UNSW Workshop on Expectation, Perception & Cognition

School of Psychology
UNSW Sydney

October 1 & 2, 2020

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General Information

Welcome to the **Expectation, Perception & Cognition Virtual Workshop**.

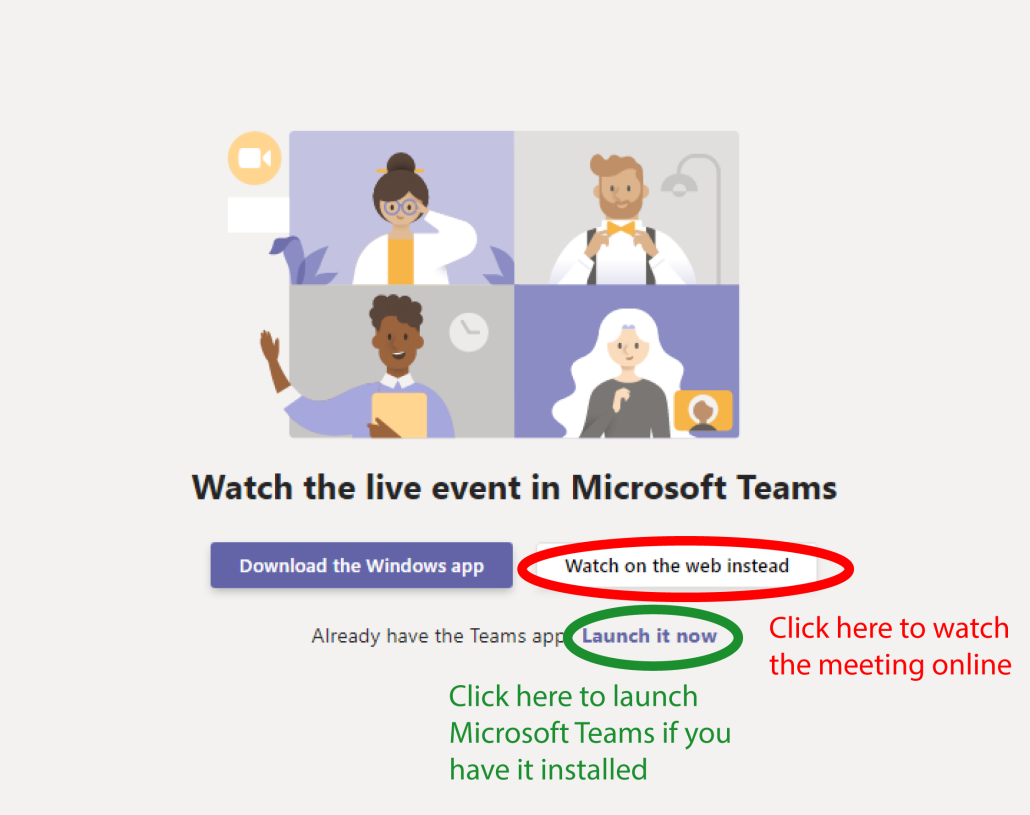
This virtual workshop is intended to provide a venue for researchers from around the world to share their recent findings on how expectations can alter our perception, and can modulate neural and psychological mechanisms of information processing.

The workshop will be run across two days from 1–2 October, 2020. The *Keynote Session* will be on October 1, from 4:45pm–8:00pm AEST (7:45am–11:00am BST, 8:45am–12:00pm CEST), and the *Poster Session* will be on October 2, from 5:00pm–7:00pm AEST (8:00am–10:00am BST, 9:00am–11:00am CEST).

Keynote Session

The Keynote Session will be hosted on Microsoft Teams. You will be able to access the keynote session by clicking this link, or by copying and pasting the following URL into your browser's address bar: https://bit.ly/2RTHKtv. The event will be open from 4:30pm AEST (7:30am BST/8:30am CEST) on October 1.

If you have Microsoft Teams installed on your computer, you should be prompted to open the Microsoft Teams program, and then automatically be granted entry to the virtual event room. If you *do not* have Microsoft Teams installed on your computer, you will see an option to "*Watch on the web instead*", which will allow you to access the virtual event room through your internet browser.

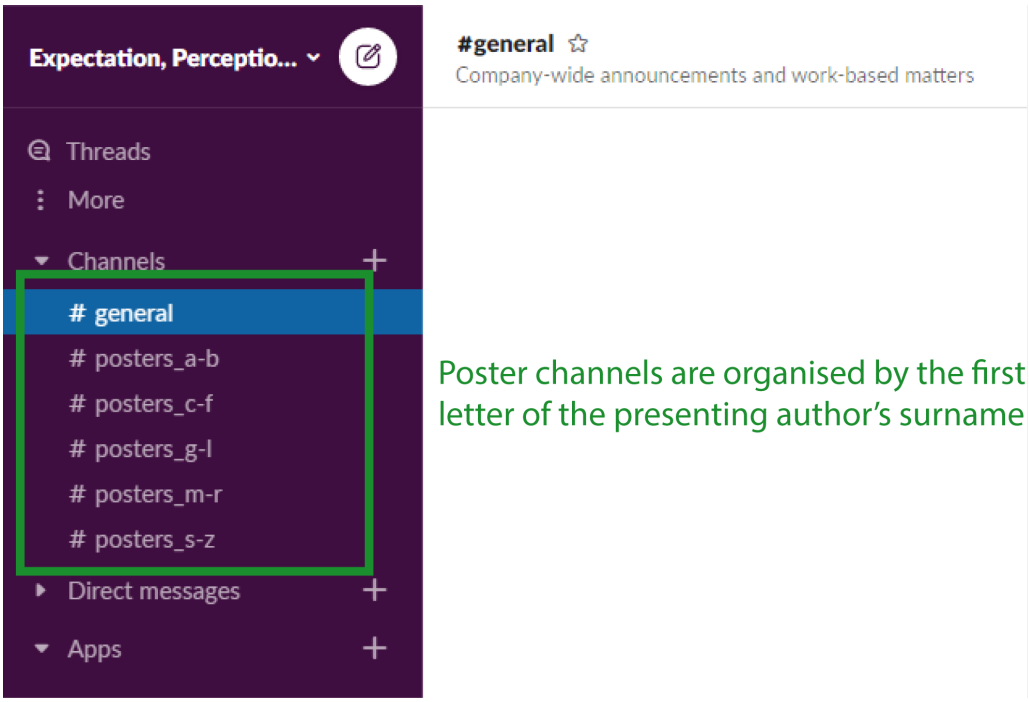


Poster Session

The Poster Session will be hosted on Slack. On the day of the Poster Session, you can access the Virtual Workshop's workspace on Slack by clicking this link, or by copying and pasting the following URL into your browser's address bar: https://expectationpe-cqc4857.slack.com.

In the week leading up to the Workshop, you will receive an email invite to join the Virtual Workshop's workspace. This invite will be sent to the email that you used to register for the event. If you did not receive an invite (be sure to check your junk folder) please contact one of the organisers. If you are already registered with Slack, with a different email address than that used for workshop registration, you can contact one of the organisers to request an invitation at that email address.

Once you have signed in to the workspace, you will see *Channels* for each of the posters on the left hand side. These channels will be organised according to the first letter of the presenting author's surname.



Within each channel, there will be a thread for each poster. This thread will contain the title of the poster, a pdf of the poster, a link to the author's brief explanatory video, and a link to a Blackboard Collaborate page where the presenting author will be available for discussion*. Attendees will be able to post written questions and comments regarding the poster in its thread. Poster threads will be made available on September 30, 2020 so that attendees can view the posters prior to the designated poster session if they desire.

Code of Conduct

By registering for and attending the virtual workshop, participants agree to:

1. Treat fellow workshop participants, staff, and organisers with respect, civility, fairness, without bias based on sex, gender, gender identity or expression, sexual orientation, race, ethnicity, colour, religion, nationality or national origin, citizenship status, disability

*Authors are strongly encouraged to make themselves available for discussion at their Blackboard Collaborate link during the Poster Session.

status, veteran status, marital or partnership status, age, genetic information, or any other criteria prohibited under applicable federal, state or local law.

Similarly, workshop participants agree to refrain from:

1. Harassment and discrimination based on sex, gender, gender identity or expression, sexual orientation, race, ethnicity, colour, religion, nationality or national origin, citizenship status, disability status, veteran status, marital or partnership status, age, genetic information, or any other criteria prohibited under applicable federal, state or local law.
2. Sexual harassment, sexual misconduct, unwanted verbal abuse with others.
3. Disrespectful, uncivil and/or unprofessional interpersonal behaviour that interferes with the working and learning environment.

The organisers aim to maintain a conference environment in accordance with the principles and expectations outlined in this Code of Conduct. Breaches or violations should be reported via email to the workshop organisers.

Keynote Talks

Keynote Session: October 1

	Australian Eastern Standard Time (AEST)	*British Summer Time (BST)*	*Central European Summer Time (CEST)*
Introduction	4:45pm–5:00pm	7:45am–8:00am	8:45am–9:00am
Prof Thomas Whitford	5:00pm–5:30pm	8:00am–8:30am	9:00am-9:30am
Prof Paul Dux	5:30pm–6:00pm	8:30am–9:00am	9:30am–10:00am
Prof Heleen Slagter	6:00pm–6:30pm	9:00am–9:30am	10:00am–10:30am
Prof Jan Theeuwes	6:30pm–7:00pm	9:30am–10:00am	10:30am–11:00am
Dr Clare Press	7:00pm–7:30pm	10:00am–10:30am	11:00am–11:30am
Panel discussion and Q&A	7:30pm–8:00pm	10:30am–11:00am	11:30am-12:00pm

Using expectations to quantify inner speech and explore auditory-verbal hallucinations

Prof Thomas Whitford (UNSW Sydney)

Professor Whitford leads a research laboratory at the University of New South Wales. His research uses EEG to explore the phenomenon of sensory attenuation, which is that self-generated stimuli tend to be perceived as less intense, and evoke a smaller neurophysiological response, than identical externally-generated stimuli. Sensory attenuation has important implications for understanding psychotic disorders such as schizophrenia, and may relatedly provide a framework for quantifying the physical and temporal properties of a person's inner speech.

On the causal neural substrates of incidental statistical learning

Prof Paul Dux (University of Queensland)

Professor Dux leads a group that uses cutting edge techniques to study the cognitive and neural underpinnings of human information-processing capacity limitations in health and disease. Of specific interest are the mechanisms of attention and executive function and the efficacy of cognitive training and brain stimulation.

Neural mechanisms underlying expectation-dependent inhibition of distracting information

Prof Heleen Slagter (Vrije Universiteit, Amsterdam)

Professor Slagter heads the Cognition & Plasticity lab, with research utilising EEG and fMRI to investigate the neural basis of core cognitive functions and the plasticity of these functions. She studies the mechanisms that allow us to select, suppress, and become aware of information in the environment and the role of past and new experiences in shaping these mechanisms.

What to expect when you are not expecting it: How implicit regularities drive attentional selection

Prof Jan Theeuwes (Vrije Universiteit, Amsterdam)

Professor Theeuwes is the Head of Department for Experimental and Applied Psychology at the VU. He uses a variety of methods to examine how external stimuli and past learning history influence perception and cognition. His current research program aims to investigate how we learn to extract statistical regularities from the environment and how this affects attentional selection.

The influence of action expectations on perception

Dr Clare Press (Birkbeck, University of London)

Dr Press leads the Action Lab at Birkbeck. Her research examines questions relating to action and perception, the link between these domains and the role of expectations in influencing perception. She investigates how we generate and update predictions regarding the consequences of our movements and how this influences ongoing action selection.

Poster Abstracts

Poster Session: October 2

5:00–7:00 pm (AEST)
8:00–10:00 am (BST)
9:00–11:00 am (CEST)

Slack Channel: #posters_a-b

Greater attentional sign-tracking predicts lower resilient coping and increased compulsive behaviours during COVID-19. LUCY ALBERTELLA[1], CHANG LIU[1], LEONARDO FONTENELLE[1], MURAT YUCEL[1], KRISTIAN ROTARU[1,2]. *[1]BrainPark, Monash University, [2]Monash Business School* — Background: The COVID-19 pandemic has resulted in high levels of psychological distress with many people engaging in compulsive behaviours to cope. Cognitive risk factors, such as reward-related attentional capture, may increase the likelihood that such behaviours become problematic. The current study examines how reward-related attentional capture is associated with coping and compulsive behaviours during the COVID-19 pandemic. Methods: Two-hundred and forty-two students completed the online survey and tasks during April to June 2020. Participants were asked about addictive and obsessive-compulsive behaviours prior to and during COVID-19 restrictions, as well as completed measures of resilient coping and reward-related attentional capture. Results: Greater reward-related attentional capture was associated with lower resilient coping as well as increases in obsessive-compulsive behaviours, intake of high sugar foods, and excessive shopping. Discussion: Addictive and compulsive behaviours generally increased during the COVID-19 pandemic. Greater reward-related attentional capture was associated with several of these increases, as well as lower resilient coping. These findings have implications for understanding the mechanisms that drive risk for addictive and compulsive psychopathology during the current pandemic. Email: Lucy Albertella, lucy.albertella@monash.edu

Individual differences in the tendency to see the expected. NORA ANDERMANE[1], JENNY M. BOSTEN[2], ANIL K. SETH[3], JAMIE WARD[2]. *[1]Department of Psychology, University of York; [2]School of Psychology, University of Sussex; [3]Sackler Centre for Consciousness Science, University of Sussex* — Prior knowledge has been shown to facilitate the incorporation of visual stimuli into awareness. We adopted an individual differences approach to explore whether a tendency to ”see the expected”, is general or method-specific. We administered a binocular rivalry task and manipulated selective attention, as well as induced expectations via predictive context, self-generated imagery, expectancy cues, and perceptual priming. Most prior manipulations led to a facilitated awareness of the biased percept in binocular rivalry, whereas strong signal primes led to a suppressed awareness, i.e., adaptation. Correlations and factor analysis revealed that the facilitatory effect of priors on visual awareness is closely related to attentional control. We also investigated whether expectation-based biases predict perceptual abilities. Adaptation to strong primes predicted improved naturalistic change detection and the facilitatory effect of weak primes predicted the experience of perceptual anomalies. Taken together, our results indicate that the facilitatory effect of priors may be underpinned by an attentional mechanism but the tendency to ”see the expected”, is method-specific. Email: Nora Andermane, nora.andermane@york.ac.uk

Depressive symptoms and reachability perception: The role of expectations. KÉVIN BAGUE, ÉRIC LAURENT. *University Bourgogne-Franche-Comté* — When we need to reach an object, we have an expectation regarding this action possibility, that is about the fact that we can reach this object or not. According to the learned helplessness theory (Seligman, 1975), expectations concerning action are impaired in depression, because no gratification ensue from action. This study aimed to investigate the link between depressive symptoms, reachability expectation and actual motor performance. Participants had to estimate whether a target was reachable with their hand, while target's distance was varied across trials. Next, actual reachability capacities were assessed. Both measures were related to arm length and converted into a body-scaled measure called critical point (πc): $\pi c = dc/L$ (where dc is the critical distance, that is the maximal distance to reach the target, and L the arm length). Participants were allocated to either healthy or supposedly-depressive groups according to their Beck Depression Inventory-Fast Screen-France scores. Frequentist and Bayesian statistics showed that estimated πc was higher than actual (motor) πc in healthy participants (pholm < .001). In this experiment, participants had to keep their shoulder in contact with the chair, whereas we usually move our shoulder forward when we spontaneously reach an object. The latter habit could be anchored

in expectations and explain the overestimation. Estimations also differed across groups (pholm < .001). Estimated πc was lower in supposedly-depressive participants than in healthy participants. This study suggests that a) expectations of reachability could differ from actual capacities though experimental constraints could account for this effect; b) participants with depressive symptoms perceive motor action possibilities that are decreased in comparison with healthy participants. Learned helplessness could minor performance expectations in depression through the usual association of action with lack of control and lack of reward. Email: Kevin Bague, kevin.bague@edu.univ-fcomte.fr

In anticipation of pain: Expectancy-modulated suppression of corticospinal excitability, pain perception, and autonomic response. KIRSTEN BARNES, NICOLAS A. MCNAIR, JUSTIN A. HARRIS, BEN COLAGIURI. *University of Sydney* — Pain is a ubiquitous experience that encompasses perceptual, autonomic, and motor responses. Expectancy is known to amplify the perceived and autonomic components of pain, but its effects on motor responses are poorly understood. Furthermore, motor activity and perceived pain have been demonstrated to mediate autonomic activity to nociception, but the nociceptive- and expectancy-related components of this response have not been isolated. Consequently, little is known about the interrelationship between perceptual, corticospinal, and autonomic responses, and whether expectancy-induced pain follows the same underlying pathways as proposed for nociception itself. Expectancy modulation of corticospinal excitability and perceived pain is particularly important given the potential for corticospinal excitability to influence pain-related behaviour. Using TMS motor-evoked potentials, we demonstrated that expecting pain suppressed corticospinal excitability in addition to heightened perceptual and autonomic responses, as is the case with genuine noxious stimulation. Multilevel modelling revealed that perceived pain mediated the effect of both noxious stimulation and expectancy-modulated pain on autonomic responses, but corticospinal excitability did not. These results demonstrate that merely expecting pain suppresses corticospinal excitability as well as exacerbating the perceived and autonomic components of pain. This finding has significant practical implications for the treatment of pain, particularly in scenarios where avoidance of pain-related movement contributes to its maintenance. Email: Kirsten Barnes, kirsten.barnes@sydney.edu.au

THINK OUT LOUD! How the volume of inner speech affects neural processing. KEVIN BERRYMAN[1], THOMAS J. WHITFORD[2], MIKE E. LE PELLEY[2], BRADLEY N. JACK[1]. *[1]Research School of Psychology, Australian National University, [2]School of Psychology, UNSW Sydney* — DOES READING THESE WORDS FEEL LIKE SHOUTING IN YOUR MIND, while reading these words feel like your normal voice? Inner speech, the subjective experience of language in one's mind, shares many of the same neurophysiological qualities as overt speech, specifically, that it produces content-specific and temporally-precise corollary discharge (neural predictive signals), which can attenuate the auditory cortex. It is, however, still unknown if corollary discharge is associated with other auditory qualities of inner speech. The present study therefore investigated whether the volume of inner speech influences auditory cortex attenuation through associated corollary discharge mechanisms. Electroencephalograph (EEG) data was collected on 60 participants who produced either a loud or soft inner phoneme at the precise moment a loud or soft audible phoneme was delivered that either matched or mismatched on volume. Key results showed that while the mere production of inner speech attenuated the N1 event-related potential component—an index of auditory cortex processing—there were no differences in N1 amplitudes between inner phonemes that either matched or mismatched the audible phoneme on volume. These results indicate that corollary discharge signals of inner speech do not convey information on its volume. Importantly, these findings provide a greater understanding of the neurobiology of thought by suggesting there is a functional dissimilarity between how the brain processes volume for inner and overt speech, which may have important implications for understanding auditory-verbal hallucinations in schizophrenia. Email: Kevin Berryman, u6862371@anu.edu.au

Did I really overcome the illness? Individual differences in outcome categorization can explain variation in causal judgment biases. FERNANDO BLANCO, MARIAN M. MORENO-FERNÁNDEZ, HELENA MATUTE. *Departamento de Fundamentos y Métodos de la Psicología. Universidad de Deusto, Bilbao, Spain.* — The standard contingency learning task consists of presenting a sequence of trials in which a potential cause (e.g., taking a medicine) and an outcome (e.g., recovery from an illness) can either occur or not occur. Then, participants must provide a judgment about the perceived relationship between the cause and the outcome. Previous experiments with this task showed that causal judgments are usually biased by the probability of the outcome occurring, even when the actual contingency is null. However, unlike in these experiments, in real contexts it is not always easy to determine when an outcome has occurred (e.g., "if my symptoms reduce their intensity, but do not disappear completely, shall I conclude that I overcame the illness?"). This means that individual differences in

the way people perceive and interpret their experiences could alter the frequency with which they perceived the outcome occurring. In this research, we used random dot patterns as stimuli, so that the interpretation of the stimulus as an outcome (i.e., recovery) was ambiguous. That is, people could vary in their spontaneous tendency to treat these stimuli as outcome occurrences. We found that those participants who most often interpreted the ambiguous stimulus as an outcome occurrence developed stronger biases in their causal judgment. We conclude that individual differences in the way ambiguous stimuli are processed and categorized can lead to variations in the tendency to show biases in causal learning. Email: Fernando Blanco, fernandoblanco@deusto.es

Pre-activations of neural representations of sensory events bias perceptions towards anticipated stimulus. TESSEL BLOM, JOSEPH GABRIELE, HINZE HOGENDOORN. *University of Melbourne* — Predictions can drive neural representations of sensory events, even without sensory information from those events. Furthermore, we recently used an apparent motion paradigm to show that such predictions are able to drive representations ahead of the incoming sensory information that would ordinarily activate them. We have recently argued that this might allow the visual system to compensate for its own temporal constraints: by pre-activating neural representations of anticipated sensory events ahead of the corresponding and lagging sensory information, the visual system can potentially interact with dynamic visual environments in real time. However, this finding provided no evidence for correlates of these pre-activated representations in conscious awareness, or for any influence on subsequent behavior. Here, we use the same apparent motion paradigm that previously revealed the pre-activation of neural representations of anticipated visual events, and now investigate whether predictions influence the perception of weak sensory stimuli. We presented targets with luminance values either slightly darker or lighter than the gray background. Targets were presented embedded in apparent motion sequences with either black or white inducers, and participants reported whether the target was dark or light in a 2AFC task. We observed that the luminance of the motion sequence strongly shifted the point of subjective equality for the 2AFC task, with targets embedded in white sequences perceived as lighter and vice versa. Importantly, we varied the timing of the target presentations from 75 ms before to 75 ms after the anticipated stimulus onset, and found that the predictive effect of the inducer stimulus is largest when the sensory information collides with the pre-activation, namely when the stimulus is presented earlier than anticipated. This implies that pre-activations of anticipated sensory events can have an influence on conscious awareness. Email: Tessel Blom, tblom@student.unimelb.edu.au

Learning to expect the predictable: The role of expectation in the cognitive control of attention. ANDRE BOTES, GINA GRIMSHAW. *Victoria University of Wellington* — Some of the visual world is relevant to our goals and needs. Much more is not. Thus we are often at risk of becoming distracted by that which is not relevant at the cost of attending to what is. Emotional stimuli are very effective distractors, that can out-compete task-relevant stimuli for our attentional resources. The Dual Mechanisms of Control framework suggests that we can effectively avoid distraction through proactive control; effortful preparatory cognitive control strategies which we enact when we can expect upcoming distraction. Typically, we see proactive control when distractors occur frequently in the environment, as we build expectation of their appearance. That said, when distractors are frequent, we also become more experienced with them, and resolving the attentional conflict they create. The present two experiments investigated the extent to which expectation drives proactive control. We assess whether expectation of upcoming distractors elicits proactive control when the experience of previous distractors is held constant. Participants performed a simple perceptual task while neutral or negative task-irrelevant images occurred on 25% of trials, either predictably (every fourth trial) or randomly. Expectation of distraction did not improve participants' ability to avoid emotional distraction in either experiment. Only when distractor frequency was increased did we find a reduction in distraction. Findings indicate that expectation alone was not sufficient to drive individuals to implement proactive control. Rather, distractor frequency appears to drive proactive control through (possibly implicit and experience based) changes in top-down control settings. Email: Andre Botes, andre.botes@vuw.ac.nz

The effect of positive and negative associative value on the mismatch negativity and p3 responses. ALYCIA BUDD[1], OREN GRIFFITHS[1], BRADLEY JACK[2]. *[1]Flinders University, The Australian National University[2]* — The mismatch negativity (MMN) and P3 are components of electrophysiological brain activity occurring in response to an event, and are implicated in processes of distraction and attentional capture (Horváth, Winkler & Bendixon, 2008). While the MMN occurs pre-attentively, the P3 is believed to occur at the level of conscious awareness of a stimulus. While stimuli conditioned with a value (e.g. reward) have the ability to capture attention involuntarily (Kim & Anderson, 2019), the effects of value and valence (i.e. positive and negative value) on measurable brain activity are not yet understood. It was predicted that value-conditioned auditory distractor stimuli would elicit larger MMN responses

than neutral stimuli, and that responses to punish-conditioned tones would be greater than reward-conditioned tones. No effect of value or valence was expected for the P3. 50 undergraduate university students took part in an auditory oddball task while completing a primary visual task. Neural responses were recorded using electroencephalogram (EEG). Four deviant tones—conditioned to signal positive, negative and neutral monetary values (10c, -10c, and two 0c)—were presented intermittently among repeated standard tones. Tones varied in frequency (450Hz-1550Hz). EEG pre-processing isolated the MMN and P3 response potentials. Results revealed no effect of value or valence on the MMN; whereas value-conditioned stimuli (10c and -10c) elicited larger P3 responses than neutral (0c) stimuli. It is argued that neutral deviant and value-conditioned deviant tones elicited two different subcomponents of the P3. These findings suggest that associative value may not influence attentional-capture pre-attentively, but at the level of conscious awareness. Email: Alycia Budd, alycia.budd@flinders.edu.au

Visual mechanisms that code inter-interactant distance exhibit psychophysical adaptation. CARL BUNCE, RICHARD COOK. *Birkbeck, University of London* — The distance between interacting individuals ("inter-interactant distance") is an important cue when interpreting social interactions viewed from third-person perspectives. Smaller distances suggest an intimate interaction between people who know each other well, while larger distances suggest a professional interaction between people who may be unfamiliar. In the present study we sought to determine whether the visual mechanisms that encode this attribute exhibit psychophysical adaptation, whereby prolonged exposure to a particular visual input biases the perception of subsequently viewed stimuli. Participants (N = 20) were required to judge whether two people were standing more or less than 1 metre apart, under three conditions: having adapted to a small inter-interactant distance, having adapted to a large inter-interactant distance, and in the absence of any adaptation. Participants' judgements were used to construct psychometric functions. Consistent with previously reported adaptation effects, we find that adapting to large distances makes subsequently viewed dyads appear closer together, while adapting to smaller distances makes subsequently viewed dyads appear further apart. These findings suggest that the mechanisms we use to represent the distance between people exhibit adaptation. Adaptation is thought to reflect the ongoing calibration of the visual system to the ambient environment. One possibility is that the inter-interactant distance is represented via opponent-coding whereby distinct neural populations are tuned to small and large distances. Adaptation may modulate the relative excitability of these populations in order to optimise the representation of the interactions around us. Email: Carl Bunce, c.bunce@bbk.ac.uk

Slack Channel: #posters_c-f

Investigating attentional biases towards food and body cues in a non-clinical population. ELLIE CASPER, ELLA MOECK, NICOLE THOMAS. *Monash University* — People are more likely to attend to food and body stimuli than neutral stimuli in their environment. But there are inconsistencies in the nuances of these attentional biases toward food and bodies and how these biases relate to eating disorder symptoms, perhaps due to limitations of typical attentional bias measures (e.g., Stroop, dot-probe tasks). To address these limitations, we examined attentional biases toward food compared to bodies with a Rapid Stream Visual Presentation (RSVP) task, administered online. We varied the type of stimuli (food, bodies) and its healthiness (healthy, unhealthy). We also measured eating disorder psychopathology (eating habits, body satisfaction, and exercise habits). Participants indicated the rotation of a target image, which was preceded by distractor images (healthy body, unhealthy body, healthy food or unhealthy food) at lag 2 (two images prior to target) and lag 8 (eight images prior to target). Consistent with other RSVP tasks, participants were more accurate at lag 8 compared to lag 2. Participants were more accurate following food than body distractors, regardless of healthiness. Our findings suggest that body stimuli capture people's attention and distract them to a greater degree than food stimuli. Although attentional biases toward food and bodies did not predict eating disorder symptoms in our non-clinical sample, future research should replicate this study with a clinical sample (e.g., participants with eating disorder diagnoses). Email: Ellie Casper, elliecasper@gmail.com

Psychophysical bias to perceived positive associations in schizotypy. SANTIAGO CASTIELLO[1,2], ANDY BAKER[3], ROBIN A MURPHY[1]. *[1]University of Oxford, [2]University of Guadalajara, [3]McGill University* — The Bias Against Disconfirmatory Evidence (BADE) and the attribution of meaning where there is none (i.e., apohenia) are associated with delusions. Generally, people behave as if they are insensitive to evidence that might disconfirm a belief, a common cognitive bias but one that is seen as symptomatic of Schizophrenia. Beliefs in the associations between two events can be experimentally acquired. We adapted the rapid streamed contingency learning task (Crump, et al., 2007) to evaluate sensitivity to the four types of relevant event that define a stochastic contingency between two stimuli. Using a repeated measures design, each

participant (n=88) was trained with 9 different contingencies (Delta P ranged from -1 and +1) and completed a measure of Schizotypy (short Oxford-Liverpool Inventory of Feelings and Experiences). Schizotypy is a latent personality dimension that shares genetic, learning, and cognitive attributes with psychopathologies exhibiting delusions, such as schizophrenia. Participants performance on the task, was used to evaluate whether schizotypy was related to an enhanced bias to perceive positive associations between cues. We modelled the data with a Logistic Mixed Model and Drift Diffusion Model and found that schizoptypy scores were associated with a leftward shift of the inflection point of the psychophysical curves, which represents an overall increased in the probability of perceiving cues as positively associated. This was consistent with the hypothesis that an enhanced perception of the association between cues may support delusions. The results suggest the possibility that a cognitive bias emerges from a differential information weighting process in the millisecond interval, or an intrinsic behavioural response bias to associate events. Email: Santiago Castiello, santiago.castiello@psy.ox.ac.uk

Serial dependence across features and objects. GIZAY CEYLAN, MICHAEL H. HERZOG, DAVID PASCUCCI. *EPFL* — Visual perception is systematically biased toward stimuli seen in the recent past, a phenomenon known as serial dependence (SD). It is widely believed that SD reflects a continuity field in vision to promote visual stability over time. The main question, however, is whether SD truly affects perception per se or rather reflects a bias at higher-level processing stages. In this work, we investigated whether SD occurs even between different visual features and objects. The specificity of SD to basic visual features would support an early perceptual effect; strong SD between even different objects would instead support post-perceptual biases. In two behavioral experiments, human participants performed an orientation adjustment task in which stimuli could change in a single feature (e.g., spatial frequency) or at the level of the entire object (e.g., Gabor patch or symmetric dot patterns). To measure SD, we quantified the deviation of adjustment errors toward previous orientations during trials with either the same or different visual features/objects. We found systematic biases in adjustment errors toward previous stimuli that are independent of changes in features and objects. The effect size of this bias was exclusively modulated by the strength of the present sensory signals and was maximum for low spatial frequency stimuli. Our results demonstrate that SD is located beyond early perceptual processing since it occurs even for different features and profoundly different stimuli. We conclude that SD emerges at high-level processing stages where task-relevant representations dissociate from the physical attributes of stimuli. Email: Gizay Ceylan, gizay.ceylan@epfl.ch

The modulation of expectation violation on spatial cueing effects. LUO CHEN, MOWEI SHEN, HUI CHEN. *Department of Psychology and Behavioral Sciences, Zhejiang University, China* — Recently, compared with traditional theories that only concern on the role of attention in producing exogenous spatial cueing effects (e.g., the spotlight theory), Chen and Wyble (2018) proposed the memory encoding cost (MEC) theory which argues that exogenous spatial cueing effects were driven by two distinct mechanisms: attentional facilitation at cued location and nonspatiotopic suppression of attention resulted from memory encoding of the cue. These two mechanisms are separately reflected by the cueing effect (valid vs. invalid cue) and the cost effect (invalid vs. nocue), and thus the benefit effect (valid vs. no cue) is caused by the combination of them. Here we investigated how expectation violation evoked by rare events modulated the spatial cueing effects by using a combined oddball and spatial cueing paradigm. The critical manipulations were the probability of cue presence in Experiment 1, the probability of cue location in Experiment 2 and whether the cue was accompanied by a deviant sound in Experiment 3. Exp 1 and 2 found that low probability of cue presence and cue at low probability location didn't change the cueing effect but generated increased cost and decreased benefit effects. However, low probability of the cue with a sound enhanced the cueing effect and cost effect but didn't influence the benefit effect in comparison with high probability of the cue with no sound in Exp 3. These results indicate that expectation violation triggered by rare events can enhance memory encoding of the cue, but its influence on attentional facilitation depends on the type of expectation violation. This study inspires us that expectation violation triggered by rare events may switch the information processing from highly selective mode to a more explorative mode. Email: Luo Chen, chenl268@zju.edu.cn

Reward rapidly enhances visual perception. PHILLIP CHENG[1,2], MIKE LE PELLEY[2]. [1]*NeuRA,* [2]*UNSW Psychology* — Rewards exert a deep influence on our cognition and behavior. Here, we used a paradigm in which reward information was provided at either encoding or retrieval of a brief, masked stimulus to show that reward can also rapidly modulate the early neural processing that underlies perceptual encoding of visual information. Experiment 1 showed enhanced response accuracy when a to-be-encoded grating signaled high reward relative to low reward, but only when the grating was presented very briefly and participants reported that they were not consciously aware of it. Experiment 2 showed no difference in response accuracy when

reward information was instead provided at the stage of retrieval, ruling out an explanation of the reward-modulation effect in terms of differences in motivated retrieval. Taken together, our findings provide the first behavioral evidence for a rapid reward-modulation of visual perception, which may not require consciousness. Email: Phillip Cheng, phillip.cheng@unsw.edu.au

Statistical learning of distractor suppression is context-dependent. JASPER DE WAARD, LOUISA BOGAERTS, DIRK VAN MOORSELAAR, JAN THEEUWES. *Department of Experimental and Applied Psychology, Vrije Universiteit Amsterdam, Amsterdam; The Netherlands Institute Brain and Behavior Amsterdam (iBBA)* — Selection history represents attentional biases that have been learned implicitly from past experiences. In the selection history domain, reward learning and contextual cueing have been shown to function in a context-dependent way, so that the learned attentional biases may differ from context to context. However, no such context-dependency has been observed for statistical learning. The present study investigates whether statistical learning of distractor suppression is context-dependent. Participants performed the additional singleton task searching for a unique shape, while ignoring a uniquely colored distractor. The distractor appeared more frequently in two locations than in the other locations. Crucially, we created two contexts within the experiments, and each context was assigned its own high-probability distractor location, so that the location where the distractor was most likely to appear depended on the context. Experiment 1 signified context through the color of the background, already producing some contextual learning. In Experiment 2, the context depended on the color of the stimuli themselves, enhancing contextual learning. In Experiment 3, context was only provided at the beginning of a trial, which resulted in a reduced context effect. Across all experiments, we obtained evidence for a generalized suppression of both high-probability locations, as well as a context-specific suppression of the high-probability location matching the context. Our results show that participants had little, if any, awareness regarding the regularities in the display. We conclude that statistical learning of distractor suppression is context-dependent. Email: Jasper de Waard, j.dewaard.jdw@gmail.com

Omission related brain responses reflect specific and unspecific action-effect couplings. TJERK DERCKSEN[1], ANDREAS WIDMANN[2], ERICH SCHRÖGER[2], NICOLE WETZEL[1]. *[1]Leibniz Institute for Neurobiology, [2]Leibniz University* — When stimuli are predicted but unexpectedly omitted, a neural response to omission can be observed using EEG. Models that incorporate prediction are able to explain such responses. SanMiguel and colleagues (2013) showed that in order to observe an omission response, it is necessary that an identity-specific prediction of the upcoming stimulus is present. They induced predictions using button presses coupled to either a single sound (known identity), or a random sound (unknown identity). An omission N1 (oN1) in the event-related potential was observed in the single condition, followed by an omission N2 (oN2) and omission P3 (oP3). None of these responses were observed in the random condition. Given the importance of omission studies in the context of predictive coding, we replicated the study done by SanMiguel and colleagues (2013). Data was collected from double the amount of participants in order to enhance power. Principal component analysis showed similar results in the single condition (oN1, oN2 and oP3 effects), but different results in the random condition where oN1 and oP3 effects were observed. In the single condition, higher amplitude effects compared to the random condition confirmed the importance of identity-specific predictions. However, the observed effects in the random condition show that predictions are also formed in anticipation of unspecific events. These results seem to be more in line with everyday life situations, where uncertainty about sensory consequences is often high. Email: Tjerk Dercksen, tjerk.dercksen@lin-magdeburg.de

Learning pain words. NATALIA EGOROVA, ABIGAIL LIM, SOPHIA HODGSON. *University of Melbourne* — Pain is a personal subjective experience. Yet, we talk about our pain using language and others understand what we mean. How pain words are learned is a long-standing question in philosophy of language. Understanding the mechanism of acquiring this specific type of vocabulary, referring both to concrete physical sensations and abstract and emotional feelings can help us understand how pain is encoded in words. In a set of two experiments, we investigated the influence of the different modalities, in which people encounter pain vocabulary, contrasting personal pain exposure, observing others in pain or reading a definition of a pain word. Sensory stimuli of different temperatures and levels of pain intensity were administered to the participants using a TSA-II system (Medoc Advanced Medical Systems, Israel). Pseudowords with the consonant-vowel-consonant pattern were generated and paired with sensory stimuli, videos of confederates experiencing sensory stimuli, or two-word definitions. Reaction times on a word recognition test at the end of the learning phase were compared between conditions. Participants were able to learn the words, with reaction times significantly different responding to learned words compared to new pseudowords. Both, Experiment 1 (N=18) contrasting definition and personal experi-

ence and Experiment 2 (N=20) contrasting observational and experiential learning revealed an interaction of modality with the pain level. Words denoting painful sensations that were learned through personal experience, elicited significantly faster reaction times during the recognition test. Adults are capable of learning sensory vocabulary even without personal experience. Yet, personal experience enhances learning specifically for the more painful items. No such enhancement was observed for pain words learned though observation/definition, and no enhancement was observed for non-painful words learned through personal experience. This suggests that painful experiences create more profound word memory traces. Email: Natalia Egorova, natalia.egorova@unimelb.edu.au

Sensorimotor predictions and movement-related tactile suppression. ELENA FUEHRER. *Justus Liebig University Giessen, Germany* — Tactile sensations on a moving body part that occur while a movement is being planned or executed are perceived as less intense than the same sensations occurring at rest. This phenomenon has been explained using predictive mechanisms. Based on efference copy signals, internal forward models are assumed to predict the sensory consequences of a movement, and the predicted sensory consequences are suppressed in perception. Research from our lab has shown that both the predictability of movement-relevant object features and the movement-relevancy of somatosensory information modulate such suppression of tactile sensations. Here, we examined whether tactile suppression is specific to the nature of the predicted sensory outcome, or whether it results from a general cancellation process. Participants were instructed to move the tips of their index fingers across textured objects at a designated speed. Depending on the spatial period of the texture, these movements caused participants to experience either a low (40 Hz) or a high (240 Hz) frequency vibration at their fingertips. Objects were presented in a blocked manner, so the vibration frequency was predictable (either low or high, depending on the block). Around movement onset, additional brief external vibrotactile stimuli of varying intensities were applied at the base of the moving index finger to probe tactile suppression. These vibrotactile stimuli also had either a low (40 Hz) or a high (240 Hz) frequency, matching (congruent) or mismatching (incongruent) the predicted sensory consequences of the movements. Compared to measurements taken on the same participants at rest, preliminary data (N=24) show elevated detection thresholds of the vibrotactile stimuli around movement onset, clearly indicating tactile suppression. Interestingly, there is a descriptive but currently not systematic trend towards more suppression in congruent than incongruent conditions. This may indicate sensation-specific predictions, rather than a general cancellation process, causing the suppression of external vibrotactile stimuli. Email: Elena Fuehrer, elena.fuehrer@psychol.uni-giessen.de

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Dissociable effects of attention and prediction on the sensory attenuation of action consequence. NITHIN GEORGE, MEERA MARY SUNNY. *Indian Institute of Technology Gandhinagar* — Sensory attenuation is the reduction in the perceived intensity of self-generated sensations. This attenuation of self-generated sensation is understood to be the result of the cancellation of sensations predicted by the action. However, a recent investigation into the time-course of sensory attenuation points to the potential role of attention in the attenuation of self-generated sensations. The present study aimed to understand the independent contribution of prediction and attention in the attenuation of self-generated sensations. The prediction associated with the stimulus feature and the focus of attention was manipulated independently by using orthogonal cues. In Experiment 1, participants performed a Gabor detection task on self-generated stimuli, and in Experiment 2, the visual stimuli were externally-generated. Our results showed pronounced sensory attenuation at the unattended location when the stimulus was self-generated (Experiment 1). When the stimulus was externally-generated (Experiment 2), improved sensitivity was observed at the unattended location. The present finding indicates that sensory attenuation of self-generated sensations is a result of the withdrawal of attention from the sensations predicted by the action. This finding corroborates the proposal from the active inference account, which posits that sensory attenuation is a consequence of the down-weighting of the sensory signal by the withdrawal of attention from self-generated sensations. Email: Nithin George, n.george@iitgn.ac.in

Probabilistic cuing of visual search: Neither implicit nor inflexible. TAMARA GIMÉNEZ-FERNÁNDEZ[1], DAVID LUQUE[1,2], DAVID R. SHANKS[3]; MIGUEL A. VADILLO[1]. *[1]Universidad Autónoma de Madrid; [2] Universidad de Málaga; [3]University College London* — The probabilistic cuing task has been used extensively to study how experience shapes the allocation of visual spatial attention. In the standard version of this task, participants search for a visual target among several distractors. The target is more frequently located in one area of the search display (i.e., the rich quadrant), although participants are not explicitly instructed about this feature of the task. As a consequence of this manipulation, participants develop a visual search bias towards the rich quadrant. It has been suggested that this attentional bias

is independent of any explicit knowledge that participants may acquire about the uneven distribution of the target location (i.e., that the probabilistic cuing is implicit). This hypothesis is based on the finding that most participants fail to report that the target appeared more frequently in one specific quadrant and that they also seem to perform at chance when asked to identify the rich quadrant. It has also been claimed that probabilistic cuing is inflexible. When a standard probabilistic cuing task is followed by an "unbiased" testing stage, in which the target is evenly distributed across the four quadrants, the search bias does not decrease during the unbiased stage. We argue that previous results supporting the implicitness and inflexibility claims are undermined by methodological shortcomings. Our main aim was to explore whether high-powered experiments with more sensitive measures would show evidence of a reduction in the attentional through the unbiased stage (testing the inflexibility hypothesis) and evidence of explicit recognition of the biased spatial distribution (testing the implicitness hypothesis). Our results challenge the idea that probabilistic cuing is implicit and inflexible. Email: Tamara Giménez-Fernández, tamara.gimenez@uam.es

Using multivariate analyses of electrophysiological data to disentangle preparatory mechanisms. JOSÉ M. GONZÁLEZ PEÑALVER, DAVID LÓPEZ-GARCIA, M. CONCEPCIÓN CASTELLANOS, MARÍA RUZ. *Mind, Brain and Behavior Research Centre, University of Granada* — Preparation is an endogenous brain function that occurs during the anticipation of a stimulus and improves performance. Neuroimaging techniques have provided evidence of preparatory activity in different cognitive domains. Two of the most relevant processes in the field are content-based selective attention (relevance) and perceptual expectation (probability), but their underlying mechanisms remain unclear. We sought to compare both domains employing a cue-target paradigm. To this end, we used time-resolved Multivariate Pattern Analysis (MVPA) on Electroencephalography (EEG) data. In a block design, participants were cued either to select or to expect an incoming target, which could be a name or a face, and make a gender discrimination. Behavioral results showed that cues effectively had an effect on responses, showing significantly faster reaction times for expected vs. unexpected stimuli. For the multivariate analyses, we trained a classifier algorithm to tell apart electroencephalographic activity (voltage values) during the preparation interval, elicited by cues that anticipated either names or faces. Results showed that the activity induced by cues, prior to target onset, carries information about the category of the relevant or expected incoming stimulus. Importantly, the fidelity of this activity correlates with response efficiency, stressing its relevance for behavior. Second, a cross-classification analysis indicated that the patterns of preparatory brain activity do not generalize across relevance and probability manipulations, suggesting that their representational format differ. Overall, our results complement the literature suggesting that attention and expectation rely on different computational mechanisms, and extend this dissociation to their anticipatory basis. Email: José M. González Peñalver, cgpenalver@ugr.es

Predictive visual motion extrapolation emerges spontaneously and without supervision from a layered neural network with spike-timing-dependent plasticity. HINZE HOGENDOORN[1], ANTHONY N BURKITT[2]. *[1]Melbourne School of Psychological Sciences, University of Melbourne; [2]Department of Biomedical Engineering, University of Melbourne* — The fact that the transmission and processing of visual information in the brain takes time presents a problem for the accurate real-time localisation of a moving object. One way this problem might be solved is extrapolation: using an object's past trajectory to predict its location in the present moment. Here, we investigate how a simulated in silico layered neural network might implement such extrapolation mechanisms, and how the necessary neural circuits might develop. We allowed an unsupervised hierarchical network of velocity-tuned neurons to learn its connectivity through spike-timing dependent plasticity. We show that the temporal contingencies between the different neural populations that are activated by an object as it moves causes the receptive fields of higher-level neurons to shift in the direction opposite to their preferred direction of motion. The result is that neural populations spontaneously start to represent moving objects as being further along their trajectory than where they were physically detected. Due to the inherent delays of neural transmission, this effectively compensates for (part of) those delays by bringing the represented position of a moving object closer to its instantaneous position in the world. Finally, we show that this model accurately predicts the pattern of perceptual mislocalisation that arises when human observers are required to localise a moving object relative to a flashed static object (the flash-lag effect). Email: Hinze Hogendoorn, hhogendoorn@unimelb.edu.au

Action influence on the audio-visual simultaneity perception. KISHORE KUMAR JAGINI, MEERA MARY SUNNY. *Indian Institute of Technology Gandhinagar, India* — Our perception of events in the environment is often multisensory. For the simultaneous perception of multisensory cues originating from an event, our brain has to deal with naturally occurring delays in physical and neural transmission times of multisensory cues. Despite these delays, understanding how multisensory cues are perceived as simultaneous when generated as a consequence of one's own action is less understood.

Previous literature suggested the role of expectation in modulating the perceived time of unisensory cue when generated as a consequence of one's action. Here, we investigated whether and how one's own action influences the audio-visual (AV) simultaneous perception using the binary simultaneity judgment (SJ2) task. In two experiments, in each trial, the AV pair was presented as a consequence of the participant's voluntary keypress action (action condition) or automatically by the computer (no-action condition). In experiment-1, the onset of AV pair was temporally contiguous with action. Whereas in experiment-2, a delay was introduced between the action and the onset of AV pair. Our study results indicated asymmetries in the time windows, within which AV cues perceived as simultaneous, of auditory-leading and visual-leading trials for the action and no-action condition in experiment-1, but not in experiment-2. In particular, we found that the time window of auditory-leading trials for action contiguous AV pairs was significantly large compared with the no-action condition. In contrast, the reverse pattern was observed for the time window of visual-leading trials. However, we found no significant difference in the total time window within which auditory-leading and vision-leading AV pairs perceived as simultaneous for action and no-action condition of both experiments. We reasoned that the observed asymmetries could be due to the differential perceived temporal shifts of auditory and visual cues towards action. Moreover, this asymmetry might occur only when the relationship between action and AV outcome was time contiguous. Email: Kishore Kumar Jagini, kishore.jagini@iitgn.ac.in

Concurrent activation of hierarchical neural representations compensates for neural delays in visual motion perception. PHILIPPA JOHNSON, TESSEL BLOM, DANIEL FEUERRIEGEL, STEGAN BODE, HINZE HOGENDOORN. *University of Melbourne* — Due to the time required for neural transmission and processing, the brain only has access to outdated sensory information. This means that unless the brain can compensate for neural delays, moving objects would be represented in the brain behind their veridical location. Additionally, processing delays accumulate as information progresses through the visual hierarchy, such that later visual representations would lag the true position of moving objects more than earlier representations. Here we investigated whether neural representations of moving objects are predictively activated in order to compensate for these cumulative delays. We presented a circular stimulus in a 37-position hexagonal grid, either briefly flashed in individual positions or moving through the array along one of 42 motion vectors. Electroencephalographic data was collected and analysed using multivariate pattern analysis. We trained classifiers to discriminate between different positions based on EEG activity evoked by the flashed stimuli, and then tested those classifiers on the motion trajectories. This allowed us to quantify the points in time at which the moving object activated different hierarchical position representations. We observed that hierarchical neural position representations that were activated sequentially for flashed stimuli were instead activated concurrently for moving stimuli. This suggests that the brain can compensate for the delays that accumulate during its own processing by predictively aligning the neural representations of moving objects in both space and time. Email: Philippa Johnson, pajohnson@student.unimelb.edu.au

Attentional modulations of posterior alpha power in sound localization: The role of spatial information. LAURA-ISABELLE KLATT, STEPHAN GETZMANN, DANIEL SCHNEIDER. *Leibniz Research Centre for Working Environment and Human Factors, Dortmund* — Lateral shifts of auditory spatial attention typically result in a hemispheric lateralization of posterior alpha power. While in the visual domain, the retinotopic organization of space allows for focal modulations that depend on target eccentricity, the spatial specificity of auditory alpha modulations remains less clear. Thus, in the present study, we modulated the perceptual load and spatial demand in a sound localization task. A centrally presented target sound was followed by a sound array containing two or four lateralized stimuli (low vs. high perceptual load). In separate task blocks, participants indicated whether the target sound was presented on the left or right side (low-spatial-demand: two response alternatives) or specified the exact target position (high-spatial-demand: four response alternatives). The analysis of mean posterior alpha power revealed no modulation of lateralization magnitude by load or spatial demand. However, the analysis of onset latencies showed that alpha lateralization emerged the earliest in low-perceptual-load / low-spatial-demand trials and the latest in high-perceptual-load / high-spatial-demand trials. Crucially, participants with earlier alpha lateralization onsets showed faster response times. In addition, when decoding the exact target location based on the topography of alpha-band oscillatory power, we found higher decoding accuracy in high-spatial-demand trials compared to low-spatial-demand trials. Altogether, this emphasizes that auditory attentional modulations of alpha power are sensitive to the task-relevance of spatial information. While this was not reflected in the magnitude of mean oscillatory power over posterior scalp, both alpha lateralization onset latencies as well as the amount of spatial information that is reflected in the scalp distribution of alpha power seems to vary depending on the spatial demands of the task. Email: Laura-Isabelle Klatt, klatt@ifado.de

Predictions based on action intention facilitate the recognition of stochastic regularities. BETINA KORKA[1], ERICH SCHRÖGER[1], ANDREAS WIDMANN[1,2]. *[1]Cognitive and Biological Psychology, Leipzig University, Germany; [2]Leibniz Institute for Neurobiology, Magdeburg, Germany* — In order to process the incoming sensory information efficiently, the predictive coding theory suggests that the brain is continuously building up and updating predictive models. Sources for predictions may be drawn from sensory regularities in a bottom-up manner based on feed-forward prediction error, as suggested when regularity violations lead to elicitation of the mismatch negativity (MMN) component. Recently, it has been shown that rare deviants of medium pitch enclosed between frequent high and low pitch standard sounds elicit the MMN component only if the standards are arranged in a deterministic fashion (e.g., alternating high and low) but not in stochastic sequences despite identical overall stimulus probabilities (Schröger & Roeber, 2020). Here, we wanted to test the implication of the predictive coding theory that predictions based on higher order generative models, for example based on action intention, are fed top-down in the hierarchy to sensory levels. We asked subjects to produce random sequences of high and low pitch sounds by button presses in two conditions: In a 'specific' condition, one button produced high and the other low pitch sounds; in an 'unspecific' condition, both buttons randomly produced high or low-pitch sounds. Rare medium pitch deviants elicited a larger MMN in the 'specific' compared to the 'unspecific' condition, despite the actual sound sequences being actually stochastic in both conditions. Thus, our results suggest that intention-based predictions can boost stochastic regularity-based predictions; this extends previous findings indicating that action intention alone (i.e. in the absence of auditory regularities) leads to predictions at sensory levels (Korka et al., 2019). Email: Betina Korka, betina-christiana.korka@uni-leipzig.de

Temporal expectation does not improve item-specific memory. MRINMAYI KULKARNI, DEBORAH E. HANNULA. *University of Wisconsin Milwaukee* — Temporal relationships between events provide important information based upon which the brain builds expectancies to guide behaviour. Such expectancies allow for the allocation of attention to critical time-points when an event is most likely to occur. Past work has demonstrated that such attentional regulation leads to improved visual perception. Whether similar benefits might be documented for episodic memory remains underexplored. Results from recent studies indicate that temporally regular encoding structure leads to better recognition in circumstances where recall of specific details of encoded information is not required. Here, we investigated whether similar improvements are evident when detailed, item-specific representations are necessary for successful memory performance. In all experiments, participants viewed stimuli (objects in Experiments 1 and 2; scenes in Experiment 3), over separate encoding blocks, with either predictable of randomized event timing. Following encoding, participants completed a recognition memory test. In Experiments 1 and 2, old and new objects were presented in the test phase, intermixed with similar ones (i.e. perceptually different exemplars of encoded objects). In order to perform this task, participants have to recall perceptual details of encoded objects to avoid incorrectly endorsing similar objects as "old". Contrary to our predictions, we found that regular event timing during encoding did not improve memory for item detail. In Experiment 3, we attempted to replicate previous findings of beneficial effects of temporal expectation on scene recognition. Here, participants encoded real-world scenes, and in the test phase were presented with old and new scenes. Unexpectedly, and in contrast with past work, temporal regularity during encoding did not have an effect on memory for scenes. These results suggest that the effects of temporal expectation on memory may be variable and that indirect upregulation of attention through imposed temporal structure may not be sufficient to have downstream effects on memory performance. Email: Mrinmayi Kulkarni, mrinmayi@uwm.edu

The time course of gaze bias in a perceptual discrimination task. SANDRA LAGATOR, MIKE LE PELLEY, BENJAMIN R. NEWELL. *UNSW Sydney* — The 'gaze cascade effect' refers to the finding that, when making a decision, the likelihood of inspecting the to-be-chosen option increases in moments prior to making a choice. Simion and Shimojo (2006) suggest that the bias reflects mutual contribution of two processes: preferential looking and mere exposure effect. We contrast this with the finding that the effect can be observed in simulations of models that treat attention as random (Mullett & Stewart, 2016). We investigated whether the time course of the bias varies with decision difficulty. Participants completed a perceptual discrimination task: on each trial they were presented with two dot patterns and were asked to choose the one with more dots in it. We manipulated decision difficulty by varying the difference in dot-density between the patterns. Our results replicate the gaze bias but fail to find evidence that the time course of the bias varies with decision difficulty. Email: Sandra Lagator, s.lagator@student.unsw.edu.au

How real is virtual reality? Visual limb representation and haptic feedback impact eye and body movements, and feelings of embodiment during object interactions in real and virtual worlds. EWEN LAVOIE, CRAIG CHAPMAN. *Faculty of Kinesiology, Sport, and Recreation / Neuroscience and Mental*

Health Institute, University of Alberta — Commercially available virtual reality (VR) hardware and software are changing the landscape of education, industry, gaming, and human behavioural research. As this occurs, it is important to test whether behaviour in VR is similar to the real-world, and assess what sensory modalities contribute most to a person's immersive experience. We translated an object interaction task from the real-world (Lavoie et al., 2018) into VR so that we could dissociate a movement from its visual appearance. Participants completed at least 20 trials in two conditions: Controllers—where they saw a visual representation of the VR controller, and Arms—where they saw a set of virtual limbs. We found participants seeing Arms moved more awkwardly in order to make the virtual limbs look similar to how they would if they were interacting with a real-world object. These movement changes were accompanied by an increase in self-reported feelings of ownership over the limbs as compared to the controllers. Overall this suggests our movements are planned to provide optimal visual feedback, even at the cost of less efficient movements. There is something about seeing a set of limbs in front of you, doing your actions, that affects your moving, and in essence, your thinking. Although many studies report the positive impacts of VR technology, until studies are completed assessing just how "real" VR is, any results should be taken with a grain of salt. Email: Ewen Lavoie, elavoie@ualberta.ca

Working memory distortion influence by irrelevant features in a dual task. YAO LIU. *ViaX, Scientific Research and Education, Beijing, China* — The visual working memory (vWM) content is our main predictor of upcoming visual events. It has been shown that vWM recall errors and biases can arise from a perceptual distractor that share a feature with the memory item. Yet, it is unclear how different levels of dual task engagement during the memory delay affect memory recall. Here, we directly compared the effects of a memory retrieval task of an irrelevant feature and an exogeneous task on vWM performance. Fifty-two participants remembered a single item associated with a color. The subsequently presented distractor was either 1) the same item that had to be judged on whether the configuration was the same as in memory or 2) an arrow of which participants pressed the direction. Unbeknownst to the participants, distractors were presented with colours that were systematically different from the ones in memory (-20%, -10%, 0%, 10%, 20%). We tested participants' error and confidence of the memory on the color feature and assessed absolute error, bias, and confidence for their responses. We observed that dual task performance was predictive of recall error though the type of dual task did not statistically affect behavioural error. Interestingly, bias towards the distractor color was larger the more dissimilar the distractor color was. Finally, there was a strong trend in the data that this bias interacted with the type of dual task. In sum, we show, via a direct comparison, that both the level of distractor processing and the dissimilarity of the irrelevant distractor color altered behavioural performance. The conclusion of the experiment provided evidences to support the shared-resource model of working memory, which suggests that vWM resources are shared for memory, perception, and prediction. Email: Yao Liu, kanwen0613@126.com

Time of distraction modulates behavioral sensitivity and distractor-evoked neural responses. TROBY KA-YAN LUI, JONAS OBLESER, MALTE WÖSTMANN. *Department of Psychology, University of Lübeck, Lübeck, Germany; Center of Brain, Behavior and Metabolism (CBBM), University of Lübeck, Lübeck, Germany* — Attentional sampling operates in a rhythmic manner. However, it is less well studied whether distractor suppression is rhythmic as well. In the present electroencephalography (EEG) study, we probe the rhythmicity of distractor suppression in auditory attentional filtering. In a pitch comparison task, we systematically varied the onset time of a task-irrelevant 25-Hz modulated tone sequence, which was presented in-between two to-be-compared target tones. Two metrics of distraction were utilized. Behaviorally, perceptual sensitivity in pitch comparison inversely relates to the degree of distraction. Neurally, 25-Hz inter-trial phase coherence (ITPC) quantifies neural phase-locking to the temporal structure of the distractor. Results of a present sample of N = 19 evidenced a robust distractor effect, in which the perceptual sensitivity was lower in trials with a distractor, compared to trials without a distractor. Distractor onset time modulated both perceptual sensitivity and ITPC periodically at low frequencies (<8 Hz). Importantly, a negative correlation between perceptual sensitivity and ITPC across distractor onset times suggests that stronger neural encoding of distractors is accompanied by lower sensitivity in pitch comparison of the target tones. These results have important implications for the temporal dynamics of the auditory attention filter. In particular, the present study supports the hypothesis that distractor processing follows a rhythm, which is convergingly manifested by the temporal dynamics of behavioral and neural measures of distraction. Email: Troby Ka-Yan Lui, kayan.lui@uni-luebeck.de

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No evidence for a relationship between autistic-like traits and use of prior information in perceptual decision making. CATHERINE MANNING[1], UDO

BOEHM[2], CHRIS RETZLER[3]. [1]*University of Oxford;* [2]*University of Amsterdam;* [3]*University of Huddersfield* — Interpreting and interacting with the world around us requires integrating incoming sensory signals with prior information. It has been proposed that autistic individuals rely less on prior information and more on incoming sensory signals, compared to non-autistic individuals.In this study we extend this hypothesis to investigate the relationship between individual differences in autistic-like traits in the general population and the extent of prior information use in perceptual decisions. We use a diffusion model framework, in which decisions are modelled as noisy evidence accumulation processes towards one of two decision bounds. Within this framework, prior information can bias the starting point of the evidence accumulation process towards one of the two bounds. Our pre-registered hypotheses were that increasing levels of autistic-like traits would be associated with reduced starting point bias and increased response caution. 222 participants with autism spectrum quotient (AQ) scores ranging from 4 to 40 were presented with random dot motion stimuli and asked to discriminate the direction of coherent motion as quickly and accurately as possible. The stimulus strength was tailored to each participant□s perceptual ability. Stimuli were either preceded with a neutral cue (square) or a directional cue (arrow). 80% of the arrow cues validly predicted the upcoming motion direction while the other 20% were invalid cues. We modelled accuracy and response time data using a hierarchical Bayesian model in which starting point varied with cue condition. We found no evidence for our hypotheses, with starting point bias and response caution seemingly unrelated to AQ scores. This paradigm would be useful for testing differences in prior information use in individuals with an autism diagnosis, in order to refine theories regarding the role of prior information in autistic perception. Email: Catherine Manning, catherine.manning@psy.ox.ac.uk

Seeing is believing? Prior knowledge of others' beliefs biases perception of their actions. KATRINA MCDONOUGH, PATRIC BACH. *University of Aberdeen* — Recent models argue that social perception—and perception in general—is an inferential process, where prior knowledge and higher-level expectations about an actor's goals and beliefs guides our perceptual experience of their actions. We have recently developed a novel paradigm, capturing these goal expectations, and allowing us to accurately measure their influence on action perception. In a series of experiments, we have demonstrated that expectations of efficient action bias action observation. Participants watched others reach for objects with either efficient trajectories (e.g. arched when reaching over an obstacle) or inefficient trajectories (e.g. reaching straight despite an obstacle). During its course, the hand disappeared, and participants made perceptual judgments about the last seen position on a touch screen. Judgments were consistently biased in line with action expectations, such that straight reaches were perceived higher when obstacle avoidance was predicted, and arched reaches were perceived lower when the actors could have reached straight. Here, we show that these biases are influenced by the beliefs attributed to the actor. When, prior to action onset, the actor expressed contradicting beliefs about the scene (e.g. stating that the path was clear despite the actual presence of an obstacle), perceptual biases followed the belief rather than visual information. This provides evidence, for the first time, for a top-down influence of prior expectation on action observation, involving sophisticated higher-order processing of theory of mind ("mentalizing"), and reveal that our perceptual experience of others' actions is derived from an integration of bottom-up sensory information and high-level cognition. Email: Katrina McDonough, katrina.mcdonough@abdn.ac.uk

The effects of oxytocin on the processing of fear stimuli: An EEG study. ELEANOR MOSES, ALAN PEGNA. *The University of Queensland* — The hormone oxytocin alters behaviour and cognition, and crucially facilitates social bonding. fMRI research with intranasal oxytocin has revealed that the hormone may do so by decreasing the anxiety response to stimuli, as oxytocin attenuates amygdala responsivity to threats, especially in anxious individuals. However, no research to date has explored the temporal dynamics of this relationship. Here, we use electroencephalography (EEG) to investigate the effect of oxytocin on the neural mechanisms that process face and non-face threats. 30 men participated in a randomized, double-blind, placebo-controlled repeated measures study, receiving intranasal oxytocin during one session and a placebo during another a week apart. Participants performed a one-back task, viewing faces (fearful, happy, or neutral) and non-faces (fear (snakes/spiders) or non-fear (mushrooms/flowers)) for 500ms and identifying repetitions, while EEG recordings were taken. Anxiety measures were also administered. ERP analysis over parietal electrodes revealed an enhanced negativity and earlier peak latency to fearful faces (compared to neutral and happy faces) at 170ms (N170), and a diminished sustained positivity to emotional faces (compared to neutral) from 200-450ms (P200). Oxytocin attenuated this sustained P200, regardless of emotion, and this attenuation was modulated by individual anxiety levels. Oxytocin effects for all faces also emerged over occipital electrodes after 150ms. Analysis of non-faces revealed a differential response to fear compared to non-fear stimuli, which was not altered by oxytocin. Our results indicate that oxytocin alters the processing of faces regardless of valence, and that this effect does not extend to non-face stim-

uli. The effect of oxytocin on later, but not early neural responses suggests that the hormone does not influence the rapid structural encoding of faces, but may attenuate the later stages of threat appraisal through the amygdala. This decreased anxiety response to socially relevant stimuli could in turn facilitate social bonding. Email: Eleanor Moses, Eleanor.moses@uqconnect.edu.au

Expectancy modulates perception of Gestalt motion. ALEXANDRE DE PONTES NOBRE[1,2], ANDREY R. NIKOLAEV[2,3], CEES VAN LEEUWEN[2], JOHAN WAGEMANS[2]. *[1]Universidade Federal do Rio Grande do Sul (UFRGS); [2]KU Leuven, University of Leuven; [3]Lund University* — It is well established that expectancy improves perception of visual stimuli. However, less is known about how expectancy influences perception of Gestalt configurations, which have been proposed to be created automatically. We used EEG to investigate the time course of expectancy effects on visual processing of motion Gestalts, specifically, coherent motion. In each trial, participants were presented sequences of 10 random-dot kinematograms (RDKs) with variable levels of coherent motion. One RDK in the sequence (the target) was followed by an auditory post-cue. Participants had to rate the coherence level of the target RDK. Expectancy was manipulated by the position of the post-cue in the sequence, so that the probability of the cue following an RDK increased as the sequence progressed. Behavioral results showed that expectancy improved perception of extreme levels of coherent motion to a larger degree than intermediate levels of coherence. Event-related potentials (ERPs) time-locked to RDK onsets showed larger P1 amplitudes and smaller N1 amplitudes for expected RDKs compared to non-expected RDKs. P1 amplitudes decreased linearly with coherence level, and this effect did not interact with expectancy. Crucially, there was an interaction for the N1: larger N1 amplitudes were observed for RDKs with intermediate coherence levels, i.e., for more ambiguous configurations, but only when the RDKs were expected. We conclude that expectancy does not affect early processing stages of motion coherence (as measured by the P1); however, it influences later processing stages (indexed by the N1). Email: Alexandre Nobre, alpnobre@gmail.com

Mental imagery and predictive processes in action observation. ELEONORA PARROTTA, PATRIC BACH. *University of Aberdeen* — Mental imagery has recently been conceptualized as a simulatory process that may rely on similar pre-activation mechanisms as other top-down prediction processes and act directly on perceptual structures (for a full discussion, see Bar, 2011). The present study tests, through a series of experiments, whether mental imagery shares with predictive processes the capacity of shaping visual perception. We tested this hypothesis by adapting a recent experimental paradigm which demonstrated that prior knowledge of an actor's intention, expressed as a verbal cue, shaped the viewers' low-level perception of the action's kinematic towards the expected trajectory (Hudson, Nicholson, Simpson, Ellis, & Bach 2016; Hudson, Nicholson, Ellis & Bach, 2016). To explore whether mental imagery of others' action produces similar perceptual distortions as prior expectations of an action, we turned this paradigm into an imagery task. In Experiment 1 participants were asked to observe videos of a hand moving and estimate its last seen position through a touch-screen response. Crucially, before action's onset, subjects were asked to imagine a reach or a withdrawal, cued by the different color of the object on the screen. To control that the perceptual bias was influenced by the preceding imagery task rather than the association of colors to actions, the same study was ran on a control group, wherein the imagery task was replaced by a counting task. Results confirmed that perceptual judgements were—erroneously—shifted towards the previously imagined trajectory, that is, further leftwards for imagined reaches and further rightwards for imagined withdrawals and that the displacement in the perceptual judgement was eliminated in the control task. Experiment 2 replicated these results, confirming that the perceptual shifts could also be observed in a psychophysical probe comparison task without motor or working memory components. These findings reveal a perceptual bias associated to both imagery and predictive processes in social perception and provide a fruitful experimental paradigm for future research aiming at exploring to what extent the neural signatures of visual perception, imagery and predictive processes differ or overlap. Email: Eleonora Parrotta, eleonora_p@hotmail.it

The influence of the musical piece familiarity factor on subjective perception of its duration. ANASTASIYA POLTARZHITSKAYA, DARIA KLEEVA, MARIA OSADCHAYA, MIKHAIL LEBEDEV, ANDRIY MYACHYKOV, ALEXEY OSSADTCHI. *Institute for Cognitive Neuroscience, National Research University Higher School of Economics* — Subjective time duration is a complex phenomenon that normally involves interaction of different sensory modalities, as well as cognitive factors. Music perception is another fascinating phenomenon that involves hierarchically distributed brain circuitry implementing prediciton-based coding [1]. We hypothesized that familiarity of a music piece interacts with brain's predictive mechanisms [2,3] and therefore may influence subjective time perception. If time duration perception reflects brain's efforts spent for tune's progression prediction, then familiar tunes should reduce the subjectively perceived time. At the same

time if memory trace left by the tune affects the temporal judgement, the familiar and most recent should be perceived longer. 1. Koelsch, S., Vuust, P., & Friston, K. (2019). Predictive processes and the peculiar case of music. Trends in Cognitive Sciences, 23(1), 63-77. 2. Friston, K., Kilner, J., & Harrison, L. (2006). A free energy principle for the brain. Journal of Physiology-Paris, 100(1-3), 70-87. 3. Matthews, W. J., & Meck, W. H. (2016). Temporal cognition: connecting subjective time to perception, attention, and memory. Psychological bulletin, 142(8), 865. Email: Anastasiya Poltarzhitskaya, navukapobach@gmail.com

The development of predictive coding in young children: An MEG study. HANNAH RAPAPORT[1], ROBERT SEYMOUR[2], WEI HE[3], LIZ PELLICANO[4], PAUL SOWMAN[3]. *[1]Department of Cognitive Science, Macquarie University; [2]Wellcome Centre for Human Neuroimaging; [3]Department of Cognitive Science, Macquarie University;[4]Department of Educational Studies, Macquarie University* — How do children come to know about the world? This question has sparked one of the most prolonged debates in the history of philosophy—namely, nature versus nurture. Despite this history of divisiveness, most researchers today would accept that the mind develops as a result of both. Predictive coding theory offers a promising framework which bridges the divide between the nature and nurture perspectives. Under predictive coding, innate knowledge—rooted in the genes—is updated in light of new information acquired via interactions with the environment. Across development, this iterative process of knowledge updating should lead to the progressive optimisation of the brain's stored knowledge about the world. In the current study, we investigated whether there is neural evidence to support a predictive coding account of child cognitive development. To this end, we used paediatric magnetoencephalography (Rapaport et al., 2019) to record the brain responses of 37 children (aged 3 to 6 years) as they listened to a multi-feature auditory oddball paradigm (Näätänen et al., 2004). Evoked 'mismatch field' (MMF) responses were calculated by subtracting activity to high-probability 'standard' tones from low-probability 'deviant' tones. Under predictive coding, each evoked response is understood as an index of prediction error, where the larger the prediction error, the larger the evoked response. Hence, if the older children are better able to predict the 'standards' relative to the 'deviants', we should see a large difference in the evoked response between the two conditions, as indexed by a large MMF amplitude. By contrast, if the younger children are relatively worse at predicting both the 'standards' and the 'deviants', we should see a smaller difference in the evoked response between the conditions, as indexed by a smaller MMF amplitude. We are currently analysing the data. Results will be ready to present in October. Email: Hannah Rapaport, hannah.rapaport@hdr.mq.edu.au

Forbidden temptation: A psychophysiological study on the influence of motivational states on intentional binding, moderated by psychopathy and trait anxiety. ANNA RENDER[1], MATT OXNER[2], HEDWIG EISENBARTH[2], PETRA JANSEN[1]. *[1]University of Regensburg (Faculty of Human Science); [2]Victoria University of Wellington (School of Psychology* — Motivational states have been highlighted to affect the feeling of control over action and consequences (Sense of Agency) through modulation of valence, arousal, and dopaminergic activity. This study investigates the influence of motivational states on the sense of agency moderated by personality traits. 59 participants watched either a sexually arousing, a pleasant or an emotionally neutral film clip. Before and after, Sense of Agency was measured implicitly using the intentional binding task (Libet Clock), which provides action and outcome binding scores. Analyses included the participants' subjective affective ratings, physiological arousal (pupillometry, GSR, HR) and personality traits (psychopathy and trait anxiety). Spontaneous eye blink rates were indexed for dopaminergic activity. Linear mixed-effects models confirmed reduced action binding after the sexual arousal induction, revealed an increase after the emotionally neutral and no change after the pleasure induction. Outcome binding decreased after sexual arousal. We found no interaction with psychopathy in action binding, but less outcome binding after sexual arousal for higher psychopathy. Higher trait anxiety was linked to decreased action binding in all motivational states, but most pronounced in sexual arousal, and to increased outcome binding after watching the emotionally neutral and pleasant film clip. A reduced feeling of control over actions has implications for evaluations of criminal responsibility. Email: Anna Render, anna.render@vuw.ac.nz

Slack Channel: #posters_s-z

Preparing to select: Preparatory influences on selective attention in a two-target method. BEN SCLODNICK, BRUCE MILLIKEN, DAVID I. SHORE, ELLEN MACLELLAN. *McMaster University* — We examined whether preparatory processes can produce selection history effects in a selective attention task. We modified a two-target attentional blink task in which participants identified two rapidly presented target items: a red target word spatially interleaved with a green distractor word (T1), followed by a single white word (T2; MacLellan, Shore, & Milliken, 2015). Prior to T1, a coloured word (T0) was presented, varying in colour across trials. In a name

all condition, participants named all T0 words. In a name red condition, participants only named T0 if it was a red word. T2 identification performance in the name red condition was significantly better than in the name all condition (even on trials where T0 was red). These results suggest that a history of preparing attention in a particular way can modify attentional templates that mediate selective attention efficiency. We discuss our findings in the context of selection history effects and associative learning theories of cognitive control. Email: Ben Sclodnick, sclodnbc@mcmaster.ca

Noradrenaline potentiates conditioned fear bradycardia, N170, and late positive potential amplitudes. MATTHIAS F. J. SPERL[1], CHRISTIAN PANITZ[1], NADINE SKOLUDA[2], URS M. NATER[2], DIEGO A. PIZZAGALLI[3], CHRISTIANE HERMANN[4], ERIK M. MUELLER[1]. *[1]University of Marburg, Germany; [2]University of Vienna, Austria; [3]Harvard Medical School, USA; [4]University of Giessen, Germany* — Fear conditioning is an important model for understanding the etiology and maintenance of anxiety disorders, while extinction of fear is considered to reflect the underlying learning process of exposure therapies. Hyperconsolidation of aversive associations and poor extinction have been hypothesized to be crucially involved in the acquisition of pathological fear. Previous animal and human research has pointed to a potential role of the catecholaminergic system, particularly noradrenaline and dopamine, in acquiring emotional memories. Here, we investigated whether the noradrenergic alpha-2 adrenoreceptor antagonist yohimbine and the dopaminergic D2 receptor antagonist sulpiride modulate human long-term fear conditioning and extinction. Fifty-four participants received yohimbine (10 mg, n = 18), sulpiride (200 mg, n = 18), or placebo (n = 18) between fear acquisition and extinction. The yohimbine group showed increased alpha-amylase activity, confirming a successful manipulation of central noradrenergic release. We assessed recall of conditioned (non-extinguished CS+ vs. CS-) and extinguished fear (extinguished CS+ vs. CS-) 24 hours later. Importantly, potentiated fear bradycardia and larger amplitudes of the N170 and late positive potential ERP components indicated that yohimbine treatment (compared to placebo and sulpiride) enhanced fear recall during day 2. In conclusion, these results suggest that yohimbine potentiated cardiac and central electrophysiological signatures of fear memory consolidation. Our findings elucidate the key role of noradrenaline in strengthening conditioned fear. Email: Matthias F. J. Sperl, matthias.sperl@staff.uni-marburg.de

Peer-to-peer: The mediating role of anxiety and expectancy in socially-transmitted nocebo nausea. WINSTON TAN[1], BRYDEE PICKUP[1], KATE FAASSE[2], BEN COLAGIURI[1], KIRSTEN BARNES[1]. *[1]University of Sydney; [2]UNSW Sydney* — Introduction/Background: The nocebo effect is a psychobiological phenomenon whereby negative outcomes occur due to psychosocial factors such as the observation of others. However, research investigating the impact of social observation on the nocebo effect has focused on single model-observer interactions. Consequently, little is known about transmission beyond these singular exchanges. This study employed a novel Virtual Reality (VR) paradigm to investigate whether socially-induced nocebo effects can be passed along a social transmission chain. Methods: Participants (N=177) were randomised to four conditions. Those in the First-Generation condition observed an actor model symptoms of nausea subsequent to VR-exposure. Second and Third-Generation participants witnessed those in First and Second-Generation conditions undergo the same procedure. The Control group received no social modelling. Nausea, anticipatory anxiety, and expectancy were measured. Results: Nausea was significantly increased among those in the First-Generation relative to Control ($p<.05$) and Second and Third-Generation Conditions ($p<.05$). Results were driven by significant differences in anxiety and expectancy. Specifically, expectancy mediated the difference in nausea between First-Generation and Control participants. Anxiety and expectancy mediated the difference between the First-Generation and Second and Third- Generation conditions. Conclusions: Simply watching another individual report nausea exacerbated the same symptoms in the observer. This may explain the occurrence of VR-related side effects in clinical and commercial settings. While transmission along a social chain was not observed, this was explained by differences in anxiety and expectancy. This sheds light on the underlying mechanisms facilitating socially-induced nocebo nausea, with important implications for its future reduction. Email: Winston Tan, wtan3277@uni.sydney.edu.au

Probabilistic predictions sharpen expected action-outcome representations in V1. EMILY THOMAS[1], DANIEL YON[2], SAM GILBERT[3], FLORIS DE LANGE[4], PETER KOK[5], CLARE PRESS[1]. *[1]Birkbeck, University of London; [2]Goldsmiths, University of London; [3]Institute of Cognitive Neuroscience, UCL; [4]Donders Institute, Radboud University; [5]Wellcome Centre for Human Neuroimaging, UCL* — Goal-directed action depends on our ability to anticipate the outcomes of our movements. Prevailing theories across the last few decades suggest that we attenuate perceptual processing of anticipated action-outcomes, relative to surprising outcomes. However, recent data suggest that this account may need revisiting, due to findings that congruent action outcomes are decoded from visual brain activity with superior accuracy relative to incongruent action outcomes. It however remains unclear what kind of mecha-

nism generates these effects, and whether influences of congruency could be explained by the operation of prediction mechanisms. Here we present a new experiment addressing this question by manipulating the conditional probabilities of action outcomes and comparing informational content associated with these events in primary visual cortex (V1). In a behavioural acquisition phase, participants acquired perfect associations between manual actions and gratings with particular orientations. In a subsequent MRI test session, participants produced manual actions either with no visual effect (33%), or to generate gratings with an orientation that was expected (33%) or unexpected (33%) on the basis of the preceding acquisition phase. When expectations were valid, representations of outcomes in V1 were "sharpened", such that linear support vector machines classified the orientation of gratings from patterns of V1 activity with superior accuracy, relative to unexpected trials. Moreover, we performed univariate preference analyses which allowed us to examine stimulus specific activity patterns, revealing a suppression of expected sensory activity in voxels tuned away from, rather than tuned to, the presented stimulus. These analyses also revealed the emergence of predictive templates in V1 for stimuli that were expected but omitted. Taken together, these findings imply that action predictions formed on the basis of conditional probabilities sharpen, rather than attenuate, expected representations, and therefore that the influence of action expectations on perception is similar to that seen in other perceptual disciplines. Email: Emily Thomas, ethoma09@mail.bbk.ac.uk

Behavior chains reveal associative structure in human instrumental learning. ERIC THRAILKILL, CATHERINE THORPE, MARK E. BOUTON. *University of Vermont* — Behavior takes the form of a chain of responses that occur in sequence and result a reinforcing outcome. For example, someone that smokes cigarettes while driving in their car must also procure cigarettes from a store. These are different behaviors that occur in the presence of different cues. Rat studies suggest that chained responses form specific associations. Here, we developed a behavior chain method for human participants. We used an analog of the reinforcer devaluation method to ask whether the first response in the chain was goal-directed and if extended training renders the first response a habit. Participants learned to press a keyboard button (R) when a shape on the screen changed color in order to earn points. A within-subject design arranged three R1-R2 chains (R1-R2, R3-R4, and R5-R6) across six buttons. On a trial, an R1 shape turned blue and presses on the correct button turned the shape back to yellow and turned a second, specific R2 shape blue. When an R2 shape was blue, pressing on a specific R2 button earned a point. Group Brief received eight trials of each chain, and Group Extended received 32 trials with each chain. After learning the three chains, all participants received a revaluation treatment consisting of intermixed trials of R2 extinction and R6 reinforcement. Revaluation was followed by a test that consisted of intermixed R1, R3, and R5 trials. Participants successfully learned the chain task. The test found lower responding on R1 in comparison to the R3 and R5. This revaluation effect remained strong after extended training. Consistent with rat studies, the results suggest that behavior chains involve learning specific associations between responses, and that R2 can function as a goal for R1. This research has potential to enhance our understanding of the associative basis of instrumental behavior and habit learning. Email: Eric Thrailkill, eric.thrailkill@uvm.edu

Vision can contribute to auditory perception by informing the sound field. KEVIN TSANG, DAMIEN MANNION. *School of Psychology, UNSW Sydney* — Auditory signals that reach the ear are comprised of the sound produced at the source after it has been affected by the environmental contributions of the surrounding sound field. The interpretation of a sound source requires one to also consider the environmental contributions that impact the resultant sound at the ear, which can potentially impair its perceptual clarity. For example, a person's speech produced in a church hall will contain properties of the speech signal, as well as the reverberant qualities of the surrounding environment. As vision provides an auxiliary source of environment information, we investigated whether the perception of visual environment information is incorporated during auditory perceptual judgements. We obtained the corresponding auditory and visual environment representations from 10 real-world locations (from the EchoThief database; http://www.echothief.com). Representing the auditory environments of these 10 locations, we extracted the impulse responses and convolved each with anechoic recordings of a word utterance. To represent visual environments, we extracted visual scene panoramas that were presented via an immersive virtual reality display. We presented participants (n = 56) with each pairwise combination of auditory location and visual location. For each presentation, participants judged whether they thought the utterance was produced within the environment that they saw. We hypothesized that participants would be sensitive to the congruence of the auditory and visual environments due to a capacity to infer the sound field from the visual depiction. We observed support for this hypothesis, as participants showed a higher tendency to judge the speech as being produced within the environment for congruent pairings (matching auditory and visual location stimuli), than for incongruent pairings (non-matching auditory and visual locations). Vision can potentially

provide useful information to the disentangling of contributing influences on auditory signals, and the human perceptual system may capitalize on this availability during perception. Email: Kevin Tsang, kevin.tsang@unsw.edu.au

When affordance-based expectations can be different from real motor performance: On the role of experimental induction of mood. COLIN VEGAS, ÉRIC LAURENT. *University Bourgogne Franche-Comté* — "I could have done better". You have most likely heard or said this on many occasions before. Sometimes, we produce a motor performance that is not the expected one. In the present research, we investigated the role of mood in the moderation of expectations derived from the perception of the sitting affordance. In Experiment 1, 43 participants (27 women, 16 men) assessed their maximum seat height (SHmax) from perceptual exposure to different seat heights (perceptual SHmax, i.e., the expected motor performance) and were subsequently asked to perform the act of sitting (motor SHmax, i.e., the real motor performance) without any mood manipulation. To express the intrinsic relationship between participants and their environment, inherent to the affordance concept, the perceptual and motor SHmax they reached were related to their total leg length (L). The results showed that the participants' perceptual SHmax/L was almost identical to their motor SHmax/L. Thus, their expected motor performance from the sitting affordance perception was reliable and consistent with their real motor performance. In Experiment 2, 40 participants (23 women, 17 men) were subjected to a composite mood induction procedure prior to the SHmax expectation task of Experiment 1. Joy, sadness and neutrality were induced. Both joyful and sad participants had a significantly lower perceptual SHmax/L than their motor SHmax/L. Thus, their expected motor performance was an underestimation of their real motor performance. For neutral participants, their perceptual SHmax/L was almost identical to their motor SHmax/L. Therefore, both joyful and sad participants produced a better real motor performance than they had expected. An interpretation based on self-regulation of mood is discussed. Overall, this study highlights that our perceptually determined motor expectations could be influenced by mood, thus shedding light on some roots of our expectations and their reliability. Email: Colin Vegas, colin.vegas@edu.univ-fcomte.fr

No evidence for reduced precision-weighting of prediction errors in autistic adolescents: Evidence from ERPs and behaviour during adaptation. EMMA K. WARD, JAN K. BUITELAAR, SABINE HUNNIUS. *Donders Institute for Brain, Cognition and Behaviour; Freie Universitaet Berlin* — Predictive Processing accounts of autism posit that autistic individuals are less biased by expectations than those without autism when interpreting incoming sensory information, most recently formulated as stronger precision-weighting of prediction errors. Since precision-weighting is fundamental to all information processing, any differences between autistic and non-autistic individuals should be domain general and observable in both behaviour and brain responses. The current study uses gaze-direction adaptation as a test case for the theoretical predictions. The current combined EEG and behavioural study with eye-tracking coregistration investigates whether increased precision-weighting of prediction errors is evident through smaller adaptation after-effects in the behaviour and ERP responses of autistic adolescents when compared to non-autistic peers. Participants viewed stimuli used in previous studies (Jenkins et al., 2006; Pellicano, Ewing & Rhodes, 2013; Ward, Braukmann, Buitelaar & Hunnius, 2020) and responded with button presses whether they perceived the gaze direction as left, direct, or right. Ordinal multi-level modelling showed that both autistic and non-autistic adolescents responded consistent with behavioural adaptation (β = -1.49, SE = 0.16, z = -9.32, estimated p < .001), with no effect of group (β = 0.41, SE = 0.30, z = 1.36, estimated p = 0.16) or interaction between group and experimental condition (β = -0.18, SE = 0.18, z = -1.01, estimated p = 0.31). Cluster-based permutation testing of the ERP responses did not show the expected larger reduction in the N170 or P2 components in response to adapted than unadapted stimuli, and no group difference was detected. The current study is one of the first to take advantage of neuroscientific methods to test specific predictions from theoretical accounts of Predictive Processing in autism. Combined with the few other available studies, the current findings raise challenges for the theory and suggest no fundamental difference in precision-weighting of prediction errors in autism. Email: Emma K. Ward, e.ward@donders.ru.nl

Orienting spatial attention in time: Lateralized alpha power reflects spatio-temporal filtering. MALTE WÖSTMANN. *Department of Psychology, University of Lübeck, Germany* — The deployment of neural alpha (8–12 Hz) lateralization in service of spatial attention is well-established: Alpha power increases in the cortical hemisphere ipsilateral to the attended hemifield, and decreases in the contralateral hemisphere, respectively. Much less is known about humans' ability to deploy such alpha lateralization in time, and to thus exploit alpha power as a spatio-temporal filter. Here we show that spatially lateralized alpha power does signify – beyond the direction of spatial attention – the distribution of attention in time and thereby qualifies as a spatio-temporal attentional filter. Participants (N = 20) selectively listened to spoken numbers presented on one side (left vs right), while competing numbers

were presented on the other side. Key to our hypothesis, temporal foreknowledge was manipulated via a visual cue, which was either instructive and indicated the to-be-probed number position (70% valid) or neutral. Temporal foreknowledge did guide participants' attention, as they recognized numbers from the to-be-attended side more accurately following valid cues. In the magnetoencephalogram (MEG), spatial attention to the left versus right side induced lateralization of alpha power in all temporal cueing conditions. Modulation of alpha lateralization at the 0.8 Hz presentation rate of spoken numbers was stronger following instructive compared to neutral temporal cues. Critically, we found stronger modulation of lateralized alpha power specifically at the onsets of temporally cued numbers. These results suggest that the precisely timed hemispheric lateralization of alpha power qualifies as a spatiotemporal attentional filter mechanism susceptible to top-down behavioral goals. Email: Malte Wöstmann, malte.woestmann@uni-luebeck.de

Remember more with an unexpected event: Violation of expectation erases short-term source amnesia. WENCHEN YAN, MENGJIAO XU, MOWEI SHEN, HUI CHEN. *Department of Psychology and Behavioral Sciences, Zhejiang University, China* — In a dynamic environment, our expectations are often violated by unexpected events, which leaves us uncertain about what information should be retained for future use. In this study we sought to investigate whether expectation violation affects the short-term memory of source information. This issue was addressed by utilizing a robust phenomenon of short-term source amnesia (Chen, Carlson, & Wyble, 2018). Specifically, in Experiment 1 participants were repeatedly asked to judge the congruency between two color representations from a colored square and a color word. Then they were unexpectedly asked to report the source information of a given probed color (either from square or word). This experiment served as a no-expectation-violation baseline that was to be compared with Experiments 2-5 wherein participants encountered an expectation violation. The expectation violation was triggered by suddenly changing the colors of the square and the word identity (Experiment 2), the locations of visual stimuli (Experiment 3), or the pitch of an auditory stimulus accompanying the visual stimuli (Experiment 4) in the surprise trial. The results of Experiments 2-4 consistently showed that participants performance in reporting the source information of the probed color was dramatically improved than that in the control experiment (Experiment 1). Additionally, Experiment 5 employed a double-surprise-trial method to trigger expectation violation by a surprise test, where on the first surprise trial participants were unexpectedly asked to report whether a probed color was presented, and then on the second surprise trial they were required to report the source information of the probed color. The result of Experiments 5 still replicated the finding of Experiments 2-4. In conclusion, these results suggested that expectation violation dramatically improved the short-term memory of source information, implying that the adaptive control mechanism turns to a more explorative mode of information storage after an unexpected event. Email: Wenchen Yan, 21839005@zju.edu.cn

Motion extrapolation in the flash-lag effect depends on perceived, rather than physical speed. JANE YOOK[1,2,3], LYSHA LEE[1], SIMONE VOSSEL[2,3], RALPH WEIDNER[2], HINZE HOGENDOORN[1]. *[1]Melbourne School of Psychological Sciences, The University of Melbourne; [2]Cognitive Neuroscience, Institute of Neuroscience and Medicine (INM-3), Research Centre Jülich; [3]Department of Psychology, Faculty of Human Sciences, University of Cologne* — In the flash-lag effect (FLE), a flash in spatiotemporal alignment with a moving object is often misperceived as lagging behind the moving object. One proposed explanation for the illusion is based on predictive motion extrapolation, which argues that the visual system constantly predicts the position for the moving object in the present moment, in order to compensate for neural transmission and processing delays. In this interpretation, the visual system uses an estimate of the object s speed to generate a prediction, which implies that the FLE should depend on an explicit neural representation. In contrast, alternative explanations of the FLE in terms of differential latencies or temporal sampling should not be dependent on such a representation of speed. Here, we test the extrapolation account by investigating the effect of manipulating perceived speed on the magnitude of the FLE in two experiments. In Experiment 1, we manipulated perceived speed by adding temporal noise to the object, and in Experiment 2 we manipulated the luminance contrast of the object. We show for both manipulations, differences in perceived speed corresponded to differences in FLE magnitude: both perceived speed and FLE were increased when the object contained dynamic noise, relative to static noise, and when it was presented in low relative to high contrast. Moreover, this effect was consistent across two different texture types. Our findings therefore demonstrate that the FLE depends on an explicit neural representation of perceived speed, consistent with the motion extrapolation hypothesis. Email: Jane Yook, jyook@student.unimelb.edu.au

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