed greater development of implicit knowledge in the TD group than in the DD group. Together, these findings suggest that the SL deficit in DD affect fundamental language learning challenges at the word level and points to greater reliance on explicit learning strategies in DD to overcome impaired implicit associative learning. Such a deficit is likely to influence spoken language acquisition and, in turn, affect the literacy skills of people with DD.

Emotion I

24	Expectancy and attention bias to spiders: dissecting anticipation and allocation processes using ERPs *Elinor Abado [1], Tatjana Aue [2], Gilles Pourtois [3] and Hadas Okon-Singer [1]* [1] University of Haifa; [2] University of Bern; [3] Ghent University

Studies suggest that there exists an interaction between a-priori expectancies and attention bias toward threat, as threat detection can override endogenous attention control driven by expectancy. Specifically, while expectancy influences the detection of neutral stimuli, it does not aid nor hinder the detection of spiders. The current study focuses on the temporal dynamics of the relationship between expectancy and attention toward threat, to better understand the mechanisms underlying the prioritization of threat detection. In this accepted-in-principle (Stage 1) registered report, an event-related potentials (ERP) experiment was conducted. Specifically, we manipulated a-priori expectancy and measured attention bias, using a well-validated paradigm. To this aim, a visual search array was presented, with one of two possible targets: spiders (threatening) or birds (neutral). A verbal cue stating the likelihood of encountering a target preceded the array, thus creating congruent and incongruent trials. Following cue presentation, preparatory processes were examined using the contingent negative variation (CNV). Following target presentation, two components were measured: early posterior negativity (EPN) and late positive potential (LPP), as these components reflect early and late stages of natural selective attention toward emotional stimuli, respectively. In line with our hypotheses, preliminary results suggest main effects of emotion during early processing (at the CNV and EPN levels) and later effect of expectancy (at the LPP level). These preliminary results may suggest that attention is

firstly directed by the emotional value of the stimulus, beginning from cue presentation and preceding picture presentation.

25 Emotional expression in deaf and hearing populations

Dean Geckt [1], Liran Evenberg[1], Svetlana Dachkovsky[1,2], Wendy Sandler[1], Hagit Hel-Or[1], and Rose Stamp[1,3]
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Emotion expression is a crucial part of everyday social interaction. In spoken languages, we express different emotions through linguistic means, such as emotive lexical items, as well as through non-linguistic means – intonation, face, head and body movements. Deaf signers also express emotions linguistically and non-linguistically, yet exclusively in the visual modality, which is accessible to both deaf and hearing people. Moreover, the same visual display, e.g., an eyebrow raise, can serve both linguistic and non-linguistic functions – signaling yes/no questions or surprise, respectively, presenting a challenge for analyzing emotion expressions in the deaf population. Studies examining the perception of emotional expressions within deaf populations show contradictory results. On the one hand, sign language knowledge contributes to signers' more accurate identification of facial expressions [1]. Yet deaf people experience delays in mastering emotional understanding, which might stem from delays both in exposure to language and to interpretation of emotional expression [2-3]. Yet, no study to date has tested whether the important factors of sign language knowledge and hearing status lead to differences between deaf and hearing individuals' production of emotional expressions. In this poster, we present our findings from 45 participants from three groups, performing a language-related task: (1) hearing non-signers, (2) hearing signers, (3) deaf signers. Their facial expressions produced in four emotion conditions -- sad, happy, angry and neutral -- are analysed using OpenFace's facial tracking technology and machine learning techniques. The results of the study show that these three groups can be classified accurately based on emotional expressions.

26 The effects of processing style and inhibitory control on negative emotional reactivity

Mor Ben Zaken-Linn and Noam Weinbach
University of Haifa

Negative and positive moods have been associated with local and global perceptual processing, respectively. This study examined if priming local or global processing can subsequently modulate subjective emotional reactivity. In a series of three experiments (total N of 208), participants completed a global/local processing task. After each trial, participants were exposed to a negative or a neutral image and then rated their negative feelings. In all three experiments, an interference caused by the global, but not the local, feature reduced negativity ratings. However, the global interference also required greater inhibitory control resources, which is also known to reduce emotional reactivity. A fourth experiment controlled the level of inhibitory control required within the global and local blocks. In this experiment, the results showed that both global and local interference reduced emotional reactivity. The results suggest that inhibitory control, rather than processing style, downregulates negative emotional reactivity in response to aversive stimuli.

27 The effect of negative stimuli in incidental learning

Meital Friedman [1], Tomer Sahar [1,2], Tal Makovski [2], and Hadas Okon-Singer [1]
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People are extremely efficient in learning regularities embedded in the environment, yet little is known about how this learning is affected by the valence of the stimuli. The current study examined Visual Statistical Learning (VSL) for negative stimuli triplets using a modification of the paradigmatic task. Participants viewed a stream of stimuli, presented one at a time, composed of triplets of spiders and triplets of butterflies. We found better incidental learning for the aversive spider triplets than for the neutral butterfly triplets. In Experiment 2, we further examined the

learning of negative stimuli by changing the number of negative elements in each triplet; none, one, or all. The results showed that the all-negative triplets were the most recognized, followed by the one-negative triplets and the no-negative triplets. We employed the paradigm using real-world images and replicated our findings. In Experiment 3, we tested memory for every single item within the presented triplet. We analyzed participants' familiarity ratings for each item depending on the number of negative elements and their position in the triplet. We found no significant advantage in negative-item recognition in this case. However, we found greater familiarity with birds before spider than birds after spider. This is the first study exploring how emotional objects influence the learning of regularities and the recall of the elements in the VSL units.

28	"Emoji vs. text": dimensional interaction using emotional emoji and text in computer mediated communication *Maya Mentzel [1], Ronnie Kerem, [1], and Boaz M. Ben-David [1,2]* [1] Reichman University; [2] University of Toronto

Recognition of emotions is an integral part of effective dialogue. With the increased reliance on online text-based conversations in recent years, we can observe a significantly growing use of emojis to express emotions in computer-mediated communication (CMC). Even so, there is limited research examining how emojis are cognitively processed in relation to the textual context in which they appear. The purpose of the current study is to explore the relationship between written text and emojis. More specifically, we aim to examine whether the two dimensions (text and emojis) are processed integrally or separably: can participants ignore one dimension, and regard the other? Is there dominance for one dimension? To test this, we will adapt the Garner paradigm to an emoji-word version whereby an emoji is paired with either a semantically congruent or incongruent word. The baseline condition for the emoji dimension will comprise of a consistent emoji presented together with differing words describing discordant emotions. Meanwhile the baseline condition for the word dimension will include a consistent emotionally descriptive word coupled with conflicting emojis. The filtering condition will vary from trial to trial on both dimensions, creating incongruent pairings. Participants will be asked to classify the presented stimuli according to one dimension. If emojis and words are processed integrally, we would expect participants' reaction times to be longer in the filter (incongruent) condition due to interference between the dimensions. Reaction times of baseline conditions will be compared to determine dominance or preference for one dimension. Preliminary results will be discussed.

Perception

29	Pupillary measures of audio-visual binding can predict the varied severity of motion sickness *Revital Zilka and Yoram Bonneh* Bar-Ilan University

Motion sickness refers to the feeling of sickness that typically occur during travel, with varied severity across individuals. Current explanations focus on the sensory conflict in the perception of motion, primarily between the vestibular and the visual systems. We have previously suggested that people tend to feel motion sickness when the conflicting stimuli are perceived as bound together. We demonstrated this by showing a correlation between the severity of Motion Sickness and the temporal binding window (temporal asynchrony interval in which this binding occurs, TBW) for the McGurk effect. In the current stud, we used an objective pupillary measure applied to a different stimulus, the double-flash illusion. Methods: We used the double-flash illusion in which a single visual flash is perceived as a double flash when presented together with two beeps. We measured the decrease in the relative pupil dilation induced by the flash with asynchrony to obtain

the TBW. We tested 25 individuals on this task, as well as the McGurk task and on the Motion Sickness questionnaire. Results: We found that the TBW obtained from the relative pupil dilation was significantly correlated with the severity of Motion Sickness obtained by the questionnaire (R=04). This correlation is lower than that obtained for the TBW of the McGurk effect (R>0.9). Conclusions: These results support our hypothesis that explains the enigmatic differences between individuals in the susceptibility to motion-sickness. The results also demonstrate a novel method for measuring the TBW based on pupil dilation.

30	Integration of navigational cues in the medial temporal lobe during self-localization *Maayan Merhav* Tel Hai College

During navigation, humans, as well as other species, integrate information from landmarks and self-motion to generate probabilistic inference of self-localization. It is suggested that navigational cues are integrated according to the law of Bayes, in which the relative weight of each cue reflects its relative reliability. The neural mechanism underlying the integration of navigational cues is not fully understood. We hypothesized that integration of navigational cues involves the subfields of the hippocampus and that the relative weighs of each navigational cue is reflected by strength of hippocampal-entorhinal connectivity. To test these hypotheses, we acquired functional brain images from participants who performed a homing task, in varying reliabilities of landmarks and self-motion. We used high-resolution fMRI to anatomically dissociate medial temporal lobe subregions. We found that activity of the CA3, hippocampal subfield is modulated by reliability levels of both landmarks and self-motion cues. We also found that increasing the reliability of landmarks information increases functional connectivity between CA3 and the anterior entorhinal cortex and weakens functional connectivity between CA3 and the posterior entorhinal cortex. The findings uncover neural mechanisms that are involved in weighing and integrating navigational cues during self-localization.

31	The effect of the ponzo illusion on indirect grasping movements *Maya Winik and Tzvi Ganel* Ben-Gurion University of the Negev

Visual information processing has been suggested to be functionally separated for two different purposes: vision-for-action, mediated by the dorsal visual stream, and vision-for-perception, mediated by the ventral visual stream. This separation is grounded in evidence from neuropsychological, imaging, and behavioral studies, demonstrating a dissociation between action and perception. Each visual stream varies in goals and specializations, which manifests as differences in their function. These specializations have developed to allow us to perceive and interact efficiently with our immediate environment. However, technological advances have changed our environmental settings from the natural settings in which these systems evolved. Virtual environments, such as VR or teleoperations systems call for action, yet provide information deviating from a real-world direct vision. This study explored the effect of indirect vision over the perception and grasping of physical objects. We used the Ponzo illusion grasping paradigm as a tool to examine the functional relations between action and perception. The target objects and the illusory background were presented to participants indirectly, on a computer display. The results showed that, unlike direct grasping, grasping movements were not tuned to the physical size differences between objects, and were instead susceptible to the illusion. This effect was evident even following extensive training. The results converge with previous findings to suggest that the natural dissociation between action and perception is weakened when actions are performed in an indirect manner.

32	Investigating mechanisms of internal synchronization via the flash-lag effect *Yotam Federman and Yuval Hart* The Hebrew University of Jerusalem

Information processing in the brain is hierarchical. The biological nature of the connections between levels means information transfer could incur significant delays of about 100ms. If this delay is not accounted for, it will propagate and accumulate between levels. For example, for a moving object, the cognitive system will be unable to track its current position in real time. One method to overcome this is to send information on the extrapolated position, based on the velocity of the object. However, extrapolation presents an inherent bias-variance tradeoff: while it removes the bias of the object's location, it relies on the noisy position derivative, thereby increasing the position estimation variance. Our work investigates the bias-variance tradeoff between different extrapolation levels in response to variable noise levels. We modeled the system as a hierarchy of control mechanisms, each level designed to track a delayed, extrapolated signal from the level below it. This gives several predictions that can be tested in flash-lag effect experiments. In the flash-lag effect, a stationary object flashes next to a moving one; despite their alignment along the motion path, the flasher appears to lag behind the mover because of the extrapolation - the amount of extrapolation can be derived from the lag. The model predicts the variance of position estimation for each amount of extrapolation. More broadly, computational systems predicting changing signals face a universal bias-variance tradeoff between delayed responses and noisy estimates. Our study opens a theoretical path to evaluate characteristics of predictive processing in the brain.

33	Visual-spatial abilities are not related to the speed of mental rotation *Mattan S. Ben-Shachar and Andrea Berger* Ben-Gurion University of the Negev

Individuals' reaction time (RT) slopes in tasks of mental rotation have been found to be related to other measure of visual-spatial abilities, and thus are viewed as a psychometric measure of visual-spatial abilities. The common interpretation of individual RT slopes is as a measure of the speed at which the rotation is carried out. However, EEG studies have found that the process of mental rotation continues after response selection has been carried out, casting doubt on the interpretation of RT slopes as measures of the speed of mental rotation. This study made use of EEG techniques to directly capture individual differences in the speed of mental rotation and assess their association with visual-spatial abilities, revealing that individual differences in mental rotation speed are not related to individual differences in RT slopes. Additionally, a computation model supports an alternative explanation by which RT slopes reflect individual differences in differential tolerances for stimulus identification within mental rotation tasks.

Posters 34-49: Upper Lobby

Language

34	The impact of mirative markers on reaction to unexpected words in hebrew sentences *Benjamin Menashe, Hadar Altshuler-Frenkel, Yael Greenberg, and Michal Ben-Shachar* Bar-Ilan University

During sentence processing, unexpected words typically evoke behavioral and neural responses such as longer reading times, compared to expected words. Miratives, including words like "surprisingly", are elements which linguistically encode expectation-violation. (Delancey, 1997). The present study aims to investigate whether a mirative preceding an unexpected word alters the typical response for that word. In other words, how will informing the reader about an upcoming surprise influence the reader's expectations and processing. Participants (N=65, mean age: 23) read 160 Hebrew sentences, presented in a self-paced reading paradigm. They controlled word-by-word presentation with button presses, and their reaction time to each word was recorded. We manipulated the presence or absence of a mirative in the beginning of the sentence, and the

semantic expectedness of a target word that appeared downstream. A linear mixed-effects model was fit to predict the log-transformed reaction time at target words, with fixed effects of expectedness and mirativity, and random effects of intercepts and slopes per participant and per sentence. We found a significant expectedness effect (beta=0.044, se=0.01, p<0.001) and a significant interaction between expectedness and mirativity (beta=-0.047, se=0.02, p<0.01), such that the presence of a mirative decreased RT for unexpected target words and increased RT for expected target words. We conclude that miratives prepare readers for an upcoming surprise, thereby modifying their expectations and leading to a reduction in their surprise-like responses to later events.

35 Activating the right hemisphere through left-hand muscle contraction improves novel metaphor comprehension

Tala Noufi and Maor Zeev-Wolf
Ben-Gurion University of the Negev

The neurotypical brain is characterized by left hemisphere lateralization for most language processing. However, when seemingly unrelated concepts are brought together into meaningful expressions, such as with novel metaphors, the right hemisphere (RH) involvement is crucial. In Study 1, we demonstrated that left-hand contractions, which activate the motor and sensory areas in the RH, improve novel metaphor comprehension in adults. Namely, they were more accurate and quicker in judging these expressions to be meaningful. Here (Study 2), we tested whether this method also works amongst adolescents who struggle with metaphor comprehension as their brains are still maturing, and significant development happens in language processing. Eighty-four neurotypical adolescents performed a semantic judgment task involving two-word expressions of four types: conventional metaphors, novel metaphors, literal, and unrelated expressions while squeezing a rubber ball with either their right hand, left hand, or not at all. The results demonstrated a similar pattern to Study 1. Namely, left-hand contractions improved novel metaphor comprehension in adolescents. These findings provide a simple and efficient method for improving metaphoric language comprehension. Moreover, this technique may aid in improving adolescents' social skills, as previous studies link metaphor comprehension and social skills in adolescence.

36 Prosody is barbaric! The effects of social categorization on processing of emotions in speech

Lior Tidhar and Boaz Ben David
Reichman University

An essential step in understanding another person lies in communication. Effective communication does not only merit the current identification of the content of the message, but also deciphering the emotional state of the speaker. Misattribution of emotional intent can lead to communication breakdown and false attributions that may, in turn, reinforce stereotypes. Processing of the auditory information in emotional speech calls for the integration of two main channels, semantics, and prosody. Semantics: "what" the speaker said, the meaning of the words (lexical content); and Prosody: "how" the speaker said it (tone of speech). In general, healthy young adults exhibited prosodic dominance, assigning a larger relative weight to prosody over semantics (Ben-David et al., 2019). However, prosodic dominance was found to be malleable due to ontogenetical factors. For the first time, we examine whether social identity can alter processing of spoken emotions, specifically how it may affect the integration of prosody and semantics.
We suggest two theoretical frameworks to explain these possible changes in perception: Infra-humanization (Leyens 2001) and Construal Level Theory (CLT, Trope & Liberman, 2010). Namely, out-group categorization could render the speaker as having lower extent of human attributes (infra-humanization) setting prosody as a primary source for emotion expression. Alternatively, out-group categorization could also psychologically distant the speaker (CLT), leading to a higher construal of emotional speech – promoting semantics.

37	Hebrew speakers 'surrender' later than English ones: processing breakdowns are sensitive to the language's grammar *Lola Karsenti and Aya Meltzer-Asscher* Tel Aviv University

In contrast to fixed subject-verb word order in English, Hebrew allows also a word order where the verb appears before the subject, particularly with unaccusative or passive verbs (e. g. halxa ha-medina). In English, reading of locally syntactically ambiguous sentences as in (1) results in processing breakdown when reading the main verb ('was returned'), compared to a baseline as in (2). However, with the next word the difficulty either decreases or disappears altogether [1-3].
(1) After the guests drank the water was returned to the refrigerator. (2) After the guests departed the water was returned to the refrigerator. In Hebrew, upon the arrival of the main verb, it is theoretically still possible that a post-verbal noun will serve as its subject (e.g. axrey she-ha-orxim ?atu maim huxzeru la-mekarer kol ha-kankanim). Thus, the realization that the main clause lacks a subject, and the ensuing breakdown, may happen not at the main verb but rather at the sentence end. We examined processing of sentences as in (1-2) with unaccusative and passive main verbs in two self-paced reading experiments in Hebrew. In Experiment 1 (N = 36) we found processing breakdown at the sentence end only (Figure 1). In Experiment 2 (N = 97) we found processing breakdown mostly at the sentence end (Figure 2). We argue that the delay in processing difficulties in Hebrew as compared with English shows the parser's sensitivity to the language's word order and, more importantly, to the thematic properties of the verb.

38	The status of the "missing v2" illusion in Hebrew *Edward Kishinevsky and Aya Meltzer-Ascher* Tel-Aviv University

Grammaticality illusions are psycholinguistic phenomena whereby comprehenders perceive ungrammatical sentences as grammatical. One such case is the "missing V2" illusion. Double center embedding (DCE) sentences (1) were shown to be extremely hard to understand, and receive low grammaticality ratings, despite being grammatical. In contrast, ungrammatical sentences such as (2), where the second verb of (1) is omitted, are frequently perceived as grammatical, in various languages (e.g. English, Mandarin). The illusion was attributed to breakdown in the routine operation of working memory.
(1) The result that the scientist that the virus infected found was published.
(2) *The result that the scientist that the virus infected was published.
Interestingly, the cross-linguistic status of the phenomenon is unclear, as German and Dutch speakers were shown to favor sentences such as (1) over (2). These findings were attributed to the languages' statistical properties, an account predicting that the illusion exists also in Hebrew.
In the current experiment we use acceptability ratings to test whether Hebrew speakers perceive (2) as grammatical. The experiment includes 24 sentence sets, each containing a DCE, a "missing V2", and missing V1 and V3 sentences. We further manipulated presentation mode between participants, testing whether sentences presented as a whole are easier to process than those presented word-by-word with brief presentation time. Initial results (N=50 out of planned 96) show a clear trend supporting the existence of the missing V2 illusion when sentences are presented as a whole, whereas word-by-word presentation induces difficulty causing an illusion also in the V3 condition.

39	Animacy feature similarity causes interference in sentence processing *Naama Gidron and Aya Meltzer-Asscher* Tel-Aviv University

Research investigating memory mechanisms in sentence processing has revealed that comprehension is prone to memory fallibility, specifically, similarity based interference. Sentence

processing often involves maintaining and integrating elements that are distant from each other. During the maintenance and subsequent retrieval of an element, e.g., a noun phrase (NP), for dependency resolution, other NPs with similar features may cause interference. While most studies aimed to detect the effects of encoding interference at the retrieval site, we investigated this interference on the site of encoding, i.e., the intervening NP. We compared two types of long-distance grammatical dependencies: subject-verb and filler-gap, when the latter is considered to have a special memory status. We wanted to investigate encoding costs on a subsequent similar NP, that is, to examine the way this similarity affects the NP's that need to be kept in memory.
In a previous self-paced reading experiment we manipulated dependency type and similarity of the animacy feature. Although not significant, we observed a trend in the data suggesting that similarity affects the dependencies differently. Since more data were needed to substantiate this claim we conducted a second experiment investigating the comprehension of the same sentences. We found a significant main effect of similarity on both dependencies. That is, when both NP's in the sentence were animates, participants were more confused significantly than when the NP's were dissimilar in animacy. This suggests that similarity causes encoding interference and affects our comprehension, regardless of the dependency that needs to be maintained in memory.

40	How do you call it?: learning, aligning with- and generalizing speaker-specific language use *Nitzan Trainin and Einat Shetreet* Tel Aviv University

Speakers can recognize inter-speaker variability in various pragmatic phenomena and adapt to the speakers' different preferences of language use when mapping inter-speaker variability is crucial for meaning inference. Furthermore, it has been repeatedly shown that interlocutors align with respect to their referential choices in what is commonly known as lexical entrainment. In this study, we examine the ability to correctly map inter-speaker variability when the language use of different individuals does not entail different meanings but instead is based on differences in stylistic preferences. Previous research on learning speaker-specific language use in such cases has so far produced mixed findings. We hypothesize that the discrepancy between findings stems – in part – from differences between the frequencies of linguistic stimuli used in the different studies. In this study, we measure inter-speaker 'stylistic' variability learning under different conditions (HH: both speakers use common words; HL: one speaker uses common words and the other uses uncommon ones). Moreover, we investigate speaker-specific lexical alignment under the same conditions. Finally, we ask to which extent speaker-specific information (obtained from speaker-specific language use) is generalized, both in linguistic domains and in social domains. Our results show that learning speaker-specific lexical preferences occurs under both conditions (HH and HL), as does speaker-specific alignment (although the alignment effect was larger in the HL condition). Furthermore, participants generalize the inter-speaker variability that they were exposed to, both within the linguistic domain (to novel words) and to the speakers' social features.

Memory I

41	The memory-experience gap: effects of sleep-dependent consolidation and the quality of information remembered *Darchi Shira, Niv Reggev, Shachar Maidenbaum and Talya Sadeh* Ben-Gurion University of the Negev

Memory-Experience gap (MEG) is the gap between the average of emotions experienced during a given event and the retroactive, overall evaluation of the experience. The retroactive evaluation of an experience is usually characterized by overestimation of the intensity of the emotion experienced. Much of the existing literature on the MEG focuses on the type of emotion, its

intensity, and individual differences. Memory of an experienced event is affected by sleep-dependent consolidation, in which certain aspects of the event undergoes further processing and will be better remembered, and others aspects, forgotten. Surprisingly, there is a lack of consideration of essential memory processes such as sleep-dependent consolidation that might explain the MEG. The current study addressed this lacuna, by examining the effect of sleep-dependent consolidation on MEG. We used virtual reality (VR) to create immersive, episodic experiences. Participants were randomly allocated into two groups: a sleep group and a wake group. In the first stage of the experiment, participants played several VR games and rated their emotions while playing. At the next stage, some participants napped in the lab, and the others listened to the podcast for an identical period of time. After this, all participants evaluated the emotions that they experienced during the first part. We found that the MEG is greater after sleep and that no MEG was formed without sleep. However, MEG was found only for positive emotions. In general, the results of the present work indicate that the existence of MEG and its intensity are influenced by sleep-dependent consolidation processes.

42	Images viewed for longer durations are better remembered during naturalistic encoding *Shaimaa Masarwa [1], Olga Kreichman [1], Limor Brook [1],and Sharon Gilaie-Dotan [1,2]* [1] Bar Ilan University; [2] University College London

Although it is yet unknown what determines which image we come across in our daily lives will be remembered, physical properties of visual stimuli are typically not considered to substantially contribute to memory. We have recently found that during naturalistic encoding image size influences image memory such that bigger images are better remembered. Here we hypothesized that during naturalistic encoding images viewed for longer duration would be better remembered. After replicating the image-size on memory effect in 2 online experiments (n=189), we ran additional online experiments to test the effect of presentation duration on memory with new na?ve participants (n=90). In this experiment participants freely viewed 160 images presented for 250, 500, 1000, or 2000 ms (image onsets always 2500ms apart) without being aware of any memory related aspect of the experiment. They were later given a surprise old-new recognition test (320 images, 50% old). A main effect of presentation duration on memory was evident by images presented for longer duration being better remembered (250ms<500ms<1000ms, post-hoc p's<0.05). As in our previous study, we found a main effect of visual category on memory with faces best remembered and outdoor the least. Given two experimental versions (each participant participated in only one version) we also found in a per-image analysis that longer presentation resulted in higher image memorability than that during shorter presentation. These results suggest that despite the different neural processes supporting longer presentations relative to those supporting bigger image size, both of these properties contribute to memory during naturalistic encoding.

43	How does contextual reinstatement affect semantic organization? *Dana Vaknin, Zohar Raz Groman, and Talya Sadeh* Ben-Gurion University of the Negev

The Context-Dependency Effect is the well-established finding in which memory performance is enhanced under conditions in which the encoding and retrieval contexts overlap (i.e., same-context), and diminished when the overlap between encoding and retrieval contexts is low (i.e., different-context). Despite much research on context-dependent memory, most prior work examined only mean levels of performance. The current experiment was conducted to examine the influence of context change, manipulated by using three different pieces of background music, on free recall. Participants were tested in either the same or different context as the material was learned in. Dependent measures of recall included: mean number of correctly recalled items, temporal organization, patterns of errors, serial position and semantic organization. The results showed no significant Context-dependency effect , although the mean number of correctly

recalled items was numerically greater in the same-context condition compared to different-context condition. Temporal organization, patterns of errors and serial position analysis showed no differences between the two context conditions. However, semantic clustering was greater in different-context condition compared to same-context condition suggesting that when contextual cues are unavailable at recall, participants use semantic organization as a compensation strategy. The present experiment provides novel evidence on the way external context change affects organization of recall.

44	How do we evaluate others' memories? *Avi Gamoran [1], Michael Gilead [2], and Talya Sadeh [1]* [1] Ben-Gurion University of the Negev; [2] Tel-Aviv University

Human episodic memory is prone to errors of commission – "recalling" false information. Therefore, monitoring the validity of one's own memories is crucial. A greater challenge, but just as important, is assessing the validity of other people's memories, in everyday life as well as in consequential decision making, such as legal settings. Previous studies have shown that information conveyed in self-reported memory justifications holds information which can be used to distinguish true from false recollections by modelling linguistic features of the text. But do humans process this information in the same way a model does? Our study examines the degree to which people can accurately classify memories as true or false, and what information is used in the process. Using previously collected data of a recognition test followed by written justifications, in an online study, participants were presented with justifications corresponding to Hits and False-Alarms and were asked to assess, based on the corresponding justification whether the witness's recognition was correct or incorrect. Participants also provided opinion ratings regarding each of the justifications (Level of confidence, generality and vivid) and about the witness (Trustworthiness, likeability, age). Our results show that human raters can discriminate Hits from False Alarms, above chance levels, based solely on the justifications provided per item. Interestingly, classification based on indirect measures provided by raters (using opinion ratings) outperforms the raters explicit classification. This suggests human raters are sensitive to valid information in memory justifications which is not necessarily employed in the final explicit decision.

45	The future, before and after: Bayesian and multivariate analyses reveal shared and unique neural mechanisms of imagining and remembering the same unique event *Inon Raz [1], Avi Gamoran[1], Gal Nir-Cohen [1], Maayan Trzewik [2], Moti Salti [1], Talya Sadeh [1], and Michael Gilead [2]* [1] Ben Gurion University of the Negev, Israel; [2] Tel Aviv University

Research shows that the brain regions that subserve our ability to remember the past are also involved in imagining the future. Given this similarity in brain activity, it remains unclear how brain activity distinguishes imagination from memory. In the current work, we scanned participants using fMRI before and after they performed a highly unique and elaborate activity wherein they went skydiving for the first time in their life. Multivariate pattern analysis, Bayesian inference, and a tightly-controlled experimental design were used to identify the neural activity that differentiates between memory and imagination of the same events. The results showed that large swaths of the Default Mode Network exhibited identical patterns of activity in recollection and imagination; several frontal areas were involved in imagination (but not in recollection), but no regions that were uniquely involved in recollection; the Precuneus was the only region that exhibited differential patterns of activity when thinking about the past vs. future. These findings join previous research concerning the crucial role of the Precuneus in our awareness of time, and suggest that recollection may be best seen as a sub-type of a broader process of mental

simulation. As such, the results advance our understanding of the ways by which the critical distinction between the past and future is manifested in the brain.

46	Intentional rehearsal bypasses the hippocampus during episodic memory encoding *Ofer Perl [1], Noga Cohen [2] , Ido Toren [3], Rik Hensosn [4], and Aya Ben-Yakov [1]* [1] The Hebrew University of Jerusalem, [2] University of Haifa; [3] Weizmann Institute of Science; [4] University of Cambridge

Perhaps the most traditional method of engraving information in our minds is by rehearsing it. Using naturalistic film clips as memoranda, we find that intentional rehearsal of an episode immediately upon its conclusion indeed increases subsequent memory. But how does this transpire? We focus particularly on the potential role the hippocampus may play given recent findings linking hippocampal activity at event boundaries with subsequent memory. These findings give rise to two contradicting hypotheses. As hippocampal activity at the offset of events is linked to successful encoding, the effect of rehearsal on memory may be mediated by an increase in hippocampal offset activity. In contrast, active tasks have been shown to inhibit the hippocampal boundary response, relative to rest. This suggests rehearsal may inhibit the hippocampal response, and exert its effect via other regions. In two independent fMRI experiments we find that memorization does not increase hippocampal activity. Moreover, it eliminates the subsequent memory effect observed at event offset during passive viewing. This indicates that rehearsal promotes memory via an alternate route, with initial evidence suggesting this may be linked to an increase in cortical activation. A new theoretical framework suggests that memory retrieval may act as a rapid consolidation event. Thus rehearsal, a form of retrieval, may bypass the hippocampus and rapidly form a semanticised, cortical representation of the event.

Methods

47	A mirror to human question asking: analyzing the akinator online question game *Gal Sasson and Yoed Kenett* Technion - Israel Institute of Technology

Question asking is a critical aspect of human communications. Yet, little is known about the reasons that lead people to ask questions, which questions are considered better than others, or what cognitive mechanisms allow the ability to ask informative questions. In this research, we take a first step towards investigating human question asking. We do so by an exploratory data-driven analysis of the questions asked by Akinator, a popular online game of a genie who asks questions to guess the character that the user is thinking of, as a reflection of how humans might ask questions. We examine different strategies for the Akinator's question-asking process, ranging from mathematical algorithms to gamification-based considerations, by analyzing complete games and individual questions. Contrary to our expectations, we show that some of the Akinator's questions do not necessarily contribute to lowering the uncertainty in the search query process executed by the game. Furthermore, we use different topic-modelling techniques to explore the topics of the Akinator's inquiries and map similar questions into clusters. Using BERTopic, a new alternative to classical LDA topic modelling methods, we show that the Akinator's questions can be distinguished by over 40 interpretable topics, such as death, family, music and more. Our results are constrained by patent protection of the game, limiting their interpretability. However, they provide a proof-of-concept to how question asking games can be utilized to empirically investigate human question asking. Our results highlight interesting commonalities in the strategies utilized by people, and the Akinator, to ask questions.

48	Harnessing the flexibility of neural networks to predict meaningful theoretical parameters in a multi-armed bandit task *Yoav Ger, Eliya Nachmani, Lior Wolf, and Nitzan Shahar* Tel Aviv University

Classical studies in reinforcement learning (RL) heavily rely on normative models of behavior, models that often stress interpretability over predictive capabilities. More recently, neural network models emerged as a descriptive modeling paradigm capable of high predictive power, however, with limited interpretation. To address these issues, we sought to augment the expressiveness of theoretically interpretable RL models with the high flexibility and predictive power of neural networks. Specifically, we introduce a novel framework whereby a neural network is trained to predict theoretically meaningful RL parameters from behavioral observations. We first simulated behavior from a large number of artificial RL agents performing a two-armed bandit task. We then trained a recurrent neural network, using the trial-by-trial artificial data to predict the agent's hidden theoretical RL parameters from observed action-reward history. At test time, we illustrate the network's successful recovery of unseen agents' RL parameters, even when their true RL parameters dynamically changed across task performance. We then applied our network to estimate non-stationary theoretical RL parameters of empirical data, where healthy and psychiatric individuals completed a similar two-armed bandit task. We found better performance in the action prediction of our network compared to two alternative methods of RL parameters estimation. We demonstrate the advantage of our modeling approach by describing high volatility in the parameters' estimation of psychiatric individuals, a group known for unstable internal mental states. Finally, we discuss how our framework may facilitate future research where temporal changes in latent parameters can be correlated with meaningful high-temporal neural measures.

49	Increasing reliability of fmri data with multi-echo acquisition *Maya Salomon-Hazut, Sun Tsruya, and Michal Ramot* Weizmann Institute of Science

Functional MRI is a leading tool for human cognitive neuroscience research, enabling the unearthing of the hidden functional structures and organization of the brain. However, one of its great limitations is the amount of noise that is present in the BOLD signal, and the difficulty of removing it. This has a particularly strong influence on many of the more advanced analyses which do not rely on signal averaging, such as resting-state analyses and many approaches using naturalistic stimuli, together with more spatially tuned multivariate pattern analyses. In order to efficiently remove physiological and measurement noise from the fMRI signal, there was recently an increase in the use of a relatively new acquisition technique of acquiring multiple echos within one repetition time (ME). This acquisition type, combined with an echo-time dependent ICA denoising technique (ME-ICA), was shown to efficiently increase the temporal-SNR compared to single echo (SE) acquisition, and to minimize motion related artifacts. However, previous examination of ME acquisition has focused on its benefits for resting state data, using 3T scanners only. Here we broaden the scope to include several functional reliability and stability measures to assess the benefits of ME acquisition across both rest and task scans, not only in 3T but also in 7T fMRI scanners. To the best of our knowledge, this is the first time that the ME has been examined in 7T.

18:40: Walk to Knights' Hall

19:00 – 20:00: Keynote lecture (at Knights' Hall)

Consciousness as a social affordance

Michael Shadlen, Columbia University

Viewed through the lens of decision-making, many seemingly elusive problems in cognitive neuroscience may be rendered tractable. The neurobiology of decision-making invites us to view thought processes as interrogations of the senses and memory for evidence bearing on provisional intentions. These mostly non-conscious thoughts have content and even what-is-it-like characteristics. I will present experimental evidence that the transition from non-conscious mental processing to conscious awareness is mediated by the same mechanisms as non-conscious perceptual decisions, with the one distinction being that it involves a provisional intention to report to other people. I will explain why the social affordance of reporting to other people confers a richness to the aforementioned what-is-it-like characteristics, such that they now correspond to our conscious awareness. While I do not believe that the neurobiology provides a satisfying answer to the hard problem of phenomenal consciousness—why we experience the conscious what-it-is-like as we do—I will explain why this special "reporting affordance" may bring the neural mechanisms into focus.

20:10 – Dinner

Thursday, February 16th

08:15 – 08:45 Business Meeting

08:50 – 10:30 Session 6 (3 parallel sessions in rooms A, B and C)

Room A: Memory

8:50-9:10	Task-irrelevant background vibratory noise afforded during motor learning benefits memory consolidation in ADHD *Maria Korman [1,2], Rinatia Maarvi-Hesseg [1,2], Lian Meir-Yalon [2], Nebal Egbarieh [2], and Avi Karni [2]* [1] Ariel University; [2] University of Haifa
Young adults with ADHD often gain less than expected from practice sessions well-suited for their peers. Here, we tested whether task-irrelevant, low-intensity vibratory stimulation (VtSt), suggested to modulate motor learning, may compensate for such learning deficits. Participants were given training, either with or without VtSt, on a sequence of finger opposition movements. Participants with ADHD benefitted from VtSt both during the acquisition (online) and the overnight skill consolidation (offline) phases. In contrast, typical individuals had reduced overnight, consolidation phase, gains under VtSt; performance partly recovering one week later. One week later, both groups showed robust retention of the gains in performance, but when tested with background VtSt, individuals with ADHD, but not typical peers tended to boost on-line their performance. These gains were contingent on participants morningness-eveningness score. We propose that ADHD can confer advantages in performance, learning and skill memory consolidation in specific 'noisy' conditions that adversely affect typical adults.	
9:10-9:30	The dependence (or independence) of object features in vLTM is a continuous, not a binary problem: the role of conceptual vs. perceptual features *Rotem Avital-Cohen and Nurit Gronau* Open University of Israel
Previous research showed that conceptual information plays an important role in visual LTM, however, the precise relations between conceptually meaningful and 'pure' visual properties in memory are largely unknown. The present study examined the interactive relations between object color (for which conceptual significance was manipulated) and location (determined arbitrarily). First, to manipulate the conceptual value of an object's color, participants (N=40) rated the extent to which an item's color was meaningful (e.g., red vs. white wine) or meaningless (red vs. white balloon). Then, memory for color-meaningful vs. color-meaningless objects was compared, within an independent group of participants (N=60). As expected, a 2-AFC recognition test showed higher memory rates for meaningful than for meaningless colored objects. Next, we tested the potential influence of a meaningful/meaningless color on memory for an object's (random) location. Participants (N=35) encoded single-colored objects appearing in an arbitrary screen location, and were then tested in a 4-AFC recognition test that included both color and location dimensions. Results showed a strong linkage between the two dimensions, that was further enhanced in the color-meaningful objects, suggesting that conceptual information may serve as a "glue" to perceptual/surface information in memory. Notably, our findings have important implications for the dispute concerning the dependence/independence of object-features in memory. Rather than viewing this subject as a binary problem, we offer a more continuous approach, according to which the relationship between features in memory largely depends on their linkage to conceptually-significant information.	

9:30-9:50	Declarative memory reconsolidation interference by pursuit eye movement *Twick Moran [1], Kohavi Itamar [1], Itzhak Shlomit [1], Lankri Guy, and Levy Daniel A [2]* [1] Ashkelon Academic College; [2] Reichman University

When a consolidated memory is reactivated, it becomes labile, thus offering an opportunity for its modification – strengthening through reconsolidation, updating with new information, or even erasing the memory through reconsolidation interference. In human memory modification research, most of the reconsolidation interference studies have focused on reducing implicit fear response. Several studies attempted to interfere with non-implicit memory, with inconsistent results. Utilization of these scientific advances in memory modification has the potential to enhance treatment efficacy for patients with PTSD, who re-experience traumatic memories. In fact, an effective PTSD treatment – EMDR – may be efficacious due to interfering with reactivated memory reconsolidation. Recently, empirical data have demonstrated that pursuit eye movements interfere with implicit fear memory. To minimize traumatic relapses, it may be important to address not only implicit affective response, but also the declarative elements of a memory. Therefore, we use pursuit eye movements, which are considered reconsolidation-blockade intervention in EMDR therapy, to modulate declarative reminiscence. In our lab we test whether pursuit eye movements inhibit reconsolidation of activated declarative memory representations of object pictures, not in the context of traumatic memory. The experiment consists of 3 sessions: On day 1 learning is established. On day 2 participants undergo manipulations - a reminder of the learned stimuli and/or administration of eye movement interference, or control conditions. Finally, on day 3 participants' memory of the studied stimuli is tested. Preliminary results indicate that pursuit eye movements inhibit the reconsolidation of activated stimuli, thus leading to a significant weakening of the representations.

9:50-10:10	Meaning mediates the predicted memorability of objects *Roy Shoval, Nurit Gronau, Yael Sidi, and Tal Makovski* Open University of Israel

Memorability studies indicate that the ability to predict which images are memorable is very poor. Metacognitive research, in contrast, indicates that people can judge their cognitive performance reliably pending the validity of the cues underlying these judgments. Here, we used a Metacognitive framework to test predicted memorability and its potential underlying cues. Participants viewed hundreds of images of real-world objects and estimated how likely they were to remember each image if seen in a subsequent test. Then, they completed an old/new memory recognition test. Indices of subjective 'meaningfulness' and 'visual complexity' were additionally collected for each image, in an independent survey. The results indicated that memorability judgments partially predicted memory performance, with image meaning serving as an important factor explaining both predicted memorability and actual memory performance. Additionally, participants demonstrated a fairly good metacognitive resolution, i.e., they were able to distinguish between well-remembered and less-remembered images. Taken together, our findings suggest that people have a subjective sense of images' memorability, which is at least partially mediated by objects' meaning.

10:10-10:30	The effects of musical tension on declarative memory *Avi Mendelsohn* University of Haifa

Music comprises a complex, yet intuitive language, which can induce various emotions and states. A unique form of emotion that can be elicited through harmonic progression is musical tension. Here I will present studies where we used manipulations in musical harmony in order to evoke tension: first by evoking tension within natural music pieces (by delaying the release of harmonic progressions from dominant to tonic chords), and the second by using isolated single complex chords with various degrees of dissonance / roughness. Each experiment included an encoding

phase, wherein individuals studied stimuli (words or images) with different conditions of background music or single chords. Memory for the studied stimuli was tested one day later using recognition tasks. Musical tension was validated through subjective reports of tension, as well as physiological measurements of skin conductance response and eye-tracking measures to assess pupillary responses to the chords. In addition, music information retrieval (MIR) was used to quantify the musical properties associated with tension and its release. We observed a trade-off effect between post-experiment tension perception and memory, such that individuals who perceived musical tension as such displayed reduced memory performance for images encoded during musical tension, whereas tense music benefited memory for those with lower musical tension perception. The relationship between pupillary responses to chords and memory is still under investigation (currently in the piloting phase). Understanding the interrelations between musical components, physiological responses, and cognitive faculties may provide insights into the basic features of memory formation.

Room B: Judgment, decision-making and metacognition II

8:50-9:10	Do some moral issues seem more objective than others? A moral foundations approach *Roy Schulman[1], Tal Eyal [1], and Nira Liberman [2]* [1] Ben Gurion University; [2] Tel Aviv University

Research on moral psychology often touches on the contents and conditions of moral beliefs, actions, and judgements, but relatively little research has been devoted to perceptions regarding morality itself (i.e., meta-ethical beliefs). The subject of my recent study is perceived moral objectivity - the extent to which a moral belief (e.g., killing is wrong) is perceived to remain true despite differences in time, place, or perspective. While past research has suggested that moral beliefs are perceived as relatively objective (compared with opinions and social norms), some moral beliefs are perceived as more objective than others. In this talk I will present the results of a study (N=258), showing that variance in perceived objectivity of moral beliefs could be partially explained by Moral Foundations Theory (Graham et al., 2013). Under this framework, different moral actions pertain to specific moral foundations, core values people subscribe to (e.g., care, purity). Results shown that violations of some moral foundations (Care, Fairness, Purity) were found to be more objective than others (Loyalty, Authority), even when controlling for the actions' severity and participants' demographics. Furthermore, the effect was moderated by the significance individuals attached to the foundations, especially for Loyalty and Authority. These findings provide initial evidence that variance in moral objectivity can be attributed to differences in moral content, as well as individual difference in core values.

9:10-9:30	On the (overrated) value of control *Rina Shtein [1], Baruch Eitam [2], and Ido Erev [1]* [1] Technion - Israel Institute of Technology; [2] University of Haifa

The original goal of the current research was to examine the joint impact of two behavioral phenomena that can lead to contradictory prediction: The need for control, and underweighting of rare events in decisions from experience. In Exp 1 and 2 the participants could choose between four options: two options that maintained the status quo and two counterproductive risky options that led to a large loss in 10% of the trials (and a small gain in the other trials). Control was manipulated between groups by the probability that the option selected by the participants determines their payoff. Our results reveal a strong tendency to underweight rare events, but, to our surprise, they do not show indications of a preference for control. Exp 3. further refines this conclusion; participants indeed display a preference for choice; however, this preference was seemingly different from preference for control. Specifically, when participants were asked

whether they wanted to choose, or let an algorithm choose for them, most people preferred to choose. However, when asked to choose between four options, of which two the options they could choose between and the other two were presented as different algorithms that randomly picked for them one of the two options, participants showed indifference between the algorithms and self-choice. In line with other recent findings, our findings speak both to the overgeneralization of the concept of control as well as for people's willingness to let other agents act for themselves as long as their preferences are obeyed.

9:30-9:50	Value certainty in drift-diffusion models of preferential choice *Douglas Lee and Marius Usher* Tel Aviv University

The drift-diffusion model (DDM) is widely used and broadly accepted for its ability to account for binary choices (in both the perceptual and preferential domains) and response times (RT), as a function of the stimulus or the choice alternative (or option) values. The DDM is built on an evidence accumulation-to bound concept, where, in the value domain, a decision maker repeatedly samples the mental representations of the values of the available options until satisfied that there is enough evidence (or support) in favor of one option over the other. As the signals that drive the evidence are derived from value estimates that are not known with certainty, repeated sequential samples are necessary to average out noise. The classic DDM does not allow for different options to have different levels of precision in their value representations. However, recent studies have shown that decision makers often report levels of certainty regarding value estimates that vary across choice options. There is therefore a need to extend the DDM to include an option-specific value certainty component. We present several such DDM extensions and validate them against empirical data from four previous studies. The data support best a DDM version in which the drift of the accumulation is based on a sort of signal-to-noise ratio of value for each option (rather than a mere accumulation of samples from the corresponding value distributions). This DDM variant accounts for the impact of value certainty on both choice consistency and RT present in the empirical data.

9:50-10:10	Context effect in decision-making under risk through the lens of BEAST Or David Agassi and Ori Plonsky Technion - Israel Institute of Technology

The prevailing research on decision-making under risk assumes stable preferences that allow models to be generalized across different data sets. Previous studies, however, have demonstrated that the type of tasks that people are required to solve can influence their choice in a particular task. In the current study, we expand the existing literature and argue alternatively that the type of task serves as a contextual cue that causes people to use strategies that have previously worked well for them in similar contexts. To test this, we use BEAST, a model that has been proven to be state-of-the-art in predicting decision-making competition. The model assumes that behavior is the average of different strategies that were effective in similar situations in the past. Here, we modify the model to allow the evaluation of the prevalence of each strategy. We train the model on a large set of recently collected databases to compare its predictive ability to 58 other models from the literature. Our results suggest that training the model on different databases causes it to rely on different strategies in each database, resulting in a substantial improvement in its predictive ability. This finding is exceptionally striking in databases originally-created to demonstrate the effects of other tasks on decision-making. Additionally, the model successfully predicts choice behavior, particularly in random datasets (at a similar level to the best model among the 58 competitors), implying that the strategies it uses can approximate those used by people in a natural environment.

10:10-10:30	Computational mechanisms underlying latent inverse value updating of unchosen actions *Ido Ben-Artzi[1], Yoav Kessler[2], Bruno Nicenboim[3], and Nitzan Shahar[1]* [1] Tel Aviv University; [2] Ben Gurion University of the Negev; [4] Tilburg University
Current studies suggest that individuals estimate the value of their choices based on observed feedback. Here, we ask whether individuals also update the value of their unchosen actions, even when the associated feedback remains unknown. Two hundred and three individuals completed a multi-armed bandit task, making choices to gain rewards. We found robust evidence suggesting inverse value updating for unchosen actions based on the chosen action's outcome. Computational modeling results suggested that this effect is mainly explained by a value updating mechanism whereby individuals integrate the outcome history for choosing an option with that of avoiding the alternative. Properties of the deliberation (i.e., duration/difficulty) did not moderate the latent value updating of unchosen actions, suggesting that memory traces generated during deliberation take a smaller role in this phenomenon than previously thought. We discuss the mechanisms facilitating credit assignment to unchosen actions and their implications for human decision-making.	

Room C: Action

8:50-9:10	Ethical considerations for autonomous vehicles: a formal approach *Asaf Dagani* General Motors R&D
Growing numbers of cities and companies are beginning to deploy state of the art technologies and services such as autonomous cars, robot taxis, delivery- and maintenance-robots, moving information kiosks and others. One of the most crucial aspects of this deployment involves defining new "rules of the road" and robot behavior that embody ethical considerations. This talk presents a framework and formal methodology for developing ethical decision-making in the context of autonomous vehicle design (soon to be published as an ISO standard 39003). One of the advantages of this methodology is that it can take any selected set of ethical values (e.g., the United Nations' universal values, the Bioethics code of conduct, etc.). The selected set of values act as general guidelines and as criteria for rule development. I will discuss the issues involved in defining ethical rules for a variety of use cases such as lane changes in dense traffic, determining ad-hoc priority in vehicle-to-vehicle interactions, negotiations in ambiguous situations, and more. For each, I will describe the methodology and processes leading up to an "ethical" rule. I will also briefly touch on the philosophical "trolley problem" example and suggest a way to resolve it in the context of dynamic control systems.	
9:10-9:30	Using arm movements to detail the temporal dynamics of the congruency sequence effect in the Simon task *Jason Friedman [1] and Christopher D. Erb [2]* [1] Tel Aviv University; [2] University of Auckland
In the Simon task, the time taken for participants to select the correct target is affected by irrelevant features of the stimuli (e.g., location), with incongruent trials taking longer than congruent trials. The congruency sequence effect describes the observation that this effect is mediated by whether the previous trial was congruent or incongruent. In this study, we examine the temporal dynamics of this effect by recording arm movements with a motion capture system to track how the response unfolds over time. Specifically, we decompose the observed trajectories into submovements and use the parameters of these submovements (timing, direction, and amplitude) to determine the state of the decision variable as a function of time. Using this analysis, we can break the decision process down into a controlled process (which takes the hand to the	

correct target) and an automatic process (which is affected by the location of the stimuli) and can describe their temporal dynamics. Using this decomposition, we observe that the controlled process is not affected by stimuli location or the congruency of the previous trial. In contrast, the automatic process is affected by the congruency of the previous trial - if the previous trial was congruent, the trajectories are more affected by the location. If the previous trial was incongruent, the participants are less affected (although still somewhat affected) by the location. So, after a participant is "tricked" in a previous trial by an incongruent stimulus, they are less affected by location in the next trial.

9:30-9:50	Control feedback increases response speed independently of the feedback's goal and task relevance *Eitan Hemed and Baruch Eitam* University of Haifa

Humans live and function in dynamic environments, in which the same motor response is effective at manipulating the environment at specific times and ineffective at others. We have shown that feedback indicating control over the environment (i.e., action-effects) reinforces responses' execution. We have further shown that this type of reinforcement is highly responsive to changes in the environment. Here, we capitalize on our previous findings to gain insight into the relationship between control-based, value-free reinforcement and the agent's goals. Over a series of experiments, we increased or decreased the goal or task relevance of the control-relevant feedback our participants' received. Control-based reinforcement occurred orthogonally to the goal-relevance of the feedback, strengthening a recent suggestion that the source of this reinforcement is a modular mechanism that depends only on confirmation of sensorimotor predictability.

9:50-10:10	The role of agency and expectation in shaping auditory evoked responses *Batel Buaron and Roy Mukamel* Tel-Aviv University

The magnitude of auditory EEG evoked responses (N100) is reduced for sounds that are the consequence of voluntary actions, compared to external sounds. Yet it is not clear what type of information conveyed by the motor commands underlying voluntary movement, shape such differences in the evoked response. One type of information is the agentic source of the stimulus (self/other) resulting in a general difference in signal gain between active sound generation and passive listening. Another type of information is expectation of sensory consequences. In this case, evoked responses should change during learning, as the action-consequence contingency is strengthened. To examine the influence of each type of information on N100 amplitude, we recorded EEG while participants (n=30) learnt new couplings between specific key presses or visual cues and corresponding tones. Results indicate that N100 amplitude in the keypress condition was less negative than in the visual cue condition. In addition, N100 amplitude decreased during learning, as the cue-tone mapping strengthened. Notably, decrease of the N100 amplitude across learning was similar for keypress/visual cue conditions and no significant interaction was found. This implies that the N100 amplitude is shaped by two independent components: expectation (which is independent of motor commands), and agency (which is invariant to the degree of expectation of the identity of sensory stimulus). Given that expectations shaped the N100 amplitude similarly in the key-press and visual-cue conditions, our results suggest that the main component driving motor modulations is the agentic source of the stimulus.

10:10-10:30	Heart-rate variability as a new marker to identify predisposition for freezing events in persons with Parkinson's disease *Benedetta Heimler [1], Or Koren [1], Rivka Inzelberg [2], Uri Rosenblum [1], Ronny*

	Bartsch [3] and Meir Plotnik [1,2] [1] Sheba Medical Center; [2] Tel Aviv University; [3] Bar-Ilan University
Freezing of gait (FOG) is a debilitating symptom of Parkinson's disease (PD) characterized by the sudden, transient inability to walk, despite an intention to proceed. The etiology of FOG is still unknown, but accumulating evidence unraveled physiological signatures of the autonomic nervous system (ANS) around FOG episodes. Here we analyzed heart-rate variability (HRV), i.e., the fluctuations in time intervals between adjacent heart-beats, mainly generated by heart-brain interactions and considered a marker of sympathetic/parasympathetic balance. We thus measured heart-rate at rest (while standing) for one minute in 22 elderly controls (EC) and in 21 persons with PD with FOG (PD+FOG) and without cardiac arrhythmia, while OFF levodopa medications. Then, PD+FOG participants performed walking trials containing FOG-triggering events (e.g., turns). During these trials, n=13 did experience FOG (PD+FOG+), while n=8 did not experience it (PD+FOG-). Most participants (n=16) repeated the experiment 2-3 weeks later, while being ON their levodopa medications -none of the patients experienced freezing. Results show that during OFF, HRV parameters at rest were significantly lower in PD+FOG+ patients (i.e., more pathological), reflecting a more damaged ANS regulatory capacity. PD+FOG- patients and EC showed comparable HRV measures. During the ON condition, HRV did not differ among groups. HRV parameters in the PD group did not correlate with age, PD duration, levodopa consumption, nor with the severity of motor deficits. Taken together, these findings suggest for the first time the intriguing possibility that ANS state monitoring might be an effective innovative approach to identify propensity to freeze at any given time.	

10:30-12:00 Poster Session 4

Posters 1-34: Main Lobby

Action II

1	Higher cognitive load in three-dimensional virtual reality color trails test interferes with head-hand coordination *Adi Lustig [1,2], Meytal Wilf [1,2], Meir Plotnik [1,2]* [1] Sheba Medical Center; [2] Tel Aviv University
The Color Trails Test (CTT), designed to assess executive functions, includes two parts: Trails A- which evaluates sustained visual attention (SVA) by tracking numbered targets in sequence and, Trails B- which assesses divided attention (DA) through the additional requirement to alternate targets color while sequencing. The simplistic motor action of the CTT i.e., drawing a connective line between targets, falls short to describe the complex demands of real-life cognitive-motor functioning. Accordingly, a virtual reality adaptation of the CTT (VR-CTT) has been recently developed. The VR-CTT requires execution of large multi-directional hand movements and head rotations, consequently forming a better-suited ecological three-dimensional environment to test cognitive-motor interactions. In order to characterize interrelations between the latter motor functions during SVA and DA tasks, we employed a cross-correlation analysis on hand and head kinematics data collected from 122 healthy participants (ages: 20 – 90 y; divided into 3 age groups: young, middle aged and older adults) who completed the VR-CTT. The level of spatial coherence of hand-head movements was found to be high (R?0.76) in both Trails A and B, in all age groups. However, assessing head-hand phase shifts revealed longer time lags (i.e., in which head leads hand) in Trails B versus Trails A, in all age groups (e.g., for the middle-aged group; 0.97 ± 0.57 vs. 0.55 ± 0.35 seconds, respectively, $p<0.0001$; Trails A differencing between young and older adults).	

These findings indicate alterations in multi motor tasks performance associated with type of cognitive load and reveal the effects of cognitive-motor interferences.

2

Reward processing in mdd: integration of rewards vs. of sensory-feedback

Shirel Bakbani-Elkayam[1], Eitan Hemed[1], Nadav Dick, Yuval Edri, Daphna Shefet[3], Uri Nitzan[2,3], and Baruch Eitam[1]

[1] University of Haifa; [2] Tel Aviv University; [3] Shalvata Mental Health Center

Multiple reward-related processes appear to be altered in Major Depressive Disorder (MDD), including an impairment in the ability to integrate reinforcement history to adjust future behavior. While most studies focused mainly on responding to tangible outcomes (`rewards' like food or monetary gain), behavioral findings from our lab have corroborated the existence of Reinforcement from Sensorimotor Predictability (a 'valence-free' reinforcer; RSP). Similar effect of RSP on low levels of action selection have been demonstrated in both MDDs and individuals in the general population. The present research investigates whether MDD sufferers have difficulties encoding probabilistic reward cues in general or if this phenomenon applies only to tangible rewards. Clinically depressed individuals (N=82) as well as healthy controls (N=75) were instructed to voluntarily press one of four keys on a keyboard, given an imperative cue. Each key had a different probability of producing feedback. The type of feedback was manipulated between subjects; (a) significant monetary outcome; (b) negligible monetary outcome; (c) RSP feedback or (d)no perceptual feedback. Participants were further instructed to take care that the sequence of responses they generate will be as random as possible. Interim results indicate that MDD is not associated with global impairment in reward integration, contrary to previously documented issues with reward integration caused by upstream reward-related processes. The response bias for monetary gain was modulated by depression levels; While MDDs maintained their response bias along the experiment (despite being reminded of the requirement for randomness), HC avoided such biases to succeed in the task.

3

Using combined vr and eye tracking to study naturalistic behavior during cognitive performance

Meytal Wilf [1,2], Alona Korakin [1,3], Yotam Bahat [1], Jason Friedman [2], W. Geoffrey Wright [4], and Meir Plotnik [1]

[1] Sheba Medical Center; [2] Tel Aviv University

Human behavior naturally involves continuous interactions between cognitive and motor domains. However, assessments of cognitive abilities are typically conducted using pen and paper tests (P&P), i.e., in isolation from “real life” and in artificial contexts. To capture more ecologic cognitive-motor interactions, we recently validated a virtual reality (VR) version of a classic executive functions test called the color-trails-test (CTT). During the test, participants are required to make continuous goal-directed reaching movements to follow a trail of numbered targets in ascending order (sustained visual attention task), or in ascending order while alternating between two colors (divided attention tasks). In the current study, we aimed to (i) dissociate cognitive and motor components of VR-CTT performance, and (ii) determine how it relates to physiological activity. To that end, participants performed VR-CTT with eye tracking, along with a ‘low-cognition’ version of the task, in which they manually tracked a visually-cued sequence of targets with no numbers, and a ‘low-motor’ version, in which they used only their gaze to perform the task without arm movements. The results showed that the task completion time depended mainly on cognitive task load (d=2.4), and less so on motor demands (d=0.46). Correspondingly, the synchrony between hand-head movements decreased with cognitive load (p?0.003). Lastly, we found that the more cognitively demanding conditions yielded larger pupil dilations (p=0.038), and that pupil size was inversely correlated with completion times in all tasks ($p<0.05$). We suggest that this novel paradigm opens the possibility to study in detail cognitive-motor performance and its relation to physiological signals.

Attention, Visual Perception II

4	Conceptual cueing - evidence from covert and overt spatial attention *Oria Appel [1], Samuel Shaki [1], and Martin H. Fischer [2]* [1] Ariel University; [2] University of Potsdam

It is still unclear how spatially associated concepts (e.g., directional expressions, object names, metaphors) shape our cognitive experience. Here, two experiments (N=64) investigated the mechanisms by which words with either explicit or implicit spatial meaning induce spatial attention shifts. Participants performed a visual target detection task according to response rules that required different degrees of prime and target processing depth. We manipulated prime-target intervals (150, 350, 550 ms) and recorded target detection speed and spontaneous eye movements. For explicit prime words, we found spatial congruency effects in detection speed independent of processing depth, while implicit prime words generated congruency effects only when participants had to compute the congruency relationship. Spontaneous eye movements reflected this superior strength of explicit compared to implicit conceptual priming. These results were robust across different prime-target intervals and imply that spatial connotations alone do not automatically activate spatial attention shifts. Instead, explicit semantic analysis is a prerequisite for conceptual cueing.

5	Global and local selective attention in hierarchical digits processing: a behavioral and ERP study *Shay Menashe, Nira Mashal, and David Anaki* Bar-Ilan University

The present study investigated the neurocognitive mechanisms underlying global and local selective attention. Behavioral and ERP data were collected while participants performed global and local tasks, in which hierarchical digits were presented to the center of the screen. The first aim of this study was to investigate the global precedence effect in centrally presented hierarchical digits. The second aim of the study was to examine the laterality patterns associated with global and local selective attention. The behavioral results indicated that the global precedence effect was not evident. In addition, the ERP findings demonstrated that under selective attention condition, global and local information was processed in parallel during most stages of processing, with no asymmetries between the hemispheres. The findings of this study support the view that global and local processing may be mediated by different neurocognitive systems. In addition, the results emphases the effects of both specific stimuli employed and the task instructions on the data produced by centrally presented hierarchical digits processing.

6	Perceptual load effects on wandering minds, may be dilution effects *Sam Seneor, Shay Monarov, and Hanna Benoni* The College of Management-Academic Studies (COLLMAN)

The dilution interpretation of the so-called perceptual load effect stipulates that the reduction of distractor interference in high set-size displays, compared to low set-size displays, need not be attributed to the 'load' component characterizing the task in high set-size presentations (i.e. searching for the target). Instead, it could be due to the 'dilution' component, i.e. the competition of nontarget (i.e., neutral) items in high set-size presentations with the distractor's representation (Benoni & Tsal, 2010; Tsal & Benoni, 2010). Previous studies (e.g., Forster & Lavie, 2009) have shown that high set-size displays may also reduce distraction from internal sources (i.e., task-unrelated thoughts TUTs, or ''mind-wandering"). These effects where interpreted in terms of 'load' effects. In the present study we investigated whether dilution can explain these effects of set size

on mind wandering, by separating the effects of dilution and load. Results suggests that dilution can explain the reduction of interference of task-irrelevant information from both external and internal sources.

7	Illusory conjunctions and the semantic Stroop effect *Eldad Keha[1], Isable Arend[2], Avishai Henik[3], and Eyal Kalanthroff[1]* [1] Hebrew University of Jerusalem; [2] Reichman University; [3] Ben Gurion University of the Negev

The semantic Stroop effect is represented by faster color-naming for color-related words in a congruent color (the word grass painted in green) compared to incongruent color-related words (the word grass painted in red). An open question is whether associating different colors with objects names is an automatic process. We administered a novel version of the illusory-conjunction task. First, participants had to focus their attention at the center of the display where either the letter H or F appeared. Next, either on the left or the right peripheral of the display, a colored word, and a colored non-word appeared next to each other. Participants were asked to first report whether the letter H or F appeared, and then to report the color of the word in the word-nonword pair. We tested the congruency effect and whether the illusory-conjunction for the incongruent condition (the non-word appeared in green next to the word grass in red) had more conjunctions errors compared to a congruent condition (the non-word appeared in red next to the word grass in green). Participants also performed the semantic Stroop task. We did not observe a stronger illusory-conjunctions effect for the congruent condition. However, there was a correlation between the congruency effect in the illusory conjunction task and the semantic Stroop effect such that a stronger semantic Stroop effect was associated with fewer conjunctions error in the congruent condition. This suggests that at least for some strongly color-associated objects, the semantic association between color and objects can be done automatically.

8	Previous target locations proactively attract visual attention *Daniel Toledano and Dominique Lamy* Tel Aviv University

Stimulus saliency and search goals influence which location receives our attention first. Accumulating research shows that past search history also plays a striking role: for instance, attention is strongly attracted to the location where a previous target was found. However, the mechanism behind this bias remains largely unknown: is the previous target location automatically activated after it is selected (proactive allocation) or does the search context trigger an attentional shift to that location (context-dependent allocation)? Here, we tested these alternative accounts using the probe paradigm. On most trials participants searched for a shape target among nontargets. On the remaining trials, letters were briefly presented, and participants reported the letters they identified. More letter reports at a given location relative to other locations are thought to indicate that this location benefits from higher attentional priority. Critically, the letters appeared either in the context of a search trial (shortly after a search display, superimposed on the shapes; search context present) or against an empty background (search context absent). We found that participants reported more letters in the previous target location relative to other locations. Crucially, this bias was equally large when the search context in which the previous target location had been selected was present or absent. Furthermore, the bias occurred both when guidance to the target was strong (easy search) and when it was weak (difficult search). These findings strongly support the notion that attentional bias towards a previous target location is proactive and does not depend on context.

9	Response priming is an imperfect window into semantic processing *Mor Sasi, Noa Izhaki, Nitzan Micher, and Dominique Lamy* Tel-Aviv University

Do we process the meaning of visual stimuli automatically? To answer this question, researchers have relied on response priming: in a typical experiment, participants categorize a visual target based on its semantic meaning (e.g., animal vs. object) and a prime, also belonging to one of the possible categories, precedes the target. Faster performance when the prime elicits the same vs. the opposite response relative to the target is taken to indicate that the prime's meaning was processed. Failure to find this effect indicates that semantic processing of the prime did not occur. This rationale is routinely been used to study unconscious semantic priming and spreading of semantic activation. Here, we challenged this rationale by dissociating semantic processing from response priming. We relied on the Action-Trigger Hypothesis (Kunde et al., 2003), according to which task demands constrain whether response codes are activated. We used a spatial cueing paradigm and manipulated semantic relatedness and response compatibility separately. We found that a cue consistently speeds responses to the target when it is semantically related vs. unrelated to the target (semantic priming), irrespective of task demands. By contrast, the same cue produces response compatibility effects only when it appears in a format that also characterizes the possible target's response features (e.g., 2 and 3, vs. 2 and three). These findings show that response priming is an imperfect window into semantic processing. Furthermore, they provide novel support for the Action-Trigger Hypothesis.

10	Perceptual averaging and visual attention *Shahar Sabary and Ruth Kimchi* University of Haifa

Facing vast amount of information and limited resources, the perceptual system exploits environmental statistical regularities and redundancy and forms ensemble perception – summary representation of a group of similar objects. Thus, for example, we seem to perceive and report the average size of objects. We examined whether attention is required for extracting average size, using an inattention paradigm that provides an online measure of the processing of unattended stimuli. Participants performed a demanding change-detection task on a small matrix presented on a task-irrelevant backdrop comprised of circles that varied in size. Independently of any change in the matrix, the average size of the circles changed or remained the same. We hypothesized that if perceptual averaging can be extracted without attention, congruency effects should emerge between changes in the target and changes in average size of the circles. The results showed no such congruency effects. When attending to the circles participants reported changes in the average size significantly above chance. These results suggest that perceptual averaging requires visual attention.

11	"Social and cognitive psychology enter a bar:" A signal detection analysis of the effects of experimentally priming the sense of attachment security on pure tone audiometric thresholds *Shir Nagar, Binny Shapiro, Amit Skurnik, Mario Mikulincer, and Boaz M. Ben-David* Reichman University

Attachment security has consistently been found to correlate with relaxed exploration, openness, and mindful attention to incoming information. In our previous study (Nagar & al., 2022, PsySci) we found that contextually infusing a sense of attachment security (security priming) can improve hearing in young and older adults. Young and older adults performed a standardized pure-tone audiometric threshold test twice. In the security priming condition, a picture of a participant's security-enhancing figure was presented throughout the task. In the control condition, a picture of an unknown person or a circle was used as a neutral prime. Across studies, participants performed better (lower hearing thresholds) in the security priming condition. As our previous study was the

first to show that attachment security improves sensory perception, in the current study we engage Signal Detection Theory to uncover the sensory and cognitive processes underlying this effect. Young participants are asked to indicate the presence or absence of pure tones presented near their sensory thresholds. Preliminary data suggest that attachment priming can engender a deep sensory change as evident by an increase in d'. We will discuss the study's meaningful implications for theory and clinical hearing tests.

Creativity

12	Development of creative thinking patterns via math and music *Libby Azaryahu[1], Orit Broza[1], Shai Cohen[2], Sara Hershkovitz[1], and Esther Adi-Japha[2]* [1]Levinsky College of Education; [2] Bar-Ilan University

The present study examines the development of patterns of creative thinking among third graders (N = 84) following multidisciplinary learning that combines math and music with various teaching emphases. For the purpose of the study, an intervention program was used focusing on patterns of creative thinking. Three classes received identical MusiMath instruction that explicitly links math and music. These classes received additional instruction regarding patterns of creative thinking differing in focus: Creative Math class, Creative Music class, and Creative Math and Music class. The fourth class was used as a control class that learned math and music in a standard way without creative intervention. To collect the data, we developed software that enabled the students to perform musical and mathematical tasks that included questions with only one correct answer, and questions that invited original and varied answers that encouraged creative thinking. Pre? to post?intervention analyses indicated that the experimental groups outperformed the control group on patterns of creative thinking in both math and music, regardless of the teaching focus. Combined instruction in creativity in the Math and Music class resulted in similar patterns of creativity in the two domains, suggesting that the creative thinking was transferable from one domain to another.

13	Self-avoidance as a mechanistic feature of creative search *Roy Gutglick [1], Ofra Amir [2], and Yuval Hart [1]* [1] The Hebrew University of Jerusalem; [2] Technion - Israel Institute of Technology

In creative thinking we search vast mental spaces of possibilities for novel and effective solutions. Thus, creative search is one of many types of cognitive search processes. Are there any shared features between different cognitive search processes and can we infer their function in creative search? Here, we analyzed players' behavior in two tasks: 1) The "Creative Foraging Game" (CFG), where players create shapes in search of those they consider interesting and beautiful; 2) "k-in-a-row", where players search for a winning move given a mid-game board configuration. We find that several measures of search efficiency in the "k-in-a-row" task correlate with the "self-avoidance" variable of the CFG, a measure of players' tendency to avoid shapes they have already created during their creative search. Numerical simulations show that self-avoidance is crucial for explore-exploit behavior. We further hypothesize that self-avoidance involves elements of cognitive control. We will present results describing the relationship between self-avoidance and executive functions, e.g., updating and inhibition, contributing to the ongoing debate in the field regarding the ways cognitive control factors into the creative process. Taken together, our results point to self-avoidance as an important feature of the cognitive mechanism underlying creative search, and suggest a new prism to examine the well established connection between creativity and cognitive control.

14	Highly creative artists exhibit a richer mental lexicon than scientists: findings from the Big-C project *Ariel Kreisberg Nitzav and Yoed N. Kenett* Technion – Israel Institute of Technology, Haifa

The associative theory of creativity argues that creativity is related to a richer, more flexible memory structure, that facilitates the process of creating more original combinations of ideas. Over the past decade, the application of computational tools from network science and natural language processing has spurred a number of studies connecting semantic memory structure and associative thinking to creativity. To date, however, this research has almost exclusively focused on assessing creativity in the general population, with far less work examining eminently creative individuals across the arts and sciences. This project leverage semi-structured interview data from the Big-C Project – a sample of world-renowned visual artists and scientists, and an intelligence-matched control group: we represented the text of interviews conducted with each of the participants as a semantic network using various token sampling approaches, and analyzed their network properties, such as measures of interconnectivity and efficiency. Our analyses reveal that the semantic networks of the visual artists showed the most interconnectivity and efficiency, while the semantic networks of the matched control group were the least interconnected and efficient. This may be considered an indication which aligns with previous findings which tied creativity to having broader, more interconnected, and flexible semantic networks. It can also be seen as a validation to using a person's textual output as basis for empirical semantic networks. We interpret these findings in the context of the ongoing debate on the domain-generality and domain-specificity of creativity.

15	Sparking creativity: encouraging creative idea generation through automatically generated word recommendations *Talia Wise and Yoed Kenett* Technion – Israel Institute of Technology

Creative block is a familiar foe to any who attempt to create, and is especially related to “writers block”. While significant effort has been focused on developing methods to break such blocks, it remains an active challenge. The current study presents a cognitive network-sciences based online algorithm that aims to spark creative ideas and break creative fixation: Once a participant “runs out” of ideas in a creative idea generation task, our algorithm suggests word-recommendations to prime new ideas. These word-recommendations are either towards or away from previous ideas, as well as close or far from the target object, based on a conceptual space extracted from the participants responses using online text analysis. Our results indicate that the location of word recommendations in the semantic space affects the fluency and creativity of one’s ideas. We find that there is a sweet spot in the semantic space where word recommendations are most successful at sparking new and creative ideas, and we show how low- and high- creativity individuals differently benefit from these word recommendations.

16	Question asking and creativity - the effect of question level *Tuval Raz [1], Roni Reiter-Palmon [1], and Yoed N. Kenett [1,2]* [1] Technion – Israel Institute of Technology; [2] University of Nebraska at Omaha

Question asking has been a critical tool for teaching and learning since at least the time of Socrates, and the development asking questions skills is important in the creative problem-solving process. Yet, the role of questioning in creativity has insofar not been thoroughly explored. The current study assessed the role of question asking in the creative process, based on Bloom’s question taxonomy. Bloom’s Taxonomy of question types has been widely accepted as a guideline in designing reasonable questions belonging to various cognitive levels. An experimental design was used to introduce the novel alternative questions task (AQT) to explore its relation to cognitive and creative thinking tasks, such as the standard alternative uses task (AUT). Participants

were asked to generate as many creative and unusual questions as possible to three common objects. Furthermore, participants completed the standard AUT task, where they were asked to generate as many creative and unusual uses as possible for three common objects. Finally, participant's fluid intelligence, curiosity, personality, and general recall questionnaires were assessed. Participant AQT responses were rated for their Bloom question level, as well as their subjective and objective originality. We found a significant positive relation between AQT question level and objective and subjective AQT originality scores, as well as between AQT and AUT objective originality scores. A second similar study replicated and generalized our findings regarding the relations between question asking and creativity. Thus, our findings uniquely highlight the relation between question asking, and especially more complex questions, to higher creativity levels.

17	Effects of non-invasive brain stimulation on creative thinking: a meta-analysis *Qunlin Chen [1], Ke Ding [2], Yingkai Yang [1], Rongjun Yu [3], Jiang Qiu [1], and Yoed N. Kenett [2]* [1]Southwest University, Chongqing, China; [2] Technion - Israel Institute of Technology; [3] Hong Kong Baptist University

Divergent thinking and convergent thinking are two complementary processes in creative cognition to explore both novel and appropriate products. Enhancing creative problem-solving through Non-Invasive Brain Stimulation (NIBS) neuromodulatory approaches is gaining increased interest. However, inconsistent findings due to differences in experimental design, stimulation parameters, and creative measures emphasize the need for a comprehensive overview of the effect of NIBS on creative performance. The current meta-analysis aimed to investigate whether creative performance can be improved by NIBS, especially through transcranial direct current stimulation (tDCS). 34 studies with 97 effect sizes (N = 1574 participants, 84 in excitatory stimulation, and 13 in inhibitory stimulation) were included. The results showed that excitatory NIBS had a small but positive effect on creative performance for both divergent and convergent performance, but inhibitory NIBS showed nonsignificant effects. For tDCS studies, anodal stimulation over the left dorsolateral prefrontal cortex (DLPFC) has been associated with an enhanced effect on creative performance, and cathodal stimulation over the left inferior frontal gyrus (IFG) has been related to a reduced effect on creative performance. These results highlight the dissociable contributions of left DLPFC and IFG for creative performance and suggest brain stimulation may hold the key to modulating creativity. Future research can better advance our understanding of the neural underpinnings of creative cognition by combining NIBS with neurophysiological measures such as fMRI and EEG.

Developmental disorders, language II

18	Greater utilization of executive functions networks when listening to stories with visual stimulation in children with lower reading abilities *Michal Appel[1], Daria Hasin1, Rola Farah[1], Raya Meri[1], and Tzipi Horowitz-Kraus[1,2,3]* [1] Technion – Israel Institute of Technology; [2] Kennedy Krieger Institute, Baltimore; [3] Johns Hopkins University

Reading relies on basic sensory processing abilities, such as visual and auditory processing, engaged during narrative comprehension, with recent evidence for the utilization of Executive functions (EF) in both processes. Therefore, the level of engagement of neural circuits associated with visual, auditory and EF during narrative comprehension in children is related to future reading abilities. The current study aims to fill out the gap related to the level of reliance on these neural circuits while visual aids (pictures) are involved during story listening in relation to reading skills.

Functional MRI data were collected from 44 Hebrew-speaking children aged 8-12 years while listening to stories with vs without visual stimuli (i.e., pictures). Functional connectivity of networks supporting reading was defined in each condition and compared between the conditions against behavioral reading measures. Children with lower reading skills showed greater functional connectivity between EF networks (default mode network and memory network), and between the auditory and memory networks for the stories with vs without the visual stimulation. A greater difference in functional connectivity between the conditions was observed for children with lower reading scores. We conclude that children with reading difficulties may need greater scaffolding, i.e., visual stimulation such as pictures describing the narratives when listening to stories, which may guide future intervention approaches.

19	Accelerated, but not still, text is associated with stronger functional connectivity of visual and auditory networks with cognitive control networks in both dyslexic and typical readers *Rola Farah [1], Keri Rosch [2], Jenny Fotang [2], Stewart Mostofsky [2], Bradley Schlaggar [2], James Pekar [2], Mark DiFrancesco [3], and Tzipi Horowitz-Kraus[1,2]* [1] Technion, Israel Institute of Technology; [2] Kennedy Krieger Institute, Baltimore, MD, USA; [3] Cincinnati Children's Hospital Medical Center, Ohio, USA

The asynchrony theory of Dyslexia postulates weaker visual and auditory network synchrony as contributing to single-word reading difficulty, with resulting slow speed of processing contributing to lower reading fluency. The current study aims to determine the neurobiological signature for this theory and to examine if enhanced reading speed during accelerated reading is associated with a greater synchronization of functional MRI BOLD fluctuations (i.e., functional connectivity) of visual and auditory networks and the visual-auditory networks with cognitive control networks in children with Dyslexia and typical readers. Children with Dyslexia (n=19, 7M) and typical readers (n=21, 15M) ages 8-12 years old participated in a fMRI scan while reading two types of texts: still text and text which was deleted from the screen (i.e., accelerated). Functional connectivity of visual and auditory networks in the two conditions and between the two reading groups was examined. Results show a Group×Condition interaction, suggesting a greater difference in visual-auditory functional connectivity between the two text conditions and groups. For children with Dyslexia, there was a lack of functional connectivity between the visual-auditory and cognitive control networks during the still condition, whereas positive functional connectivity between these networks was observed in the accelerated condition. Typical readers showed positive functional connectivity between the sensory and cognitive control networks in both conditions. These results support the complexity of reading fluency and the involvement of cognitive control networks as the synchronizer of the sensory networks in this process, especially in children with reading difficulties.

20	Machine learning-based detection of dyslexia from resting-state fmri functional connectivity data *Nikolay Taran, Rotem Gatenyo, Emmanuelle Hadjadj, and Tzipi Horowitz-Kraus* Technion – Israel Institute of Technology

Dyslexia is a neurodevelopmental disorder that affects word decoding and, consequently, reading fluency. This disorder is usually diagnosed after 2-3 years of formal schooling, limiting the benefitial effect of early intervention. Here, we aimed to differentiate between children with dyslexia and typical readers based on functional connectivity measures extracted from resting state fMRI using a machine learning algorithm. Ten minutes of resting state fMRI data were acquired from 118 children: 52 typical readers and 66 children with dyslexia. The examples were built based on the correlation coefficients between 264 previously defined Regions Of Interest (ROIs). Different groups or ROIs were utilized: executive function, attention control, the default mode network, and a control group - sensory motor hand network. Two types of classifiers were tested: Support Vector Machine and Random Forest. The best accuracy level was achieved for the

Support Vector Machine model when extracting the features from the attention ROIs: Ventral Attention Network (83% accuracy and 85% F1), and Dorsal Attention network (79% accuracy and 82% F1). The cingulo-opercular and the fronto-parietal networks provided a classification accuracy of 75% and an F1 equal to 78%. The control group features were extracted from the Sensory Motor Mouth and showed the poorest accuracy and F1 (50% and 64%, respectively). These results indicate that the biggest neurobiological differences between children with dyslexia and typical readers are found in attention-related brain networks. The results are aligned with theories pointing at executive fuctions and visual attention challenges in children with dyslexia.

Emotion II

21	The effect of emotions and prior attitudes towards speakers on inter-brain synchronization by mediated messages *Barak Atia, Yael Caspi, Yair Berson, and Abraham Goldstein* Bar-Ilan University

It's not just what you say, it's how you say it. Peripheral aspects can be more important for message effectiveness than the quality of the argument. A communicator aims to align listeners' cognitions, emotions, and behaviors with their own. We have previously shown that emotion-laden speeches that are charismatically delivered increase inter-subject correlations (ISC) in brain activity as measured byMEG. Here we focused on how ISC is affected by the specific motivation and emotion elicited and by prior attitudes towards the speaker. In the first study, we investigated the effects of specific emotions, anger and fear, and approach-avoidance motivation on inter-brain synchrony. Sixty subjects listened to two different short stories designed to induce anger or fear and either approach or avoidance motivation. We found increased inter-subject correlations elicited by approach relative to avoidance motivation and fear relative to anger. The second study investigated the effects of listeners' attitude toward the speaker on brain synchronization within a group. Fifty-eight participants watched the same video presenting a speaker talking about "happiness in life". Before watching the video, half of the subjects read positive personal descriptions of the speaker, and the other half read a negative description. We found that a positive attitude toward the speaker induces higher ISC in several brain regions. Our findings demonstrate the effect of internal and external factors on inducing similarity of brain activity across subjects. Our findings can help to optimize mass-mediated messages and to elucidate the cognitive and affective processes underlying message reception and audience engagement.

22	It's not as bad as it seems: emotion amplification in understanding others *Shir Genzer [1], Noga Cohen [2], and Anat Perry [1]* [1] Hebrew University of Jerusalem; [2] University of Haifa

Understanding others' emotions is an essential social-cognitive skill, that allows us to predict the world around us – a crying baby might be hungry or tired, a fear in someone's voice might mean there is danger underway, and an angry letter from your boss might hint that you should be prepared for a difficult conversation. Since understanding others' emotions play such an important role in prediction–an important question is do we judge other's emotions accurately, or, perhaps, are biased to over-estimate them. To investigate this question, we analyzed four datasets, in which we manipulated the naturalistic nature of the interaction, as well as the modalities in which the emotions were presented. Importantly, for all datasets, we had prior information about the actual emotions the targets felt in real time. In Study 1 (N=1,217), we used 134 videos of people telling emotional-autobiographical stories and asked participants to assess the targets' emotions. In Study 2, we analyzed two live dyadic-interaction studies over the Zoom platform (N=478), with cameras either on or off. Then, both participants rated the speaker's emotions (Study 2) or their own

emotions (Study 3). In Study 4 (N=203), we used 79 text messages in which targets described an emotional autobiographical experience and asked participants to rate the targets' emotions. Across all studies and modalities, we found that perceivers tend to overestimate the target's emotional intensity. We will discuss these findings in the context of recent studies on overestimating emotions, along with possible advantages and disadvantages in overestimating emotional states.

23	"What's in an emoji?" Emotional processing, dimensional interaction and aging-related effects of using emotional emoji and text in computer mediated communication *Maya Mentzel [1], Eden Eliyahu [1], Noam Brosh [1], Danielle Friedman Giladi [1], Deen Yochelman [1], and Boaz M. Ben-David [1,2]* [1] Reichman University; [2] University of Toronto

Perception of emotions is essential for successful communication. In spoken communication, emotions are conveyed via prosody (tone) and semantics (lexical content). Prosody is lost when communication shifts from spoken to computer-mediated communication (CMC), in which emotions are conveyed via emoji (e.g.,) and text. Research on CMC is scarce given its novelty, and the nature of emoji-text relationship in CMC is unclear, especially among the elderly population. The current research engages with the elderly population and discusses three questions: 1) Identification/Discrimination. Can participants identify emotions in each channel, text and emoji to the same extent? 2) Integration and Selective attention. Is the emoji-text relationship integral? 3) Channel dominance. Do emojis dominate semantics? To answer these questions, we adapted the original Test for Rating of Emotions in Speech (T-RES), originally designed to test the prosody-semantics interplay, to create the Test of Emotional teXT Messages with Emoji (TExtME). TExtME presents T-RES spoken sentences as text in CMC, using three emotional emoji instead of the T-RES prosodies. These emojis were s found (in a pretest) to represent best the following emotions: Anger, Happiness and Sadness. Participants in the TExtME are asked to rate text messages based on a combination of semantic and paralinguistic content. If emojis are placeholders for prosody, we can expect similar performance trends in both spoken and CMC tests (T-RES and TExtME) and for both young and old adults. Preliminary results will be discussed.

24	Valence effects on visual word recognition as a function of concreteness and emotion word type *Yaron Felman, Aya Meltzer-Asscher, and Orna Peleg* Tel Aviv University

The emotional valence associated with individual words (i.e., the extent to which the emotion evoked by a word is positive or negative) has emerged as an important variable in visual word recognition. Yet, the precise nature of these emotional effects remains unclear. This lack of clarity may be related to the fact that although valence tends to interact with other properties of the word, such as concreteness (e.g., Kanske & Kotz, 2007) and emotion word type (e.g., Zhang et al., 2017), these factors are usually studied separately. To get a more accurate picture, we conducted a lexical decision experiment, in which the target words were carefully selected to differ with respect to valence (positive, negative or neutral words), concreteness (concrete or abstract words) and type of emotional word (emotion-label or emotion-laden words), whilst being matched with respect to arousal, frequency, familiarity, and length. Under these controlled conditions, we found that positive words were easier to identify than negative or neutral words, and that this positivity advantage was more pronounced in abstract than in concrete words. Moreover, within the group of abstract words, emotion-label words were recognized faster than emotion-laden words, and this word type effect was more pronounced in negative than in positive words. These results can be interpreted in the framework of embodied theories, which emphasize the important role of

emotional experience in comprehending abstract concepts (e.g., Vigllioco et al., 2014, Borghi et al., 2017).

25	The spread of affective and semantic valence representations across state space *Orit Heimer and Uri Hertz* University of Haifa

Valence, the representation of a stimulus in terms of good or bad, plays a central role in models of affect, value-based learning theories, and value-based decision-making models. Previous work used reversal learning to empirically support a theoretical division between two different types of valence representations for a stimulus: the semantic representation of valence, i.e., stored accumulated knowledge about the value of the stimulus, and the affective representation of valence, i.e., the experienced affective response to this stimulus. In the current work, we examined the spreading of the two types of valence representations across states. In two pre-registered experiments (N=585), the participants were led across a chain of four rooms representing different states. The chain had fixed transition probabilities between the rooms and a reward (loss of time/loss of points/gain of points) at the leftmost room. We used semantic ("How far are you from the reward room?") and affective ("How do you feel in this room?") self-reports during and after the maze to check for possible differences between the spread across states of the two valence representations. Preliminary results show that the semantic valence representations spread linearly across states, while affective representations were more localized to the reward state. Furthermore, this localized effect was more pronounced when the reward had negative valence compared to positive valence. We present computational modeling accounts of these effects, examining structure-dependent and structure-oblivious models.

Memory II

26	The effects of boundary strength on memory for the preceding event *Miriam Havin [1], Kevin Campion [2], and Aya Ben-Yakov [1]* [1] The Hebrew University of Jerusalem; [2] University of Cambridge

People naturally segment continuous experience into discrete events and this segmentation has been shown to impact long-term memory. This is demonstrated by evidence that occurrence of a boundary modulates memory performance. Yet it is unknown whether memory is affected not only by the occurrence of a boundary, but also modulated by boundary strength. Here, we tested whether the strength of a boundary affects memory of the preceding event. To that end, we presented participants (n=36) with a film created using the life simulation game 'The Sims'. The film depicts characters performing various actions (e.g., eating, meditating, etc.), grouped into distinct events separated by different levels of boundaries. The boundaries included either a small spatiotemporal change (e.g., jumping from the bedroom to the bathroom), a large spatiotemporal change (e.g., jumping from the house to a carnival) or a character change. Participants' memory was then tested using cued-recall. We found that participants' memory of the actions comprising an event was modulated by the strength of the boundary following the event. Improved memory was evident for those events which were followed by a large spatiotemporal change or by a character change, as compared with events followed by small spatiotemporal changes. These results demonstrate that the effect of boundaries on subsequent memory is graduated, with strong boundaries leading to better encoding of the preceding event.

27	Neurocognitive representation of self-defining memories *Rotem Monsa [1] and Shahar Arzy [1,2]* [1] Hebrew University of Jerusalem; [2] Hadassah Hebrew University Medical School

Our lives are interwoven with significant experiences that leave their mark by meaningful memories. Self-defining memories (SDMs) are memories of highly significant personal memories that people perceive as contributing to their overall life story or sense of identity. A body of psychological research (Blagov & Singer, 2004) suggested such memories to carry four main subcomponents: emotion, content, self-relevance and specificity. How are these subcomponents contributing to the representation of SDMs? Here, we asked participants to recall personal SDMs and insignificant memories under functional MRI (fMRI) and respond to different questions about each memory to quantify the four subcomponents. We used Multivoxel pattern analysis (MVPA) to uncover the brain system of SDMs, and representational similarity analysis (RSA) to quantify the relative contribution of each subcomponent. A brain system encompassing the temporoparietal junction (TPJ), paracingulate Gyrus, posterior cingulate cortex, precuneus and parahippocampal gyrus was found to distinguish between SDMs and insignificant events. as for the relative contribution of each subcomponent to the construction of SDMs, RSA found that self-relevance was mainly characterizing SDMs (89%), as coded mainly in the superior temporal gyrus, retrosplenial cortex, precuneus and cingulate cortex. To a much lesser extent (11%), content was also found to code SDMs, mostly in the anterior cingulate cortex, fusiform gyrus and precuneus. Emotion and specificity did not elucidate any unique neural coding. These findings demonstrate the importance of self-relevance to SDMs. This work emphasizes how “a view from the brain” may inform us about the nature of psychological processes.

28 Semantic learning creates semantic networks and long-term representations

Yael Schems Maimon and Roy Luria
Tel-Aviv University

The goal of the present study was to investigate the effectiveness of semantic learning in creating long-term and working-memory representations. In 2 experiments we taught participants about novel objects via semantic learning - a form of learning that focus on connecting various aspects of information about the studied material to create durable LTM semantic networks. In this learning process, which simulates natural learning rather then memorization, a detailed semantic network is formed by exposing the participants to various aspects of the novel information. In turn, the novel semantic network should enhance visual working memory (VWM) performance, assuming VWM relies on existing LTM representations. Experiment 1 demonstrated that new LTM representations were formed through semantic learning. Specifically, subjects were taught in 4 learning sessions various details about unfamiliar musical instruments, watched videos in which these instruments were played and were encouraged to create intuitive associations regarding the instruments by thinking about their look, sound and use. Semantic learning not only established branched representations in LTM, but also enabled an improvement in VWM performance, compared to pre-learning performance. Importantly, the semantic learning improvement in VWM performance was observed without any specific VWM training. Experiment 2 provided direct evidence for the formation of a semantic LTM network following learning. Namely, participants responded faster to correct sentences about the learned stimuli when they described a close semantic connection, compared to a distant semantic connection. We conclude that semantic learning enables the formation of detailed representations in LTM, representations which enable a better and efficient utilization of VWM capacity.

29 Understanding the role of eye movements in memory retrieval

Keren Taub, Yonatan Goshen-Gottstein, and Shlomit Yuval-Greenberg
Tel-Aviv University

When retrieving memorized information, people often gaze at locations that were viewed during encoding. This behavior was found to enhance memory, and thought to suggest that eye movements can serve as retrieval cues. In three studies, we tried to explain the contribution of the visual and motor components of eye movements to memory, and define the conditions under

which they enhance performance. In Study 1 (N=70), we dissociated the contributions of the visual and motor components. Findings showed that both components enhanced memory recognition and indicated that the abilities to gain from visual and motor cues are correlated. In study 2 (N=80) we examined how visual context modulates the contribution of eye movements to memory, by occluding it and testing how this affects eye movements and performance. Findings showed that, during test, people tend to move their eyes similarly to encoding regardless of visual context, but that this behavior in beneficial only when the visual context is consistent with that viewed during encoding. In Study 3 (N=40) we dissociated visual and motor cues during free-view retrieval task. Findings suggest that participants preferred motor rather than visual cues, but that this behavior was not beneficial for performance. Taken together, our studies indicate that both motor and visual information induced by eye movements are linked to memory, but that the benefit of this behavior to performance depends more on the visual component. Following these findings, we propose to revisit the hypothesis that eye movements, as motor action, constitute a retrieval cue.

30	Interpretation bias modification and autobiographical memory specificity *Daniel Mandelbaum and Eyal Kalanthroff* The Hebrew University of Jerusalem, Jerusalem

Imagery-Cognitive Bias Modification (i-CBM) is a new therapeutic tool designed to alter negative interpretation bias among depressed individuals and to reduce their depressive symptoms. Despite its promising potential, the mechanism underlying the effect of i-CBM on depressive symptoms is yet to be fully understood. In order to shed light on this mechanism, in our study, we checked the effect of i-CBM on another cognitive bias prevalent in depression: over-general autobiographical memory, which is the tendency to retrieve autobiographical memories in a less specific and more over-general way. We recruited 60 participants and divided them into two groups, positive and negative i-CBM. Both groups completed AMT (autobiographical memory test) before and after one i-CBM session that was in accordance with the group condition (negative/positive). We predicted that autobiographical memory specificity will be enhanced in the positive group and reduced in the negative group. The results were in accordance with our hypotheses, they yielded an increase in autobiographical memory specificity in the positive group and a decrease in specificity in the negative group. These results strengthen the claim that cognitive biases do not operate in isolation but rather influence and interact with one another. In addition, based on these results, it could be suggested that i-CBM helps in reducing symptoms of depression through its effect on the perception of autobiographical memory in depressed individuals. After the i-CBM participants interpret their autobiographical memory differently, this different interpretation affects their process of autobiographical memory retrieval.

31	The effect of negative valence on false memory formation in the DRM paradigm: a preregistered meta-analysis and preregistered replication *Sera Wiechert [1,2], Dora Proost [3], Emmelie Simoens [3], Gershon Ben-Shakhar [2], Yoni Pertzov [2], and Bruno Verschuere [1]* [1] University of Amsterdam; [2] Hebrew University of Jerusalem; [3] Ghent University

In the Deese-Roediger-McDermott (DRM) paradigm, participants learn lists of words (e.g., apple, orange), semantically associated with a non-presented lure (i.e., fruit). In subsequent memory tests, individuals tend to report the non-learned lures, i.e., displaying false memories. The DRM task has been criticized for not capturing the aversive nature of (clinical and forensically relevant) real-life memories. To obtain a robust estimate of the influence of negative vs neutral words lists on the DRM effect, we conducted a preregistered meta-analysis (krecall = 48; nrecall = 2193; krecognition = 72; nrecognition = 2900; kresponsebias = 31; nresponsebias = 1128) and a preregistered replication (nfinal = 278). We expected increased false memories for negative valence in both recall and recognition tests. Importantly, we found a robust original DRM effect in both approaches. For recall, neither the meta-analysis nor the replication showed the expected

valence effect (dreplica = 0.02, dmeta = -0.16). For recognition, the meta-analysis (d = 0.22) and replication (d = 0.31) showed that negative valence (vs neutral) increased false memories. However, this effect may be confounded by shifts in response tendencies as controlling for response bias nullified the valence effect in our meta-analysis (dmeta = 0.05), and we also found evidence for differential response bias in our replication (dreplica = 0.40). Hence, the effect of valence on false memory reports in the DRM may not represent a systematic difference of emotional information but instead depend on how the memory is tested, and be partly attributable to differential response tendencies.

32	Stop using d? And start using da: evidence from empirical data on how to measure sensitivity in recognition memory *Adva Levi [1], Caren M. Rotello [2], and Yonatan Goshen-Gottstein [1]* [1] Tel-Aviv University; [2] University of Massachusetts Amherst

Simulation data shows that all old-new recognition studies that used d? or H-F to establish changes in sensitivity between two conditions reached conclusions not supported by the data analysis. Those simulations revealed high Type I error rates between two iso-sensitive recognition-memory conditions that only differed in bias. In contrast, the simulations revealed da to be a bias-free measure of sensitivity. Critically, simulations make assumptions that may not be true of empirical data. For example, simulations test a finite set of data-generating models, specifically Gaussian unequal variance, and if these are not true (e.g., Rouder & Pratt, 2010) then da would fail to distinguish between bias and sensitivity when used in experiments. Also, while the values of confidence judgments were sampled independently in our simulations, empirical confidence ratings show sequential dependencies (Kantner et al., 2018). To estimate the Type I error rate for da, we ran 20 identical experiments (N = 960) in which only bias was manipulated between conditions. Type I error rates were comparable to those found in our simulations. Our results support the use of da in binary tasks such as recognition.

Posters 35-50: Upper Lobby

Emotional disorders II

33	White-matter individual differences as a biomarker for stress-related disorders *Rotem Saar-Ashkenazy [1, 2], Jonathan Guez [3, 4], Yael Jacob [5], Ronel Veksler [2], Jonathan E. Cohen [6], Ilan Shelef [7], Alon Friedman [2, 8] and Mony Benifla [9]* [1] Ashkelon Academic College; [2] Ben-Gurion University of the Negev; [3] Achva Academic College; [4] Beer-Sheva Mental Health Center; [5] Icahn School of Medicine at Mount Sinai, New York; [6] Hebrew University of Jerusalem; [7] Soroka Medical Center; [8] Dalhousie University, Halifax; [10] Rambam Health Care Campus

Background: Traumatic stress has been associated with increased risk for brain alterations and development of anxiety disorders. Studies conducted in posttraumatic patients have shown white-mater volume and diffusion alterations in the corpus-callosum. In addition, decreased cognitive performance has been demonstrated in acute stress disorder and posttraumatic patients. However, whether the reported cognitive alterations result from stress related neuropathology or reflect a predisposition is not known. In the current study, we examined in healthy controls, whether individual differences in state and trait anxiety are associated with those cognitive and brain alterations reported in acute stress disorder and posttraumatic patients. Methods: Twenty healthy volunteers were evaluated for anxiety using the state-trait inventory (STAI), and were tested for memory performance using the item-association memory paradigm. Brain imaging was

employed to extract volumetric and diffusion characteristics of the corpus-callosum. Results: Significant correlations were found between trait anxiety and all three diffusion parameters (fractional-anisotropy, mean and radial-diffusivity). Associative-memory performance and corpus-callosum volume were also significantly correlated. Conclusion: We suggest that cognitive and brain alterations, as tested in the current work and reported in stress related pathologies, are present early and possibly persist throughout life. Our findings support the hypothesis that individual differences in trait anxiety predispose individuals towards negative cognitive outcomes and brain alterations, and potentially to stress related disorders.

34	The moderating role of anxiety and depressive symptoms in the association between frame and risk-seeking, risk-aversion, and omission behaviors under uncertainty *Chen Goren, Nilly Mor, and Ilana Ritov* The Hebrew University of Jerusalem

Under uncertainty, most people tend to be risk-averse to assure gains (gain frame) and risk-seeking to avoid losses (loss frame). People also prefer harm caused by omissions over equal or lesser harm caused by acts. We posit that while both risk-seeking and risk-aversion behaviors can be seen as two types of action, omission can be seen as a third behavioral alternative that emphasizes inaction. Whereas anxiety has been found to attenuate risk-seeking under uncertainty, the role of depression in risk attitudes remains largely unknown. Therefore, the current study aimed to examine the moderating role of anxiety and depressive symptoms in the association between gain and loss frames and risk attitudes (risk-aversion, risk-seeking, and omission) under uncertainty. Participants (N = 117) completed self-report measures of depressive and anxiety symptoms, followed by a multiple-choice monetary task, assessing risk attitudes. Over 50 trials, equally divided into potential monetary gains and losses, participants were required to choose between a gamble, representing risk-seeking; a sure option, representing risk-aversion; and not choosing or not acting within the given time frame, representing omission. As predicted, participants made more safe choices under gains and more risky choices under losses. Anxiety symptoms were associated with more risk-aversion for gains, while depressive symptoms were associated with more omission. Overall, our study replicates previous findings on anxiety and risk attitudes in a novel paradigm. Moreover, it demonstrates that depression plays a significant role in inaction under uncertainty, thus emphasizing depression's typical symptoms of indecisiveness and inactivity.

35	Anxiety and executive functions in patients with epilepsy and psychogenic nonepileptic seizure *Lana Omari[1,2], Eldad Keha[1], Aryeh Dienstag[2], Razan Assi[1], Diya Doufish[2], Dana Ekstein[2], and Shiri Ben-David[1,2]* [1] The Hebrew University of Jerusalem; [2] Hadassah Medical Center

Patients with Epilepsy and psychogenic nonepileptic seizure (PNES) suffer from cognitive impairments. The attentional control theory suggests that anxiety and cognitive performance are interrelated. To deepen and refine our understanding of the mechanisms underlying these disorders, this study aims to evaluate the attention, inhibitory control functions, and anxiety levels in patients with epileptic seizure (ES) compared with PNES and comorbid cases. Understanding PNES and ES from a cognitive and emotional perspective can lead to better outcomes in the conceptualization of these disorders and their treatment. In the current study we examine attention and inhibitory control (on a Stroop task and Attentional Network Test), explicit anxiety (using State-Trait Anxiety Inventory) and Anxiety Sensitivity Questionnaire (ASI-13) among patients treated at the Epilepsy Center at Hadassah Medical Center, Jerusalem. Our pilot results are based on a small sample size (ES group N=13, PNES and comorbid cases group N=9), therefore no significant effects were found. Yet the direction of results points towards higher state anxiety in the PNES + comorbid cases than ES group. No differences in attention and inhibitory control deficit

between the groups were found. The high levels of anxiety may underlie the psychogenic nature in PNES + comorbid cases group. In other words, PNES may represent a form of anxiety, according to theories of conversion. The cognitive deficit in ES group is a reflection of organic processes, whereas the cognitive deficit in PNES + comorbid cases is a reflection of complex interactions between vulnerable cognitive control and emotional systems.

36 The many sides of expansive scope: the relationships between regulatory scope and ocd, anxiety, depression, and impulsivity

Ori Levit [1], Noga Sverdlik [2], Reuven Dar [1], and Nira Liberman [1]
[1] Tel Aviv University; [2] Ben-Gurion University of the Negev

One's regulatory scope (RS) is the range of factors that they consider when evaluating alternatives and taking action. Sverdlik and colleagues (2022) conceptualized RS as a disposition, distinguishing individuals along a continuum that ranges between an expansive scope (taking into consideration factors that are improbable, distant in time, space, and social perspective) and a contractive scope (taking into consideration only factors that are likely, proximal in time, space, and social perspective). These researchers developed and validated a self-report questionnaire to assess dispositional RS. In the present project, we investigated the relationship between dispositional RS and obsessive-compulsive disorder (OCD), anxiety, depression and impulsivity, all assessed via self-report questionnaires in the general, non-clinical population. Two studies (NTotal = 603) found that, as predicted, expansive scope was positively correlated with OCD and anxiety. It was also negatively correlated with impulsivity (low self-control), when controlling for OCD and anxiety. Depression showed a more complex association with RS: A positive overall correlation with expansive scope, but a negative correlation with expansive scope when controlling for OCD and anxiety. These findings suggest that having an expansive scope may have downsides: While considering distant factors is associated with better perspective-taking and better self-control, it is also associated with worries and intrusive thoughts that disrupt daily life. Additionally, these findings provide insight into how individuals with subclinical OCD, anxiety, and depression experience the world in terms of psychological distance and scope, which may contribute to theoretical conceptualization of these disorders.

37 Multiple session inferences training affects mood, depression and rumination as well as spontaneous inferences for events in daily life

Baraah Abu Saleh, Nilly Mor, Baruch Perlman, and Noa Avirbach Shabat
The Hebrew University of Jerusalem

Dysphoric people make negative inferences about the causes of negative events in their lives, attributing them to internal, stable and global causes. Cognitive theories posit that a negative inferential style is a main risk factor for depression. The aim of the current research was to examine the effects of inferences training beyond the lab into daily-life. 60 dysphoric individuals were assigned to either a positive condition or a control condition. Inferential style, depression and rumination were assessed prior to and following the training. The training consisted of six sessions across three weeks. Participants were presented with mostly negative events. In the positive condition, these events were followed by a positive inference and yes/no questions that served to reinforce the inference. In the control condition, participants only answered yes/no questions. On each training session, participants reported their mood and state rumination, and were asked to reflect on a negative personal event that took place recently, describe a cause for it and rate the inference. Only participants in the positive condition showed significant decreases in negative inferential style, depression and rumination, which continued to decrease at follow-up. Importantly, they rated inferences they made for their personal negative events as more positive than participants in the control condition. Our study demonstrates for the first time, that training

dysphoric people to make more positive inferences for negative events can reduce depressive symptoms and ruminative thinking. Moreover, they point to a possible mechanism, involving transfer of the training from lab-based scenarios to real-life negative events.

Metacognition

38	A cognitive computational framework for dishonest behaviors *Eran Dorfman and Kinneret Teodorescu* Technion – Israel Institute of Technology

Dishonesty is a widespread issue that has a negative impact on societal wellbeing. While most real-life situations contain repeated temptations to act dishonestly, most experimental lab studies commonly employ static one-shot settings. The current study aims to shed light on the cognitive mechanisms that underlying dishonest behavior in repeated settings. To this end, the current study employed a perceptual dots task with a decision-making phase in which participants are provided with tempting circumstances where selecting the incorrect response will increase their earnings. We integrate cognitive computational methods and experimental investigation of behavior. Our results show that a mechanism of reliance on small samples of past experiences can account for previous findings according to which the frequency of enforcement reduces dishonesty levels more than the magnitude of punishment. This mechanism argues that decisions are formed based on sampling a small number of similar events and their outcomes, therefore the impact of frequent events is higher than their magnitude. While cheating was more prevalent in the no-enforcement condition, it remained at a low level and far from the maximum possible, a result which cannot be accounted by the above-mentioned mechanism by itself. The inclusion of a cheating aversion parameter is required to explain the low observed levels of dishonesty without enforcement. We are currently conducting studies to determine whether and how the cheating aversion parameter is sensitive to the initial incentives to cheat.

39	Inter-brain coupling underlies the establishment of moral alignment in groups through deliberation *Aial Sobeh and Simone Shamay-Tsoory* University of Haifa

We investigate how moral alignment — defined as alignment in moral views and values between group members — evolve in groups facing novel and morally ambiguous issues. We ask, what underlying neural mechanisms distinguish consensus-oriented deliberations leading to moral alignment on controversial moral issues, from deliberations that do not. Specifically, we examined the potential role of left IFG interbrain coupling in modulating the degree to which deliberation led members to change their own private views in line with the consensus. We designed a novel fNIRS hyperscanning paradigm involving groups of four individuals who were asked to rate a series of moral dilemmas independently and then discuss their initial ratings together with the task or reaching consensus decision on each dilemma. Following group deliberations, members were asked to rate the same dilemmas again privately. We extracted measures of interbrain coupling during deliberation blocks and assessed the level of change in private moral ratings following deliberations to examine whether interbrain coupling predicts subsequent alignment of personal moral views. We hypothesized that an increased left IFG interbrain coupling between a group member and their fellow members during deliberation blocks will predict the change, or active alignment, of privately held moral views towards the reached consensus. The behavioral results show that group members tend to align their moral views following deliberations by systematically converging around the reached consensus. Importantly, neuroimaging results show, as

hypothesized, that increased left IFG interbrain coupling during consensus-oriented deliberation between a participant and their group members predicted their subsequent moral alignment.

40	The impact of practicing mentalization skills on narrative writing *Gal Joseph, Rachel Schiff, and Shani Kahta* Bar Ilan University

Mentalization skills, or the writer's ability to reflect on the characters' mental state and interpret the thoughts, feelings, desires, goals that underlie. behaviors and actions, are necessary for character development in narrative writing. However, interventions that aim to improve writing skills have mostly focused on enhancing the writer's text structure skills. The purpose of the present study was to examine the effect of a narrative writing intervention that focused on improving mentalization skills on the written narratives' microstructure, macrostructure, and the mental states used as compared with a Text structure-based intervention. Ninety third graders were divided into three groups, participating in a 19-session intervention: A Mentalization skills and Text Structure (M+TS) group that practiced emotional intelligence skills, cognitive ToM, and the ability to describe the internal and external features of the characters, a Text Structure (TS) group that focused on the story's microstructure and macrostructure elements, and a control group. Results indicated that all groups improved their narrative writing skills in terms of the text microstructure and macrostructure elements; however, the M+TS group outperformed the TS and the control group on all measures. Moreover, only the M+TS group significantly improved their mentalization skills. The results highlight the importance of practicing mentalizing skills when teaching narrative writing.

41	Once upon a time: the effect of narrative engagement on neural synchronization *Tal Ohad and Yaara Yeshurun* Tel-Aviv University

A good story manages to engage the audience. In this study, we explored a possible neural mechanism by which engagement with a story captivates the audience, and tested whether engagement with a story synchronizes listeners' brain responses. To do so, we pre-registered and re-analyzed a previously collected dataset by Chang et al. (2020) of functional Magnetic Resonance Imaging (fMRI) scans of 25 participants that listened to a 1-hour story and answered questionnaires, assessing the degree of their overall engagement and engagement with the story's main characters. These questionnaires revealed individual differences in engagement with the story, as well as different valance of engagement with specific characters. Neuroimaging data showed that the auditory cortex, the Default Mode Network (DMN) and language regions, were involved in processing the story. Moreover, increased engagement with the story was correlated with increased neural synchronization within regions in the DMN (especially medial prefrontal cortex), as well as regions outside the DMN such as Dorso Lateral Prefrontal Cortex and the reward system. Interestingly, there was a dissociation between neural synchronization patterns elicited by positively- and negatively-engaging characters. Finally, engagement increased functional connectivity within and between the DMN, the Dorsal Attention Network (DAN) and the Control Network (CN). Taken together, these findings suggest that engagement with a narrative synchronizes listeners' responses in regions involved in mentalizing, reward, working memory and attention. By taking advantage of individual differences in engagement, we revealed that these synchronization patterns are due to .engagement, and not due to differences in the narrative's content.

42	Between truths and lies: the complex indices of deceptive behavior *Oryah Lancry-Dayan, Gershon Ben-Shakhar, and Yoni Pertzov* The Hebrew University of Jerusalem

In the era of social media, distinguishing between truths and lies becomes more and more essential. Two fields of research have tried to solve this challenge: computer sciences and psychology. Yet, despite the massive effort invested in resolving this problem, it still requires further research and deeper theoretical understanding. The goal of our project is to utilize the insights gained from both research fields. Specifically, we aim to use theoretical knowledge from the psychological research in order to derive the features for the machine learning algorithms that have been used in computer science studies. Based on previous studies, we hypothesize that deception is related to three constructs of cognition and behavior: (1) stress\arousal, (2) cognitive load and (3) social interactions. Thus, deception is expected to be stressful, lead to enhanced arousal and cognitive load, and modulate observable social behavior. To measure these behavioral changes, we track participants gaze behavior, physiological responses, speech and facial expressions while they tell truthful and deceptive stories during a video interview. Initial findings indicate a complex change of behavior during lies that can be harnessed for the classification of truth and lie. Additionally, individual differences would be used to characterize different profiles of liars. The metacognitive awareness of participants to their type of liar would be assessed through questionnaires. Overall, this project provides a comprehensive framework for understanding deceptive behavior, from the general indices of deception to the idiosyncratic aspects of it.

43	Subclinical OCD and inference about absence in visual search *Noam Sarna[1], Matan Mazor[2], and Ruvi Dar[1]* [1] Tel Aviv University; [2] Birkbeck, University of London

Obsessive-compulsive disorder (OCD) is characterized by excessive doubt, which often leads to rituals of repetitive checking and reconstructing – for example, an individual with OCD may attempt to retrace their entire trip driving to work in an attempt to convince themselves that they haven't accidentally run someone over without noticing. Previous research has shown that obsessive-compulsive participants struggle to make decisions even under mild uncertainty, such as when searching for an absent target. Here we tested the hypothesis that obsessive-compulsive traits are associated with a selective difficulty with such inference about absence, a cognitive process based on the belief that one would not have missed a target. In a pre-registered online experiment (N=1000), participants were divided into two groups of high (OC+) and low (OC-) OC tendencies and performed 96 trials of a visual search task in which they were asked to decide whether a target was absent or present. Our objective was twofold: first, we aimed to replicate previous findings of longer search times among OC+ participants in target-absent trials. Second, we intended to decouple absence from uncertainty by measuring search times in low-uncertainty target-absent searches. Contrary to previous findings, we found similar search times in target-absent trials between the OCD groups, conveying no evidence that OC+ participants struggle with decisions under mild uncertainty. We discuss potential explanations for this failure to replicate a well-documented effect in light of differences between in-person and online settings and a small sample versus a pre-registered replication in a large sample.

Perception III

44	The impact of bias in attention orientation on prism adaptation aftereffects *Or Mizrahi [1], Mohamed Tarabeih [1], Meytal Wilf [2], and Smadar Ovadia-Caro [1]* [1] University of Haifa; [2] Sheba Medical Center

Prism adaptation (PA) is a visuomotor adaptation task that induces sensorimotor aftereffects and modulates attention orientation. Previous work has demonstrated that the bias in attention orientation before PA influences PA aftereffects. However, inconsistencies in the direction of the bias at baseline suggest repeated measures are required to fully understand the relationship between attention bias and PA aftereffects. Here, we performed left and right PA on a population

of consistent leftward and consistent rightward biased subjects at baseline to examine the impact of PA manipulation on these two groups. Sensorimotor aftereffects were documented using two motor tasks and the impact on attention orientation was measured using the greyscale task; a perceptual measure of the bias. Subjects were repeatedly tested after a single PA session; immediately after, 30 minutes, a day, and two days following the PA session. Thus far, data from 14 right-handed subjects were collected, 7 rightward and 7 leftward biased that underwent right PA and left PA, respectively. A repeated measure ANOVA was used to examine the effects of time, group, and their interaction. For both our sensorimotor tasks, we found a significant effect of group, time, and their interactions. Our immediate sensorimotor aftereffects replicated previous studies. However, long-lasting sensorimotor effects were more pronounced in the left-biased, left PA group, lasting up to 48 hours after PA. Importantly, we found no significant effects on attention orientation. To conclude, left PA seems to be more powerful in producing aftereffects than right PA, with surprisingly long-lasting aftereffects.

45	Discrimination and estimation of horizontal and oblique directions *Eman Mhajne, Luseen Katish, and Sarit Szpiro* University of Haifa

Adults exhibit lower motion direction thresholds and larger estimation biases for cardinals versus oblique directions (i.e., the oblique effect). It is unclear whether the difference in biases is driven by the difference in thresholds and in what ways the estimate distributions are different between oblique and horizontal. We examined the perception of motion directions in adults using a random dot kinematogram stimulus surrounding either a horizontal (0°) or an oblique (320°) boundary. For each participant we tested their motion coherence threshold for oblique and horizontal using an CW/CCW discrimination task and a 3-down 1-up staircase. Then, each participant viewed the motion directions at their calculated thresholds and adjusted the mouse to estimate the perceived motion direction. We found a correlation between thresholds, but not between biases, in the horizonal versus the oblique condition. Analyzing estimate distributions, we found that although participants performed the estimation task at similar level of difficulty for near horizontal and near oblique directions (because thresholds were adjusted for each), there was a significant difference in bias. Moreover, estimate distributions were not unimodal. Analysis with gaussian mixture model revealed that the number of clusters differed between estimate distributions of horizontal and oblique directions. While oblique estimate distributions had 1-3 clusters, horizontal estimate distributions were overwhelmingly bi-modal. These results suggest that perception of near horizontal directions may follow a unique decision strategy, possibly an implicit choice before the estimation response, leading to a distinct bimodal pattern of estimates.

46	Neural mechanisms determining the duration of task-free, self-paced visual perception. *Shira Baror, Thomas J Baumgarten, and Biyu Jade He* Hebrew University of Jerusalem

Humans spend hours each day spontaneously engaging with visual content, free from specific tasks and at their own pace. Aiming to understand how the brain supports such spontaneous perceptual experiences, here participants freely viewed naturalistic images and self-paced each image's viewing duration while undergoing encephalography (EEG) monitoring and eye-tracking. Across two datasets we found that while image content influenced viewing duration in an idiosyncratic manner, the images' presentation order strongly influenced viewing duration similarly across participants: The earlier images were presented in the experiment, the longer they were viewed. We next sought for the neural mechanisms controlling self-paced viewing duration. To this end, we ran a regression analysis on viewing duration that controlled for presentation order, and used the residuals of this regression as a proxy for spontaneous viewing duration. The images' presentation order, and separately, the regression's residuals, were then correlated with EEG and eye-tracking metrics. The results revealed that the neurophysiological underpinnings of

spontaneous viewing duration are doubly dissociable from those of presentation order: While presentation order was correlated with baseline alpha power and with baseline pupil size, spontaneous viewing durations (i.e., regression residuals) were associated with the magnitude of evoked EEG activity and evoked pupil-size changes. Spontaneous viewing durations were also associated with neural stability, measured by similarity in spatial activity patterns across time points. As early as 500ms after image onset, higher neural stability predicted longer viewing durations. These findings broaden our understanding of the neurophysiological dynamics contributing to spontaneous human perceptual behavior in naturalistic settings.

47 Can we time two intervals simultaneously? Evidence from behavior and EEG

Shahar Haim, Nir Ofir, Leon Deouell, Ayelet N. Landau and Eran Lottem
Hebrew University of Jerusalem

Timing is an important cognitive faculty, and the brain's capacity to follow temporal patterns and produce well-timed motor commands is crucial for a wide variety of tasks. One elementary component of temporal processing is interval timing. Sensorimotor interval timing requires subjects to self-initiate responses to a given stimulus only after a certain amount of time has elapsed. Furthermore, humans are seemingly capable of keeping track of multiple overlapping yet not necessarily synchronized intervals. Although current theories regarding the neural computations that give rise to interval timing are readily applicable to the timing of single actions, they fall short of explaining simultaneous timing seeing that they are essentially one-dimensional. To study simultaneous interval timing, we developed a novel interval timing task performed on two asynchronous auditory input streams. Optimally, solving the task requires subjects to maintain two separate and independent interval representations, each associated with a different action. We found that the subjects were capable of maintaining two asynchronous timing streams. Their accuracy was unaffected by the existence of a distracting stream, or by the requirement to monitor two streams at the same time. We then used electroencephalography (EEG) to measure the participants' neural activity while they performed this task. Analysis of activity in fronto-central channels revealed a negative deflection that was tightly aligned to, and predictive of temporal judgments. Furthermore, activity switched rapidly between interval representations, multiplexing the timing of two intervals by a single, global variable. These results suggest a novel neural mechanism for flexible, multi-dimensional timing of behavior.

48 Neural signatures of evidence accumulation in temporal decisions

Nir Ofir and Ayelet N. Landau
Hebrew University of Jerusalem

Cognitive models of interval timing can be formulated as an accumulation-to-bound process. However, the physiological manifestation of such processes has not yet been identified. We used electroencephalography (EEG) to measure the neural responses of participants while they performed a temporal bisection task in which they were requested to categorize the duration of visual stimuli as short or long. We found that the stimulus-offset and response-locked activity depends on both stimulus duration and the participants' decision. To relate this activity to the underlying cognitive processes, we used a drift-diffusion model. The model includes a noisy accumulator starting with the stimulus onset and a decision threshold. According to the model, a stimulus duration will be categorized as "long" if the accumulator reaches the threshold during stimulus presentation. Otherwise, it will be categorized as "short." We found that at the offset of stimulus presentation, an EEG response marks the distance of the accumulator from the threshold. Therefore, this model offers an accurate description of our behavioral data as well as the EEG response using the same two model parameters. We then replicated this finding in an identical experiment conducted in the tactile domain. We also extended this finding to two different temporal ranges (sub- and supra-second). Taken together, the work provides a new way to study

the cognitive processes underlying temporal decisions, using a combination of behavior, EEG, and modeling.

12:00 – 12:40: Light lunch (provided by hostel)

12:40-14:50 Session 7 (3 parallel sessions in rooms A, B and C)

Room A: Symposium 7: How can deep learning algorithms contribute to the study of the human mind? (Organizer: Galit Yovel and Michael Gilead)

12:40-13:00	Utilizing deep learning to form and test teleological hypotheses about human perception *Tal Golan* Ben-Gurion University of the Negev
Artificial neural networks provide us with a powerful way of explaining perceptual representations. By training neural networks on different tasks, we can operationalize alternative hypotheses about human representations in terms of the goals these representations may serve. These models make crisp and non-equivocal predictions, which we can empirically test in behavioral, neuroimaging, or electrophysiological experiments. I will demonstrate this approach with a recent study on face-dissimilarity judgments. My collaborators and I trained six deep neural networks of the same architecture on different perceptual tasks. We then used the trained networks to derive predictions about how humans rate the dissimilarity of face pairs. Capitalizing on our white-box access to the neural networks, we morphed a set of faces so that together they form an optimal experiment for comparing these six different hypotheses. Presenting human participants with this stimulus set allowed us to uncover that among our candidate models, a neural network trained on inverse rendering—estimating facial 3D structure from image input—best explains human face dissimilarity judgments. I will close by discussing the pros and cons of using neural networks to implement neuroscientific theories.	
13:00-13:20	Deep language models as a cognitive model for natural language processing in the human brain *Ariel Goldstein* The Hebrew University of Jerusalem
Naturalistic experimental paradigms in neuroimaging arose from a pressure to test the validity of models we derive from highly controlled experiments in real-world contexts. In many cases, however, such efforts led to the realization that models developed under particular experimental manipulations failed to capture much variance outside the context of that manipulation. Recent advances in artificial neural networks provide an alternative computational framework to model cognition in natural contexts. In contrast to the simplified and interpretable hypotheses we test in the lab, these models use local computations to interpolate over task-relevant manifolds in high-dimensional parameter space. Counterintuitively, over-parameterized deep neural models are parsimonious and straightforward, providing a versatile, robust solution for learning diverse cognitive functions in natural contexts. In this talk, I will use natural language as an example to contrast the two perspectives. Our study aims to model natural language processing in the wild. To that end, we recorded ECoG data from epileptic patients while they engaged in open-ended free conversations with their doctors, friends, and family members during their week-long stay in the hospital. Traditionally, the investigation of the neural basis of language relied on classical language	

models, which use explicit symbolic representations of parts of speech (like nouns, verbs, adjectives, adverbs, and determiners) combined with rule-based logical operations embedded in hierarchical tree structures (Chomsky 1986). Recently, advances in deep learning have led to the development of a new family of deep language models, which were remarkably successful in many natural language processing (NLP) tasks in the wild. We provide empirical evidence that the human brain and deep language models share three fundamental computational principles as they process the same natural narrative: (1) both are engaged in continuous next-word prediction before word onset; (2) both match their pre-onset predictions to the incoming word to calculate post-onset surprise; (3) both rely on contextual embeddings to represent words in natural contexts. Together, our findings suggest that deep language models provide a new and biologically feasible computational framework for studying the neural basis of language.

13:20-13:40	Using deep learning algorithms to uncover the content of human mental representations in perception and memory *Galit Yovel, Adva Shoham, and Idan Grosbard* Tel Aviv University

Recent studies reveal remarkable similarities between the representations humans and deep neural networks (DNNs) generate for faces and objects. These DNNs are optimized for image classification and therefore represent only visual information. However, human face and object recognition primarily concerns familiar stimuli that are encoded by perceptual and semantic codes. Furthermore, familiar stimuli can be also recalled from memory, whereas current DNNs only concern perceptual representations. Thus, to account for human representations of familiar stimuli in perception and memory, we used visual, visual-semantic and natural language processing (NLP) DNNs. Participants were asked to judge the similarity of familiar faces based on their images (perception) or to recall their visual appearance based on their names (memory). We measured the similarity of the same images based on visual DNNs that are trained only on images, a visual-semantic DNN (CLIP) that is trained to pair images and text as well as their Wikipedia description by an NLP algorithm (SGPT). We found that the visual-semantic DNN accounted for human representations in perception and memory beyond the pure visual DNN. In addition, an NLP algorithm accounted for additional variance in human representations in memory, but not in perception. We conclude that a complete account of human mental representations of familiar stimuli should incorporate visual and semantic information. Overall, we show that DNNs are valid models of human mental representations. The human-like representations that they generate for complex visual and textual information offers cognitive sciences new tools to uncover the content of the human mind.

13:40-13:50 break

13:50-14:10	Harnessing the flexibility of neural network to explain human choice-behavior in reinforcement learning paradigms *Yoav Ger and Nitzan Shahar* Tel-Aviv University

Classical studies in reinforcement learning (RL) heavily rely on normative models of behavior, models that often stress interpretability over predictive capabilities. More recently, neural network models emerged as a descriptive modeling paradigm capable of high predictive power, however, with limited interpretation. In this work we present two studies, demonstrating a proof-

of-concept for how neural networks can be used to drive meaningful theoretical interpretations. In Study 1, we demonstrate how the number of training epochs of recurrent neural network (RNN) per subject can be reliably used as an indication for the amount of information available in unseen human choice behavior. We validate this claim in both artificial and empirical data. Specifically, we show that using this approach allowed us to conclude that low compared with high intelligence participants produce noisier choice data in a well-established reinforcement learning paradigm (i.e., two-step task). In Study 2, we present a different approach where a different neural network was trained to predict theoretically meaningful RL parameters from behavioral observations using the same RL paradigm. We show using both artificial and empirical data that this approach can drive meaningful trial-by-trial dynamic estimations of latent parameters. We discuss how our framework may facilitate future research and combine the high flexibility of neural networks with the need to obtain meaningful estimation of latent parameters.

14:10-14:30	Beyond the matrix – multi-agent approach to study social-ecological systems *Uri Hertz* University of Haifa

Some of the biggest challenges facing humanity require understanding of the complex inter-dependent relations between humans and their social and biophysical environment as a social-ecological system. Studying cooperation in complex social-ecological systems is challenging, and different approaches were developed to reduce the problem space. One successful approach is to capture the characteristics of social dilemmas in matrix of discrete actions and joint outcomes (matrix games), while ignoring the way such outcomes and rewards are manifested in the real world. However, such reductionism may limit the predictive power of this approach, as social cognition and environmental affordances may play a crucial role in affecting the emergence and maintenance of cooperation strategies. Here I will discuss the opportunities for experimentally studying complex social-ecological systems. Allowing multiple players to interact in a videogame-like environment, whose spatial and temporal characteristics can be manipulated, allows experimenters to examine how different behavioral patterns emerge, the cognitive mechanisms supporting such patterns, and their dependencies on environmental settings. Modern AI techniques, namely multi-agent reinforcement-learning (MARL) provide new avenues to model such complex social worlds and behavioral patterns. These techniques can be fed back to the laboratory where they help to design new experiments in more complex social situations without compromising their tractability for computational modeling.

14:30-14:50	"The Vygotsky Machine" - A social psychology perspective on AI *Michael Gilead* Tel Aviv University

Current models in cognitive neuroscience and artificial Intelligence are heavily invested in the empiricist notion according to which abstract cognitive representations are derived from direct observation of the repeated regularities of the environment. In line with classic perspectives in the social sciences (e.g., the symbolic interactionism perspective; Mead, 1934) and with recent empirical findings concerning the inherently social nature of human cognition (e.g., Tomasello, 1999; Henrich, 2015), I will argue that higher-order cognition is mostly instantiated on "hearsay" rather than on direct observation. A potential consequence of such a view is that it may be useful for scientists to adopt a more pluralistic view of cognitive representation, that includes both symbolic (i.e., language-like) and sub-symbolic representations. I will try to demonstrate these ideas with a thought experiment which I call "the Vygotsky machine": an imaginary multi-agent AI architecture wherein a community of neural networks communicate with each other using meaningful symbols (e.g., words), keeps a record of their conversations, and over generations, develops useful cultural artefacts.

Room B: Perception and attention

12:40-13:00	The modality independent nature of the brain's navigation network *Daniel-Robert Chebat [1] Elena Aggius-Vella[2], Shachar Maidenbaum [3], and Amir Amedi [2]* [1] Ariel University; [2] Reichman University; [3] Ben-Gurion University of the Negev
The Parahipocampal Place Area (PPA), the Occipital Place Area (OPA) and the RetroSplenial Complex (RSC), respond to visual scenes during navigation tasks. V6 is a retinotopic that integrates eye movements with retinal and visuo-motor signals. What happens to these visual regions when humans deprived of vision from birth, or briefly blindfolded learn to navigate using a sensory substitution device (SSD)? To explore these questions, congenitally blind (CB), sighted (S) and sighted briefly blindfolded controls (SbbC) actively navigated virtual Hebb-Williams mazes during fMRI neuroimaging before and after navigation training. All subjects could successfully complete the mazes both in the real and virtual world. Before training the non-visual groups (CB, and SbbC) did not recruit the scene-selective nodes. After training however, the CB subjects showed a significantly higher level of BOLD in all three nodes, while the blindfolded showed this effect only in OPA and RSC but not in PPA. Our results also show that right V6 (rhV6) can process auditory spatial cues similarly to visual cues. Indeed, after training rhV6 of CB is selectively recruited for auditory navigation similar to rhV6 of the S. Taken together, our findings suggest that area rhV6 is a unique hub that transforms spatially relevant sensory information into an egocentric representation for navigation. rhV6 is in fact a supramodal area that can develop its selectivity for navigation in the absence of visual experience during the critical period, and that areas, usually considered visual, perform modality-independent spatial computation that do not require visual input.	
13:00-13:20	How do we perceive image and object ensembles? *Shaul Hochstein, Noam Khayat, and Marina Pavlovskaya* The Hebrew University of Jerusalem
Ensemble perception is the ability to efficiently represent groups of similar objects by their summary statistics. Observers are better at perceiving the means of image sets than remembering presence of a particular set member. Observers extract averages of image sets, on-the-fly, on a trial-by-trial basis either explicitly, when requested, or automatically and implicitly, when performing an orthogonal task. Paradoxically, ensemble images share sufficient features to allow recognizing them as set members, but each one is different, or we would have a useless tautology. To study mechanisms underlying ensemble perception, we directly compare explicit and implicit ensemble perception, using 3 set-presentation paradigms (temporal, spatial, spatio-temporal), which might require different underlying averaging mechanisms, and testing 3 set parameters (circle size, line orientation, disc brightness), which have different cerebral representations – all with the same observers. Interestingly, ensemble perception is more precise when explicit than when implicit – in all tested scenarios. We specifically ask how the mean is computed when set members are presented over time: Is there a running representation of mean and number, n, so that supplemented items affect the average less and less, (difference from average divided by growing n)? Finally, assuming that performance subserved by different mechanisms should predict each other less than performance subserved by the same mechanism, we look for individual differences in performance for the variety of testing scenarios to determine congruence of mechanisms involved.	
13:20-13:40	Development of biological motion perception: insights from late-sighted children *Shlomit Ben-Ami [1,2], Chetan Relaker [1], Dhun Verma [3], Kashish Tiwari [3],*

	Mrinalini Yadav [3], Priti Gupta [4,3], Pragya Shahc, Sharon Gilad-Gutnick [1], Suma Ganesh [5], Nikolaus F. Troje [6], and Pawan Sinha [1] [1] MIT; [2] Tel-Aviv University; [3] The Project Prakash Center, Delhi, India; [4] Indian Institute of Technology, Delhi, India; [5] Dr. Shroff's Charity Eye Hospital, Delhi, India; [6] York University, Toronto, Canada
Our visual system exhibits an exceptional sensitivity for the movement patterns of other humans (i.e., biological motion), which starts to emerge with very little visual experience. Even inexperienced individuals (human neonates, dark-reared chicks) can detect biological motion patterns. Patients treated for congenital cataracts can recognize walking humans in the first moments of unobstructed sight after a lifetime of near blindness. More intricate sensitivities, including walking direction discrimination and action recognition, are in place months after treatment for congenital cataracts. However, it is not known if these capabilities are acquired after surgery or spared altogether. To probe this, twenty-five children with early-life visual deprivation and late sight onset participated in six tasks testing multiple aspects of their perception, starting prior to sight restoration, and continuing periodically for up to five years after. Our results indicate a gradual onset of abilities, modulated by the quality and extent of available visual input. Recognition of human walking patterns soon after sight onset is followed by a progression of other proficiencies: discrimination of walking direction, detection of coherent action patterns, and finally recognition of these actions. Perception of finer-resolution action information, including the ability to recognize fine-motor and face-movement displays, is not gained even over a period of five years. Intriguingly, we found exceptional recognition of complex two person interactions sequences, surpassing that of basic simple actions of a single individual. Our studies offer the opportunity to place different biological motion perception capabilities on a common developmental timeline, and reveal a stratification of their onset.	

13:40-13:50 break

13:50-14:10	Duration perception is consistent with the bayesian inference framework *Noam Tal-Perry [1], Shiraz Nir-Halbar [2], Simaan Libbiss [3], and Shlomit-Yuval Greenberg [3]* [1] University of Oxford; [2] Weizmann Institute; [3] Tel-Aviv University
The mechanism behind our ability to estimate durations is still not well understood. One competing model that has tried to capture this mechanism is the Bayesian Inference model, according to which the perceived duration (posterior) results from weighing together the actual duration representation (evidence) with previous experiences (prior). One unique prediction that stems from the model suggests that the weight of each component will depend on its reliability – evidence of high signal-to-noise ratio (SNR) will outweigh priors, and vice-versa for low SNR evidence. In this study, we assessed the model's validity in explaining duration estimation by testing this prediction in a time reproduction task. In three experiments (total N = 110), we manipulated the representation quality of timed intervals using a distractor task. In the core design, participants timed a visual stimulus (probe), which was followed by a series of colored stimuli (distractors) whose sequence participants were asked to either memorize (distractor trials) or ignore (standard trials). A second stimulus (test) then appeared, which participants used to reproduce the probe duration via a button press. In distractor trials, participants were then asked about the color of one of the distractor stimuli. In all three experiments, probe reproduction was drawn to the interval distribution centre. Importantly, this pull was stronger for distractor compared to standard trials, suggesting an over-reliance on the prior distribution, as predicted by the model. Since this prediction is unique to the Bayesian Inference account, our study greatly supports the model over other models in explaining duration perception.	

14:10-14:30	Inter-individual variations in internal noise predict the effects of temporal attention: the case of the attentional blink *Felipe Luzardo and Yaffa Yeshurun* University of Haifa

Individuals differ considerably in the degree to which they benefit from attention allocation in different tasks. For instance, considerable individual differences have been reported in the attentional blink (AB): a deficit in reporting the second of two targets when it occurs 200-500 ms after the first. While some individuals reportedly show little to no AB, others exhibit a large deficit. Here, we examined whether a perceptual factor – the level of internal noise – is related to inter-individual variability in this attentional effects. Previous studies have shown that internal noise correlates with other attentional effects like those of exogenous and endogenous spatial attention. Here, we estimated observers' internal noise using the double-pass procedure combined with an external noise paradigm and computational modeling. We also measured the AB in a rapid serial visual presentation paradigm. We found correlations between individual levels of internal noise and the magnitude of AB. Participants with higher levels of internal noise also exhibited attentional blinks of greater magnitude. This finding, taken together with findings of previous studies, demonstrates that internal noise – a fundamental characteristic of visual perception – can also predict individual differences in the effects of temporal attention. We speculate that internal noise might be related to increased attention-related inhibitory processes, such that individuals with high levels of internal noise might demonstrate increased levels of attention-related inhibition.

14:30-14:50	The double potential of augmented reality: a research tool and an assistive technology - a case study *Sarit Szpiro* University of Haifa

Augmented reality (AR) glasses combine the real world with computer-generated virtual elements. In recent years, commercial AR headsets such as the Microsoft Hololens have emerged, and can become effective both as accessibility tools (e.g., by directly modifying the natural environment a person sees) and as a research tool (e.g., by testing behavior in the real world). Here, we illustrate two examples of how AR can be used in the context of assisting people with low vision. In two studies, we examined how AR assists people with low vision in daily tasks. In the first study, we examined how enhancing target objects can assist visual search in a mock shopping setup. Object search was faster and more accurate when target objects were highlighted using augmented reality. In the second study, we examined how enhancing mobility related objects (e.g., stairs, obstacles) and archeological exhibits can assist exploring a museum. For most low vision participants, AR helped in both in mobility and in seeing and enjoying exhibits. However, for some the dark lenses restricted their sight. Findings from these studies highlight the benefits and limitations of AR as an assistive tool for low vision. Drawing from research in human-computer interaction, I will highlight key factors in using AR in academic research: (1) Experiment setup – how to design experiments for naturalistic setups; and (2) Prototyping – how to test your AR idea before investing too much in development; (3) Advantages and disadvantages of virtual reality (VR) and AR.

Room C: Emotion

12:40-13:00	An examination of shame and pride through concealment and exposure *Yiftach Argaman and Assaf Kron* University of Haifa

We examined whether shame and pride drive individuals to conceal negative- and expose positive-status-related information. Study 1 (N=120) developed an experimental paradigm to examine this assumption—following IQ tests, we randomly gave participants a low or high IQ score and asked them to disclose their score and photo to others. Shame was associated with the tendency to conceal and pride with the tendency to expose ($p<0.001$). Studies 2-4 used Study 1's paradigm. Study 2 (N=480) examined if people conceal and expose less when those who may learn about the event are less relevant to their status. We manipulated high and low relevance and found that low relevance modified concealment but not exposure ($p<0.001$). Study 3 (N=360) examined whether concealment and exposure occur even when information about the event that may change one's status (i.e., IQ score) remains undisclosed. We asked participants to exhibit only themselves to others (i.e., their photo without the score). Even when scores remained undisclosed, shame and pride induced tendencies to concealment and exposure ($p<0.001$) but only in the specific domain they were elicited. Study 4 (N=160) examined how concealment and exposure of the event affect the experience of shame (i.e., feelings). We led participants to believe their score was deleted or exposed to others. Participants felt shame even when their score was deleted, and exposure further magnified shame ($p<0.001$). The (in)congruency of the results with existing models of shame and pride is discussed, followed by initial suggestions for a new integrated model.

13:00-13:20	Pleasant emotional feelings follow one of the most basic psychophysical laws (Weber's law) as most sensations do *Rotem Berkovich and Nachshon Meiran* Ben Gurion University of the Negev

Emotion episodes may include a conscious aspect of the emotion, namely being aware of our own emotional experience. Despite explosion in research over previous years, it remains unclear how emotions reach awareness and become feelings. Already in 1884, William James argued that emotional feelings resemble ordinary sensations in this respect. Here, using a novel model-based ratio scale of emotion intensity, we provide one of the strongest pieces of evidence supporting James' perceptual theory by showing that emotion awareness obeys one of the most fundamental laws of perception, Weber's law. According to this law, stimulus encoding accuracy decreases with intensity. In this work, we asked participants to provide binary pleasant-versus-unpleasant reports of their experience when watching normed emotion-eliciting pictures (NAPS; Marchewka et al., 2014). The results validate our model's measure of emotion intensity by showing its monotonous relation to picture norms. Most importantly, they show, for the first time, that in humans, pleasant emotion experiences follow Weber's classical psychophysical law—indicating decreased encoding precision with increasing pleasantness. This result supports James' theory, suggesting that (pleasant) emotions reach awareness just as ordinary sensations do.

13:20-13:40	Attending faces during real-time stressful social situation *Liat Bergman, Batsheva Orni, Nitzan Guy, Yoni Pertzov, and Salomon Israel* Hebrew University of Jerusalem

Mutual gaze plays a part in communication between two people or more, as emotion expressed around the eye region helps inferring the mental state of the other person. However, a direct and steady eye contact might be perceived as aversive, as it elevates skin conductance and overall brain activity. In this study we examined eye-gaze patterns during real-time social interactions while participants performed a standardized public speaking task known to elevate stress through social threat. This task was performed in front of two unfriendly committee members, both maintaining eye contact with the participants. Participants' eye-gaze patterns were captured

during the task via eye-tracking glasses, allowing us to characterize dynamic patterns of eye-gaze during social interactions. In a sample of healthy university students, we tested the degree to which individual differences in endocrine response (i.e. cortisol levels) correlate with the amount of time participants gaze at faces during the public speaking task. We hypothesize that participant with higher levels of stress will gaze less towards the committee members faces, as to avoid eye contact.

13:40-13:50 break

13:50-14:10	Neural correlates of inclusion motivation in loneliness *Alisa Kanterman, Michael Nevat, and Simone Shamay-Tsoory* University of Haifa

Humans have a fundamental need to belong. The term coined here, "inclusion motivation", represents the drive to be included in social interactions. In a set of experiments, we sought to characterize the behavioral and neural mechanisms underlying inclusion motivation. In the first experiment, we developed the Active Inclusion Task (AIT), which is based on the Cyberball paradigm for social exclusion. The AIT allows participants to actively influence their inclusion during conditions of fair-play and exclusion, by waving a virtual hand controlled by keyboard presses. We found that loneliness, a subjective feeling that one's social ties are deficient either quantitatively or qualitatively, was associated with higher inclusion motivation only when low effort (a few keypresses, as opposed to many) was required. In the second experiment, we scanned 54 participants using functional magnetic resonance imaging, and found that while for low loneliness, insula activation was increased during exclusion compared to fair-play, high loneliness showed blunted discrimination between the two conditions. In addition, we found a negative correlation between insula activation and the number of keypresses. Finally, psychophysiological interaction analysis revealed, that while for low loneliness the insula was the main neural node associated with inclusion motivation, for high loneliness there was additional recruitment of brain regions related to self-monitoring including the middle temporal gyrus and precuneus. We conclude that inclusion motivation may be a prominent facet of motivation, with the potential to explain social behavior in health and pathology.

14:10-14:30	Why and when avoidance-avoidance conflicts and approach-approach conflicts differ? *Maya Enisman, Ariel Levy, and Tali Kleiman* Hebrew University of Jerusalem

Would you rather meet up with a friend or watch a movie? Wash the dishes or empty the trash? These examples correspond to different conflict types in Kurt Lewin's (1931) seminal theory of motivational conflicts. The first example is an approach-approach conflict, a conflict between two positive options. The second example is an avoidance-avoidance conflict, a conflict between two negative options. According to the theory, supported by abundant empirical findings, people take longer to resolve avoidance-avoidance conflicts compared with approach-approach conflicts, and experience them as more difficult to resolve. In seven experimental studies (N = 1,255), we revisit the theory by asking two questions: Why and when avoidance-avoidance and approach-approach conflicts differ? To answer the "why" question, we directly examine the theory's mechanism using a mouse-tracking technique (i.e., tracking people's hand movements as they resolve conflicts presented on the computer screen, Studies 1–2). We show that avoidance-avoidance conflicts (compared to approach-approach ones) elicit more oscillations and returns to the middle-point

between alternatives, and that these mechanistic measures uniquely account for the experienced difficulty. To answer the "when" question, we manipulated affective context (Studies 3–7). We show across design, stimuli, and for both experienced difficulty and decision time, that the difference in relative difficulty between the conflict types is context-dependent: Avoidance-avoidance conflicts are only more difficult than approach-approach ones within positive or neutral affective contexts, but not within a negative affective context. Taken together, our results test the predictions made by Lewin's classic theory and describe its boundary conditions.

14:30-14:50	A new computational model of mood finds that the earliest events influence mood the most *Hanna Keren* Bar Ilan University

Immense efforts are being invested in trying to understand mood disorders such as depression and in developing more effective clinical treatments. These aims face the challenges of huge individual variability and non-linearity in individual mood responses, as well as the lack of quantitative and robust mood measures. In this talk I will present how we used computational modelling, combined with an engineering based closed-loop Mood-Machine-Interface we developed, to overcome these challenges. Using these methods, we were able to develop a new computational model of mood, the Primacy Mood Model: This model proved that our mood is influenced the most by the earliest events, rather than the recent events as previously assumed. We replicated this computational discovery across different types of reward environments, in adolescents and adults, healthy and depressed, and across different experimental conditions. I will then show how the closed-loop methodology was crucial for validating this result, and moreover, how it enables us to control and modify mood. Thus, this methodology can uniquely allow to answer also many other key questions about the dynamics and mechanisms of mood. Overall, the computational finding and engineering methodology have implications both for understanding the timing of events that maximally influence mood, and for the development of individualized mood interventions.

14:50-15:10 Coffee break

15:10-16:30 Session 8 (3 parallel sessions in rooms A, B and C)

Room A: Symposium 8: How can Experimental Psychologists Contribute to the Understanding of Real-World Social Issues? (organized by Noam Markovitch)

15:10-15:30	Confirming social stereotypes is intrinsically rewarding *Niv Reggev [1] and Jason Mitchell [2]* [1] Ben Gurion University of the Negev; [2] Harvard University

Stereotypes about various social groups permeate our everyday life and shape many of our social interactions. People prefer to affiliate with individuals adhering to contemporary views of prescriptive and proscriptive stereotypical norms, leading to biased attention, hiring patterns, and even voting, to name a few consequential outcomes. Extant efforts to experimentally induce change in stereotypical perceptions and to attenuate their impact on society have mostly failed to create long-lasting change in how individuals think of different social groups. In this talk, I will suggest that to understand the persistence of stereotypes, we can adopt a social cognitive neuroscientific approach focusing on the mechanisms operating within a person when they

process stereotype-relevant information. Specifically, I will show that individuals experience confirmation of their stereotype-based predictions about other people as a form of intrinsic reward, akin to winning money or savoring delicious food. In a set of pre-registered studies (total N > 1000), participants consistently chose to interact with stereotype-confirming targets, even when making such choices entailed forgoing (modestly) higher monetary amounts. To provide further support for the subjective value of stereotype-confirmation, two separate groups of participants underwent fMRI scanning (total N=58) while rating stereotype-confirming or stereotype-violating targets. Reward-related regions increased their activity to expectation-confirming relative to expectation-violating information. Together, these findings indicate that participants subjectively value the successful prediction of social targets. This subjective value may underlie the motivation to confirm our expectations while interacting with—and interpreting information about—individuals from other social groups.

15:30-15:50	What can experimental psychology offer to society? A critical reflection on “wise interventions” and a call for slow science *Nurit Shnabel* Tel Aviv University

The requirement for researchers and institutions to create a justification for continued funding, as well as the popularity of TED talks and similar forums, have led experimental psychologists to provide "quick fixes" to complex social problems. These range from attempts to close the racial gap in higher education achievement, to preventing PTSD among combatants or promoting the Middle East peace process. Advocates for such “quick fixes” label them as “wise interventions,” arguing that – through the precise targeting of a well-identified psychological process – brief and inexpensive strategies (such as short self-affirming writing exercises) can have far reaching consequences. In recent years, however, such interventions have been heavily criticized for various reasons, ranging from failure to replicate, wrong conceptualization of the problem and/or solution, to questionable research practices or even fraud. In my talk I will advocate for “slow science.” I will explain why psychology, as a young empirical science (of less than 150 years), should be viewed primarily as a basic rather than applicable science. Based on my own research on reconciliation between individuals and groups, I will argue that experimental psychology can provide valuable insights and conceptual frameworks for interpreting and understanding social phenomena, but not hands-on recipes for fixing social problems. As such, its contribution can be likened to that of theories in neighboring disciplines, such as game theory. I will also discuss the importance of experimental psychology in giving voice to critical social issues and promoting social discussion about them, which is meaningful in its own merit.

15:50-16:10	The impact of affect on the credibility of sexual assault testimonies *Diane Shachar, Roni Porat, Gali Perry, and Shir Atzil* The Hebrew University of Jerusalem

For many victims of sexual assault, seeking justice is a difficult ordeal often experienced as secondary traumatization. This is partly because they face disbelief and suspicion from law-enforcement, the media and society. The individual differences in coping mechanisms of assault victims, can lead to differential expression of affect during legal procedures. For example, victims may appear agitated or stoic, some explicitly express their pain and some hide it. Some victims may even express positive affect while describing traumatising events. This research maps how variation in affective expression during a sexual assault testimony can affect the credibility of the victim. We hypothesized that the expression of positive affect and elevated arousal will impair the credibility of the testimony, given an incongruency with societal expectations. To test this hypothesis, we conducted a pre-registered online study with 596 participants, who were randomly assigned to one of four conditions, where we manipulated the expression of valence and arousal of a single sexual assault testimony performed by an actress. We show that affective display has a

causal effect on the credibility of the testimony. Specifically, when it was enacted with positive affect and elevated arousal, participants rated it as less credible and experienced less empathy towards the victim, compared to testimonies with negative valence and low arousal. This shows that victims' affective expressions can damage their credibility, regardless of the testimony content. This study provides a novel empirical paradigm to test the credibility of victims and indicates a causal role of affect in credibility judgement.

16:10-16:30	Yes, but then what? A call for experimental psychologists to study sexual interactions *Noam Markovitch, Anat Perry, and Tali Kleiman* The Hebrew University of Jerusalem

Until recently, sexual interactions were viewed as either consensual and wanted or nonconsensual and unwanted, with consent and wantedness conflated. However, both research and the public discussion on the topic (following #MeToo) has shown that consenting to and wanting sexual interactions are distinct processes such that sexual interactions can be consensual but not mutually desired. Scientific research on unwanted consensual sexual interactions is limited, and experimental research on basic psychological processes operating within sexual interactions is scarce. We argue that the understanding of behavior, cognitions, and emotions within sexual interactions can be advanced by applying highly relevant knowledge and methods gained by experimental psychologists. We review the literature on the processes of arousal, internal conflicts, and understanding others, broadly defined, and apply it to the context of sexual interactions. Specifically, we argue that findings regarding effects of physiological and affective arousal may inform our understanding of sexual arousal effects; that the literature on decision-making may inform our understanding of deciding to consent to an unwanted sexual act; that the literature on self-control is relevant once one of the partners is conflicted; and that trying to interpret the nonverbal behavior of the partner may be prone to biases and situational factors. Studying these processes is a first step toward understanding the unfolding of unwanted consensual sexual interactions. Moreover, it is a critical step toward changing societal norms and conventions, through awareness and education grounded in empirical research, thus promoting equal, healthy, and positive sexual interactions.

Room B: Symposium 9: Current advances in creativity research (Organizer: Yoed Kennet)

15:10-15:30	Self-monitoring and risk-taking in the creative process: is there a gender gap? *Tair Tager-Shafrir and Michal Lavidor* Bar-Ilan University

Creativity is a key component in innovation, which in turn, contribute to social and economic growth. However, while women and men have equal performance on standard creativity tests, women have fewer opportunities and more barriers on their way to fulfill creative and entrepreneurial accomplishments. Here we examined two factors found to be related to gender, self monitoring and risk taking, testing whether manipulating these factors will interact with gender in creativity tasks. Standard verbal creativity tasks were employed as well as a novel non-verbal task. In the self monitoring study, participants took a test to measure creativity under conditions in which we emphasized that the creative products would be judged and given a score. The results indicated a significant interaction of gender and the conditions of judgment, with men being positively influenced by the knowledge that their creative products were subject to judgment. In the risk-taking study, we encouraged women and men to take risks and then tested their performance on creativity tests. We found that enhancing risk-taking had a positive effect on

women's performance and a negative one on men's performance. It seems that in some cases gender differences in creativity can be easily produced, by changing slightly the test instructions. The relationship between gender, creativity, self-monitoring and risk-taking as expressed in different creativity tests will be discussed.

15:30-15:50	Computational trade-offs in creative search Computational trade-offs in creative search *Gutglick Roy [1], Amir Dan [1], Schurr Roey [2], Amir Ofra [3], and Hart Yuval [1]* [1] Hebrew University of Jerusalem; [2] Harvard University Cambridge; [3] Technion – Israel Institute of Technology

Creative search is a complex and multi-faceted phenomenon. Its complexity is evident in the different ways different individuals search. Here we hypothesize that these individual differences stem from differences in balancing competing computational tasks that trade-off with each other. To that aim, we analyzed players' behavior in the "Creative Foraging Game" (CFG), where players create shapes and save the ones they consider interesting and beautiful. The game extracts many different behavioral measures on players' search trajectories (e.g., originality, search efficiency, and self-avoidance), thus providing a finer-grained description of the entire search process. Using Pareto analysis on players' data, we find that players' searches are combinations of different competing search strategies with trade-offs between them. For example, one computational trade-off balances between searching for highly original shapes vs. collecting many shapes. This trade-off is associated with the tendency of players to avoid shapes they have already created (termed self avoidance); We found that players with high self-avoidance show higher originality scores while players with low self avoidance create more products. Numerical simulations indicate that self-avoidance is crucial for explore-exploit behavior in the game. Furthermore, we crossed players' behavior in the creative foraging game with their performance in a strategic problem task. We found that self-avoidance is associated with improved strategic problem solving. Taken together, our findings unpack the complex phenomenon of creative search into a set of computational tasks that trade-off with each other. More broadly, they suggest a new path to study cognitive search processes.

15:50-16:10	The role of memory in creative ideation *Yoed N. Kenett* Technion – Israel Institute of Technology

Creativity reflects the remarkable human capacity to produce novel and effective ideas. Major advancements in the past two decades in creativity research have been made via focusing on specific cognitive capacities and how they relate to creativity, such as memory. Recent work suggests that creative ideas do not just emerge randomly out of nowhere but typically result from goal-directed memory processes based on semantic, conceptual, and episodic, contextual, memory. Specifically, cognitive and neuroscientific research demonstrated that creativity is supported by controlled retrieval, involves semantic and episodic memory, builds on processes used in memory construction, and recruits different memory systems at different stages in the creative process. Here, I will present a new framework describing the role of memory (focusing on semantic and episodic) in creative ideation. Specifically, this framework describes how creative ideas arise across four (potentially sequential) stages involving memory search, construction of candidate ideas, and evaluation of their novelty and effectiveness. I will discuss evidence supporting the contribution of semantic and episodic memory to each of these stages of creative ideation. The resulting framework overcomes shortcomings of previous theories by showing how creative ideation can be conceived as a multi-stage process relying on the controlled, dynamic involvement of different memory systems.

16:10-16:30	Creative cognition: a neuro-cultural perspective *Tal Ivancovsky [1] and Simone Shamay-Tsoory [2]* [1] UAB Barcelona; [2] University of Haifa

The two-fold model of creativity assumes a cyclic motion between the generation and the evaluation of ideas, as common or deviant ideas are rejected, and novel and appropriate are elaborated. In a set of experiments we examined whether cross?cultural differences in creativity are explained by enhanced activity in brain regions that mediate inhibitory control. Since uniqueness is discouraged in East?Asian cultures, we assumed that more ideas are inhibited in these cultures, resulting in diminished creative outcomes. These cultural influences may affect the neural networks that mediate creativity. We, therefore, predicted that the left inferior gyrus (L?IFG), a region associated with the evaluation phase, would be “hyperactive” among individuals from East-Asian cultures compared to Western ones. Israeli and South Korean participants currently living in Israel were scanned while performing the AUT. As hypothesized, South Koreans showed enhanced activation of the L?IFG compared to Israelis. This enhanced activation was associated with lower originality scores. The results suggest that cross-cultural differences in creativity might be explained by variations in inhibitory control. We further suggest an extended two-fold model and emphasize the importance of socialiation in regulating the evaluation phase. The model offers explanations as to how different environmental processes, including enculturation, affect creativity.

Room C: Symposium 10: Social-Emotional Cognition over the Lifespan (Organizer: Sharon Naparstek Zamler)

15:10-15:30	Effects of kibbutz communal upbringing in adulthood: trait emotional intelligence and attachment patterns *Ronen Sidi and Daniela Aisenberg-Shafran* Ruppin Academic Center

Emotional difficulties characterize kibbutz children raised with communal sleeping arrangements (CSA), including insecure attachment and lowered ability for intimacy. Research examining these children's emotional characteristics in their adulthood is lacking. Trait emotional intelligence (trait EI) is a newer concept for emotional traits that capture a person's typical way of processing emotional information and reacting to it. The present study examined if difficulties in intimacy and trait EI characterize adults who had been raised in CSA kibbutzim (Hebrew plural of kibbutz). Participants comprised 1185 adults, aged 30–79, of whom 735 were raised in CSA kibbutzim, and the rest were not raised in a Kibbutz. Participants completed three self-report questionnaires: Schutte's-Self-Report Emotional-Intelligence-Test (SSEIT) to measure trait EI; Revised-Adult-Attachment-Scale to measure adult attachment; and Rosenberg-Self-Esteem-Questionnaire to measure self-esteem. Results showed that most of kibbutz CSA participants revealed levels of intimacy and trait EI comparable to non-kibbutz participants. However, a significant difference was found among adults with low self-esteem and poor attachment quality: trait EI and intimacy were significantly lower for the CSA kibbutz group than for the non-kibbutz group. Furthermore, CSA kibbutz participants reported poorer non-verbal communication skills than non-kibbutz participants. We suggest that a minority of the CSA kibbutz children were less resilient to the kibbutz ecology. These children might have been more vulnerable to the effects of limited social options, decreased parental support, and the kibbutz education's ideological demands. For these children, the effects of communal upbringing on intimacy and attachment appear to be long-lasting, extending throughout their adulthood.

15:30-15:50	Infants' emotion recognition during the covid-19 pandemic: do masks differentially hinder emotion recognition? *Liat Israeli-Ran and Florina Uzefovsky* Ben-Gurion University of the Negev

The widespread use of facemasks might hinder infants' ability to recognize emotions. We tested this question using the cross-modal emotion recognition task (based on Walker-Andrews, 1986). Infants view two facial expressions side-by-side, accompanied by a vocal expression matching one of the shown emotions. They watched twice, one of them with a facemask occludes the lower part of the face. We hypothesize that looking time to the congruent expression will decrease in the facemask condition, and, in the facemask condition, emotional recognition of sadness will be affected more than happiness. Data was collected online with a sample of 127 infants (age: M=18.98 ±2.63 months, 49 % female). To test our hypothesis, we conducted a mixed-effects model with proportion looking-time to the congruent as the dependent variable and condition (mask \ no mask) and emotion (happy\ sad) The widespread use of facemasks might hinder infants' ability to recognize emotions. We tested this question using the cross-modal emotion recognition task (based on Walker-Andrews, 1986). Infants view two facial expressions side-by-side, accompanied by a vocal expression matching one of the shown emotions. They watched twice, one of them with a facemask occludes the lower part of the face. We hypothesize that looking time to the congruent expression will decrease in the facemask condition, and, in the facemask condition, emotional recognition of sadness will be affected more than happiness. Data was collected online with a sample of 127 infants (age: M=18.98 ±2.63 months, 49 % female). To test our hypothesis, we conducted a mixed-effects model with proportion looking-time to the congruent as the dependent variable and condition (mask \ no mask) and emotion (happy\ sad) as predictors. We found a main effect of congruency (t(103)= 5.95,p < .000) and a significant effect of condition (t (105) =-2.95,p = .003). A follow-up analysis revealed that while the proportion in the no-mask condition was higher than 0.5, the proportion in the mask condition was not. The main effect of emotion was significant (t (128)= 2.79,p = .005), but not the interaction with condition. The proportion to the happy emotion was larger than 0.5, but not for the sad. This study aimed to examine the influence of facemask-wearing on emotion recognition in infants. We found that occlusion of the lower part of the face reduced their ability to recognize emotions across modalities. We found the main effect of congruency (t(103)= 5.95,p < .000) and a significant effect of condition (t (105) =-2.95,p = .003). A follow-up analysis revealed that while the proportion in the no-mask condition was higher than 0.5, the proportion in the mask condition was not. The main effect of emotion was significant (t (128)= 2.79,p = .005), but not the interaction with condition. The proportion to the happy emotion was larger than 0.5, but not for the sad. This study aimed to examine the influence of facemask-wearing on emotion recognition in infants. We found that occlusion of the lower part of the face reduced their ability to recognize emotions across modalities.

15:50-16:10	Interpretation flexibility as a resilience factor for emotional reactions to social situations in children and adolescence *Reuma Gadassi Polack [1,2], Michael V. Bronstein [3], Audrey Edelman [2], Hedy Kober [2], Jutta Joormann [2], and Jonas Everaert [4]* [1] Tel-Aviv Yaffo Academic College; [2] Yale University; [3] University of Minnesota, Twin Cities; [4] Tilburg University

Emergent literature on interpretation biases in adults has shown that difficulties in revising interpretation biases are positively associated with psychopathology symptoms, and suggest that it is more important to mental health than initial interpretation biases. It is unknown whether interpretation bias inflexibility plays a role in psychopathology before adulthood. Moreover, though theories posit that flexibility in the interpretation of social situations may buffer against social stress, no study has examined this. The current study examines interpretation bias and

inflexibility in relation to depression and social anxiety in adolescence (cross-sectionally), and its moderation of the association between social stressors and depressive symptoms (longitudinally) in adolescents. Participants (N=176; Age 9-18 years old) completed a novel cognitive task that assesses bias and inflexibility of unfolding social situations. Then, they completed a 28-day daily diary in which they reported social interactions with family members and friends and depressive symptoms. Results show that only girls (vs. boys) showed a decrease in positive interpretation bias and increase in negative interpretation bias with age. Moreover, more negative interpretation bias and less positive interpretation bias were associated with higher social anxiety and depression symptoms. Importantly, interpretation inflexibility of positive (but not negative) social situations was associated with higher levels of social anxiety and depressive symptoms. Finally, interpretation inflexibility moderated the associations between social experiences and depressive symptoms in daily life. These results suggest that interpretation biases and inflexibility may act as both risk and protective factor for adolescent anxiety and depression.

16:10-16:30	Aging affects the interpretation of ambiguous social situations *Sharon Naparstek [1], Aidel Wittler [1], Jake Kuperstok [1], Reuma Gadassi Polack [2,3], Michael V. Bronstein [4], and Jonas Everaert [5]* [1] Bar-Ilan University; [2] Tel-Aviv Yaffo Academic College; [3] Yale University; [4] University of Minnesota; [5] Tilburg University

Interpretation bias describes the tendency to interpret ambiguous information in a consistent manner. A negative, rather than positive bias, is associated with poorer mental health. Interpretation inflexibility is a reduced ability to switch between interpretations and is also associated with poorer mental health. Both abilities are built upon other, lower-level, cognitive abilities such as attention and executive functions (EF). Thus, changes in these functions due to age-related deterioration, might affect both. Previous work described a positive interpretation bias in older adults, yet the effect of aging over interpretation flexibility was not studied before. Here, we examine the moderating effect of age and EF over the interpretation bias and inflexibility. In this ongoing research (expected N = 250), 30 healthy adults participated in an online study: 15 young (mean age 32.6) and 15 old (mean age 70.7). Interpretation biases and flexibility were examined by employing the emotional Bias Against Disconfirmatory Evidence (BADE) task. EF were examined via the Behavior Rating Inventory of Executive Function (BRIEF) self-report questionnaire. Compared to young adults, older adults reported lower EF in all domains. In the BADE task, older adults (vs. younger) showed higher positive interpretation bias and higher interpretation inflexibility for positive, but not negative, situations. These findings provide further evidence for age differences in processing ambiguous information, and on the role of EF in adaptive interpretations. As interpretation bias and inflexibility are associated with poorer mental health, unraveling their moderators might serve as a basis for the development of future age-specific intervention programs.