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jamovi: A rich, open statistical spreadsheet (and sexy alternative to SPSS)

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Analysis of muscle activation reveals covert responses during selective and non-selective stopping tasks.

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Looking for silver linings, not wallowing in misery—retractions of negative misinformation are effective in dysphoric rumination

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Effects of Item Relatedness on Output Interference in Recognition Memory: A Bayesian Hierarchical Analysis

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Probiotic+Prebiotic supplementation effects on cognition and mood

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Language Distance Drives Adaptive Effects in the Anterior Cingulate Cortex.

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Comparing approach biases towards high- and low-calorie foods when their caloric content is accurately judged

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Quality versus quantity in end of life choices of cancer patients and support persons: a Discrete Choice Experiment

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A cross-cultural comparison of empathy for facial expressions of happiness, sadness, and anger

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Empathy is the sharing and understanding of others’ emotions. Previous self-report studies found that Western females reported a higher level of empathy than Asian females, while no significant cultural difference was found between Western and Asian males. The findings of cross-cultural empathy comparison studies using behavioural tasks are, however, limited and inconsistent. In this study, we asked 61 Australian Caucasians (29 males) and 68 Mainland Chinese (32 males) to finish two self-report scales (viz., Empathy Quotient and Interpersonal Reactivity Index) and two computerised behavioural tasks. In the behavioural tasks, participants were asked to evaluate their emotional and cognitive empathy for facial expressions of happiness, sadness, and anger. The ethnicity of the faces covered both Asians and Caucasians. Results for self-report empathy comparisons replicated previous findings of a significant culture-sex interaction. For behavioural tasks, a significant cultural difference in cognitive empathy for targets depicting happiness was found (i.e., Australians > Mainland Chinese). In contrast, an inverse trend of the main effect of participant culture for emotional empathy for anger was found (i.e., Australians < Mainland Chinese). Finally, for targets depicting sadness, out-group biases (i.e., in-group < out-group target) were found in the Mainland Chinese participant group on both cognitive and emotional empathy, but not in the Australian participant group. The current results highlight the fact that the behavioural expression of empathy is influenced by both the cultural group of participants and the relationship between participants and targets (e.g., in-/out-group biases).
Efficient coding in visual working memory accounts for stimulus-specific variations in orientation recall

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Recall of visual features from working memory shows stimulus-specific variation in both bias and precision. While a number of existing models can approximate the average distribution of recall error across target stimuli, attempts to capture the way in which error varies with the choice of target have been ad hoc. Here we extend Bays' (2014) population-coding model to provide a principled account of these stimulus-specific effects by allowing each neuron’s tuning function to vary according to the principle of efficient coding. This principle states that neural responses should be optimised with respect to the frequency of stimuli in nature. For orientation this means incorporating a prior that favours cardinal over oblique orientations. While continuing to capture the widening of error distributions with set size, the resulting model accurately described stimulus-specific variations in recall error. Furthermore, efficient coding produced a repulsive bias away from cardinal orientations – a prediction that ought to be sensitive to changes in the environmental statistics. We subsequently tested whether shifts in the stimulus distribution influenced response bias to uniformly sampled target orientations. Across adaptation blocks we manipulated the cardinality of non-target items by sampling from one of two bimodal distributions: a congruent (incongruent) distribution with peaks centred on cardinal (oblique) orientations. Prior to adaptation responses were repulsed away from the cardinal axes. However, exposure to the incongruent distribution produced systematically increasing biases away from oblique orientations that persisted post-adaptation. This result confirms the role of prior expectation in generating stimulus-specific effects and validates our neural framework.
Spontaneous perception of numerosity in children and adults

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Humans – including infants – and many other species have a capacity for rapid, nonverbal estimation of numerosity. However, the mechanisms for number perception are still controversial: some maintain that the system calculates numerosity via density estimates – similar to those involved in texture – while others maintain that more direct, dedicated mechanisms are involved. I will present a series of experiments showing that provided items are not packed too densely, human subjects are far more sensitive to variations in numerosity than in either density or area. In a three-alternative forced choice task requiring discrimination along a two-dimensional space spanning density, area and numerosity, subjects spontaneously show far greater sensitivity to changes in numerosity than either area or density. We have extended this line of research with a novel reproduction technique in which subjects match by trackpad as closely as possible the size and density of a sample dot-array. This task is quick and user-friendly, lending itself to developmental and clinical studies. The results are similar to those of forced-choice psychophysics, showing fewer errors along the numerosity than the area or density axes. Children as young as five show similar effects, with greater overall errors but similar selectivity to numerosity. Dyscalculics similarly show a preference for numerosity, but with lower precision. The series of experiments strongly supports the thesis that humans extract number information, directly and spontaneously, via dedicated mechanisms.
The contribution of depth cues in Emmert’s law

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Afterimages appear larger when projected onto a surface that is further away, and smaller when projected onto one that is closer. Emmert’s law provides a mathematical equation for calculating the perceived size of an afterimage when all depth cues are available. This law purports that an afterimage will change in direct proportion to the perceived distance of the projection surface. As perceived distance depends on the availability of depth cues, it is expected that the magnitude of the proportional change will decrease as depth cues are eliminated. We aimed to determine to what extent removing various depth cues affects Emmert’s law. Participants (N = 30) projected afterimages induced by a ring of LEDs onto a board presented at ten distances under binocular, monocular, and eyes-closed viewing-conditions. We calculated the slope of the change in perceived size of the afterimage over viewing distance and then computed how much this slope deviated from the hypothetical slope predicted by Emmert’s law. ANOVA revealed that viewing conditions affected the degree to which the afterimage size deviated from Emmert’s law, \( F(2,58) = 142.91, p < .0001 \). Specifically, our findings show that the perceived size of the afterimages closely reflected the size-distance scaling predictions made from Emmert’s law under binocular viewing-conditions. Adherence to Emmert’s law decreased under monocular viewing-conditions, and a complete breakdown in Emmert’s law was observed under eyes-closed viewing-conditions. This study provides the first demonstration of how perceived size is modulated by the availability of depth cues under conditions of constant retinal image.
Surface curvature from kinetic depth can affect lightness

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The light reaching the eye confounds the proportion of light reflected from surfaces in the environment with their illumination. To achieve constancy in perceived surface reflectance (lightness) across variations in illumination, the visual system must infer the relative contribution of reflectance to the incoming luminance signals. Previous studies have shown that cues to surface shape can affect lightness; the typical perception of two surfaces of unequal lightness that is produced by viewing abutting linear luminance gradients (the Craik-O'Brien-Cornsweet effect) can be altered to an impression of two surfaces of equal lightness if the depiction includes contour or stereo cues that indicate surface curvature. Here, we investigated whether cues to surface shape provided by motion (via the kinetic depth effect) can similarly influence lightness. Human observers judged the relative brightness of patches contained within abutting surfaces with identical luminance ramps. We found that the reported brightness differences were significantly lower when the kinetic depth effect supported the impression of curved surfaces, compared to similar conditions without the kinetic depth effect. This demonstrates the capacity of the visual system to use shape from motion to "explain away" luminance gradients, and supports the cue-invariance of the interaction between shape and lightness.
Potential links in a causal relationship between poor reading and anxiety

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There is solid evidence for an association between reading and anxiety disorders, which are each associated with numerous comorbid emotional health, behaviour, and executive function problems. However, we currently do not know how or why these two common childhood disorders are associated. The aim of this study was to identify potential links that might be involved in a causal relationship between poor reading and anxiety. We conducted a study with three groups of children aged 8-12 years of age (N=65). Groups comprised anxious poor readers (n=34), non-anxious poor readers (n=14), and anxious typical readers (n=17). Participants completed a 2-hour cognitive assessment that comprised reading and spelling tests and emotional health questionnaires. Data were analysed using a three-way analysis of variance with follow-up group comparison t-tests. We discovered that anxious poor readers had significantly poorer irregular word reading, poorer self-concept (i.e., reading attitudes, perceived reading competence), and poorer executive functions (i.e., shifting, planning and organising) than non-anxious poor readers. We also discovered that anxious poor readers had significantly higher social anxiety and significantly poorer working memory than anxious typical readers. In terms of theory, these findings suggest that irregular word reading, social anxiety, self-concept, and executive functions are potential links in a causal relationship between poor reading and anxiety. In terms of clinical practice, these findings suggest that clinicians working with poor readers should be equipped to both assess and treat poor readers for anxiety. As well as improving their well-being, this may increase their response to evidence-based reading intervention.
Adults’ sensitivity to graphotactic differences within the English vocabulary

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Different writing systems, even those that use the same letters, differ in how those letters combine. For example, English and Welsh have some different graphotactic patterns. The present study tested the idea that the English vocabulary includes Latinate and basic subsystems and that skilled readers are sensitive to some of the graphotactic differences between them. In three experiments, university students saw pairs of nonwords and were asked to choose the item in each pair that appeared more wordlike. Participants were more likely to select an item with an onset and an ending that suggest the same system (e.g., phalid, with the Latinate onset ph and the Latinate ending id) than an item with a mismatch (e.g., shalid, with the basic onset sh and the Latinate ending id). Participants also used the presence of a double versus a single medial consonant as a marker of the system to which an item belongs. For example, consistent with the low rate of medial consonant doubling in Latinate words, participants were less likely to pick the item with the double medial consonant in the pair flobbic versus flobic, where the ending is Latinate, than in the pair flobbest versus flobest, where the ending is basic. The results suggest that skilled readers have learned about some of the graphotactic differences between Latinate and basic words and do not treat English as a monolithic system. This may benefit reading and spelling, for correspondences between spellings and pronunciations sometimes differ as a function of a word’s origin.
Are orthographic skeletons formed with and without semantics? Evidence from eye movements

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There is thought to be a causal relationship between children’s oral vocabulary knowledge and their word reading. Initial evidence (Wegener et al., 2017) suggests a cognitive mechanism that supports this link: oral vocabulary knowledge, along with knowledge of sound-to-letter mappings, permits the formation of spelling expectations, or orthographic skeletons, even before written words are seen. Here, we asked what oral vocabulary knowledge is needed for children to generate orthographic skeletons: is semantic knowledge required, or is knowledge of a word’s pronunciation sufficient? Grade 4 children (N=83) were taught either the pronunciations and meanings, or only the pronunciations, of one set of 16 novel words while another set were untrained. Spellings of half the items were predictable from their phonology (e.g. nesh) while the other half were unpredictable (e.g. koyb). Trained and untrained items were subsequently shown in print for the first time, embedded in sentences, and eye movements were monitored. Across all measures (first fixation duration, gaze duration, total reading time) there was a significant two-way interaction between training and spelling predictability, consistent with the formation of spelling expectations. This interaction did not vary with training type (phonology and semantics vs. phonology only). These findings suggest that children formed expectations of the spellings of written words before those written words were seen. However, there did not appear to any clear indication that knowledge of the meanings of words gave rise to stronger spelling expectations than knowledge of only the phonology.
who needs qstn mrks :) Young people’s responses to the spelling, punctuation, and emoji of digital messages

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Digital communication is an important part of most young people’s lives, and often involves the unconventional writing style “textese” (hey pete!! :) ). However, we know little about how young people perceive others who use textese. In Study 1, we investigated how teenagers’ perceptions of (fictional, teenage) text message writers varied as a function of whether the messages were written to a friend or a teacher, and with no, medium, or high levels of textese-style spelling. Participants were 92 Grade 8 students. We found that participants perceived those who used high levels of textese to teachers (compared to friends) as being less appropriate, less attentive to detail, less intelligent and less friendly, than those who used less textese to teachers. In Study 2, we examined adolescents’ behavioural responses to requests written by text message, characterised by the presence or absence of emoji (smiley faces) and conventional punctuation (question marks). Participants were 45 Grade 5-8 students. We found that the presence/absence of a question mark had no effect on students’ tendency to comply with a message’s request, or to use appropriate punctuation in their reply. However, messages containing an emoji made participants more likely to comply with the message, and to use emoji themselves, than messages without an emoji, or with an emoji combined with standard punctuation. Together, these studies suggest that far from being careless communicators, young people are sensitive to even small changes in others’ writing style, and vary their judgements and responses accordingly. Implications for communication are discussed.
Knowing when you haven't been shown enough: The development of children's sensitivity to the clarity of causal demonstrations

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Much of what children learn comes from the explanations others provide them with; what they are told, rather than what they have discovered for themselves. Shafto, Landrum and Eaves (2015) suggest children simultaneously learn about the world from others and learn which of these informants to trust. The selective trust paradigm, where two informants provide a child with conflicting information about familiar objects, has repeatedly demonstrated that from 3 years old children will selectively trust previously accurate object-labellers to provide them with new object labels over previously inaccurate object-labellers (Mills, 2013). Whilst this is an interesting and robust finding, it does not address whether preschoolers can a) simultaneously learn new information from others whilst being selective and b) evaluate informants who vary in the quality or clarity of the information they provide, rather than overall accuracy. The present research sought to address these gaps by investigating whether 68 preschoolers and 53 school-aged children could learn new information from informants, i.e. the causal functions of a novel toy (see: Bonawitz & Schulz, 2007), whilst evaluating their teacher-quality, i.e. their capacity to know how much information to impart. Whilst all children learnt how to use the novel toy, only school-aged children preferred to learn new information from the previously clear informant who allowed them to make this initial correct inference. Preschool children failed to be selective. Regular experience of a formal teaching environment and the growth of Working Memory Capacity (WMC) are discussed as possible explanations for school-aged children’s greater epistemic vigilance towards ambiguous informants.
Enhancing extinction learning: Occasionally reinforced extinction eliminates spontaneous recovery, but not necessarily reacquisition, of extinguished responding

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Background: Fears underlying anxiety and stress disorders are commonly treated with exposure-based therapies, which are based on the principles of extinction learning. While these treatments are efficacious, fears may return after successful treatment. Past research suggests that post-extinction recovery of fear could be reduced through extinction training that involves occasional presentations of the aversive unconditioned stimulus (US), paired with the conditioned stimulus (CS). Here, we examined whether extinction training with occasionally paired or unpaired USs is superior in the reduction of fear recovery to conventional extinction training. Method: Following differential fear conditioning to neutral cues, participants (N=72; M=21.61 years, SD=3.95) underwent non-reinforced or occasionally reinforced extinction training. Recovery and reacquisition of extinguished responding were assessed after a 10-min break. Results: Presentation of paired and unpaired USs, but not standard extinction training, eliminated spontaneous recovery of differential skin conductance responses (SCRs). Our results further suggest that explicitly unpaired, but not paired, training may guard against rapid reacquisition of differential SCRs. No benefits of occasionally reinforced extinction were found on the reinstatement of SCRs or recovery of differential negative CS+ valence. Conclusion: Presenting USs during extinction training was more effective than standard extinction in the reduction of fear recovery, as indexed by SCRs, but explicitly unpaired training was more effective than paired training.
Serial dependencies in body size judgements

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Body size is a salient marker of physical health, with extremes implicated in a range of mental and physical health issues. It is therefore important to understand the mechanisms of perception of body-size of self and others. One hundred and 65 young females participated across two studies. Study 1 developed a novel technique for estimating body size, which we term the bodyline, based on the numberline method in numerosity studies. Participants judged the apparent size of sequentially presented female body images by positioning a marker on a line, delineated with images of extreme sizes. Participants performed this task easily and well, with average standard deviations less than 6% of the total scale. Study 2 compared bodyline data for upright and inverted bodies. Performance was significantly improved for upright relative to inverted bodies, consistent with the involvement of higher level processes in upright body size judgements. Across both studies, data were consistent with regression to the mean. Furthermore, results demonstrated a consistent assimilative bias towards the size of the previously viewed body. The assimilative bias increased with the difference in size of past and present images, up to a maximum effect for a difference of one third the scale, then fell off for larger size differences. This selectivity indicates a highly sophisticated system that assimilates across small but not large size differences. The magnitude of serial dependence, but not of regression to the mean, was well predicted by a simple Kalman-filter ideal-observer model, suggesting that serial dependencies serve a functional role.
Protection from uncertainty in the Exploration/Exploitation Trade-off.

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When making a decision, the Exploration/Exploitation trade-off describes how an organism must often choose between an option with a known pay-off, and another option with an unknown but potentially better (or worse) pay-off. Currently, it is thought that uncertainty drives exploratory behaviour. However, previous research has suggested that uncertainty can be processed differently depending on whether it occurred in an expected or unexpected manner (Yu & Dayan, 2005). To examine this, we design two experiments based off the ideas of Latent Cause Theory (Gershman & Niv, 2012). We show that when participants are exposed to uncertainty gradually, they make fewer exploratory decisions than when exposed to uncertainty suddenly, even if the level of uncertainty is the same (an effect we call “Protection from Uncertainty”). However, when exploration is assessed through participant attention (using eye-tracking, Beesley et al., 2015), there is no difference between groups, suggesting some level of dissociation between attention and responding. We explore two possible explanations for why this might be the case. One explanation is that, while participants can readily transfer an explicit decision rule from certainty to uncertainty when uncertainty is introduced gradually, attention is driven entirely by prediction error (which is equal across conditions when the task is uncertain). Another possibility is that participants may perceive it to be more costly to make a sub-optimal decision than increase their attention to environmental cues, when both may have useful information to help participants perform better on the task.
Identity priming effects are orthographic, not phonological: Evidence from English and Japanese

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Masked priming tasks have been used widely to study early orthographic processes - the coding of letter position and letter identity. Recently, using masked priming in the same-different task Lupker, Nakayama and Perea (2015, JEP:HPP) reported finding a phonological priming effect with primes presented in Japanese Katakana, and English target words presented in the Roman alphabet, and based on this finding, argued that many effects in the same-different task in the literature could be based on phonology and not orthography. Here we point out that their experiment in fact does not speak to the issue of whether priming observed with orthographically similar primes is phonological, rather than orthographic. We then report experiments using words and pseudowords written in the Roman alphabet to investigate this question. The results indicate that the priming produced by orthographically similar primes in the same-different task for letter strings presented in the Roman alphabet is almost exclusively orthographic in origin, and phonology makes little contribution. The same was found when using single letter stimuli presented in Japanese (syllabic) kana and (logographic) kanji. We offer an explanation for why a substantial phonological priming effect is observed only when the prime and target are in different writing systems.
Investigating attentional scaling and selective spatial enhancement

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Recent research suggests that endogenous changes in the spatial scale of attention (i.e. narrowing versus broadening attention) selectively influences processing mediated by the parvocellular visual channel. (i.e. spatial acuity, and not temporal acuity). However, this model of selective spatial enhancement (SSE) has only been tested using one specific method of attentional induction: a shape inducer paradigm (e.g. Goodhew, Shen, & Edwards, 2016). Here, we proposed that this shape inducer paradigm may have selectively primed the parvocellular mediated, ventral visual channel. That is, the observed finding of SSE may have been a result of the specific method of attentional induction used, rather than reflecting the effect of attentional scaling on vision more broadly. To address this, we developed a new method of attentional induction which would engage the magnocellular mediated dorsal visual channel: a motion inducer paradigm. To manipulate attention, the motion inducer was presented at different spatial scales. The effect of this manipulation on visual processing was then measured using spatial and temporal acuity tasks. If attention scaling effects are the result of the specific method of attention induction used, this motion inducer should selectively influence performance on a magnocellular related tasks (temporal acuity), leaving performance on parvocellular related tasks (spatial acuity) uninfluenced. However, contrary to this, we found that changes in the size of the motion inducer selectively influenced parvocellular mediated processing. This pattern of results supports the SSE model of attention scaling.
Neural bases of rhythmic entrainment in humans: critical transformation between cortical and lower-level representations of auditory rhythm

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The spontaneous ability to entrain to meter periodicities is central to music perception and production across cultures. There is increasing evidence that this ability involves selective neural responses to meter-related frequencies. This phenomenon has been observed in the human auditory cortex, yet it could be the product of evolutionarily older lower-level properties of brainstem auditory neurons, as suggested by recent recordings from rodent midbrain. We addressed this question by taking advantage of a new method to simultaneously record human EEG activity originating from cortical and lower-level sources, in the form of slow (<20Hz) and fast (>150Hz) responses to auditory rhythms. Cortical responses showed increased amplitudes at meter-related frequencies compared to meter-unrelated frequencies, regardless of the prominence of the meter-related frequencies in the modulation spectrum of the rhythmic inputs. In contrast, frequency-following responses showed increased amplitudes at meter-related frequencies only in rhythms with prominent meter-related frequencies in the input but not for a more complex rhythm requiring more endogenous generation of the meter. This interaction with rhythm complexity suggests that the selective enhancement of meter-related frequencies does not fully rely on subcortical auditory properties, but is critically shaped at the cortical level, possibly through functional connections between the auditory cortex and other, movement-related, brain structures. This process of temporal selection would thus enable endogenous and motor entrainment to emerge with substantial flexibility and invariance with respect to the rhythmic input in humans in contrast with non-human animals.
Proactive control through temporal expectancy does not influence emotion-induced blindness

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Providing participants with advance information about an attention task often allows them to recruit proactive control, enabling them to reduce interference by anticipating it. The degree to which proactive control reduces interference from emotional distractors is not well understood. In some cases, such as in spatial attention tasks, proactive control has been found to reduce emotional interference. However, in emotion-induced blindness (EIB) tasks, the benefits of proactive control appear smaller. In EIB, participants view rapid streams of images and are asked to detect and respond to a target that appears soon after a distractor. Performance is typically impaired when the distractor is emotional, compared to neutral, and one suggestion is that EIB reflects perceptual competition between targets and emotional distractors. Here, we gave participants advance knowledge of when the distractor (Exp 1) or target (Exp 2) would appear in the rapid streams to see whether such temporal expectancy can reduce EIB. Participants first completed EIB trials in which the distractors (or targets in Exp 2) were randomly interspersed across a number of serial positions. In the second half, one group continued the same task whereas a second group was accurately informed that the distractor (or target; Exp 2) would appear in a fixed serial position. Results showed that the two groups did not differ in performance in either experiment. Consistent with notions that EIB may reflect relatively early perceptual competition, it may be more resistant to the influence of proactive control via temporal expectancy than other measures of emotional interference.
Age-related difference in large-scale spatial learning

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Spatial learning ability often declines in old age, but not all elements of this ability are affected by aging in the same way. Specifically, it has been shown that older adults have increased difficulty in learning a spatial layout through first-person navigation, but their skills in learning the layout by reading a map are preserved relatively well. Currently, this finding is limited by the fact that first-person navigation and map reading typically differ both in perspectives from which spatial information is acquired (first-person versus aerial views) and in orientations that individuals experience during learning (variable egocentric orientations versus a constant, usually north-up, orientation), making it unclear whether the differential age-related changes of spatial learning stem from processing of perspectives or orientations. To address this issue, in the present study spatial layouts were presented to younger and older participants from an aerial perspective, while varying the orientations of the layouts in the same manner as in first-person navigation. Older participants’ spatial learning performance in this hybrid condition was equivalent to that in the first-person navigation condition, which was less accurate than that in the map-reading condition. On the other hand, younger participants learned the layouts equally well in all three conditions, indicating that the difference between the conditions was unique to the older participants. Together, these results suggest that changing orientations, but not any specific perspectives, are difficult to process for older adults, causing the selective decline of spatial learning through first-person navigation in later life.
The contribution of covert and overt spatial attention to perceptual decision making.

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Our visual world is vast, complex and, without a filtering mechanism, computationally overwhelming. Spatial attention solves this problem by filtering the relevant aspects of a scene from the irrelevant. Typically, spatial attention is focused through two complementary forms of orienting: covertly (without eye movements) and overtly (with eye movements). While appropriately focused spatial attention certainly improves visual perception, little is known about the individual contributions of covert and overt attention to perception. Across 2 experiments participants completed an orientation discrimination task while a central arrow (experiment 1) or peripheral cue (experiment 2) directed attention covertly and instructions directed eye movements. Results revealed both covert and overt attention to have a separate influence on performance. Consistent with previous studies, the mere preparation of an eye movement towards the target improved discrimination performance. More surprisingly however, performance was also better when the arrow or cue correctly indicated target location, regardless of which direction a saccade was prepared. Even when an eye movement was prepared in the opposite direction to the target, covertly oriented attention still improved detection. LBA modelling revealed both covert and overt orienting mechanisms to influence performance by modulating the rate of evidence accumulation. These results suggest that covert and overt attention both individually contribute to perception and that covert attention may not always be tied to the goal of a saccade.
Experience in action: The moderating role of culture in near-hand space

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To generate a coherent percept of our visual environment, both the dorsal and ventral pathways must work together to process the available sensory information. In typical studies of visual perception, the relative contributions of the two visual pathways are often determined by manipulating stimulus properties (e.g., spatial and temporal frequencies; Livingstone & Hubel, 1988). More recently, research has demonstrated that hand proximity to the visual stimuli can also modulate the relative balance of dorsal and ventral pathway contribution, by increasing the contribution of dorsal processing when the hands are placed near the visual stimuli; a phenomenon commonly known as “altered vision near the hands” (Gozli, West, & Pratt, 2012). Evidence from a separate literature indicates the culture can have remarkable effects across a variety of attentional and perceptual tasks (e.g., McKone et al., 2010). Although not explicitly tested, these differences may reflect differences in the relative contribution of dorsal and ventral pathways. Here, the present study focused on the influence of cultural experience on the modulation of dorsal and ventral processing in visual perception near the hands. Using a global motion task to measure dorsal sensitivity, we observed a significant effect of cultural experience on visual perception near the hands. Specifically, Asian, but not Caucasian, participants exhibited improved global motion thresholds when the hands were placed near versus far from the visual stimuli. These findings provide evidence that cultural experience is one factor that moderates the magnitude of dorsal enhancement in near-hand space.
Tackling the elusive relationship between task switching and working memory capacity

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Working memory capacity (WMC) and task switching are widely used to assess executive functioning. Although each of these constructs has been extensively studied independently, there has been comparatively little research done exploring their association. From a theoretical perspective, one would expect a relationship between performance on these tasks, as both are purported to measure executive attentional control. However, most studies have failed to find such a relationship. To explore these perplexing findings, an initial study examined the relationship between WMC and task switching using a variety of switching paradigms. This study revealed an interesting pattern of results in which switch costs and WMC were only related in low WMC participants. It was hypothesized that such findings may have emerged if high WMC participants were not required to fully recruit their attentional resources during the switching task. A second study used a switching paradigm designed to more heavily tax attentional control, however it did not replicate the results of study 1. One reason that we did not find the expected relationship between switching and WMC may be our use of switch costs as the dependent measure. The standard switching paradigm confounds task switches with cue switches, and does not allow for the separation of task and cue switch costs. A third study, designed to isolate the specific component of switch costs reflecting attentional control will perhaps allow us to shed some light on this elusive relationship.
Male nurses and female builders: uncovering the cognitive basis of gender stereotypes

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Stereotypes are beliefs about a person that are based on their group membership. Stereotypes facilitate expectations about the characteristics of individuals within a certain groups. For example, we are more likely to expect a nurse to be female rather than male and construction builder to be male rather than female. We offer and test a cognitive, attention-based account for stereotypes and counterstereotypes. In a nutshell, we propose that judgments concerning an individual could be affected by their group membership due to the failure of selective attention: When making judgments about others, people fail to attend exclusively to the individual’s attributes (profession) and instead take into account beliefs about the group (gender), which they should have ignored. Our experiments used an adapted version of Garner’s speeded-classification paradigm. Participants were presented, on each trial, with an image of a female or a male employee, nurse or builder, and had to classify the profession and ignore the sex of the present figure. Response-time measures allow us to assess selective attention and thus the extent to which participants succumb to irrelevant category information -- stereotypical beliefs.
Morphological processing without semantics: An ERP study with spoken words

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The time-course of morphological processing during spoken word recognition was investigated using event-related brain potentials (ERPs) in an auditory lexical decision task. We compared three different types of French words: truly suffixed (‘farmer’, comprising the stem ‘farm’), pseudo-suffixed (‘corner’, comprising ‘corn’) and non-suffixed words (‘cashew’, comprising ‘cash’). Affixed and non-affixed nonwords were also tested. The behavioural results showed that participants responded slower to non-suffixed words than to truly suffixed and pseudo-suffixed words, but there was no difference between the two suffixed conditions. Moreover, participants made more errors rejecting suffixed nonwords than non-suffixed nonwords. The EEG results showed a greater late N400 effect for non-suffixed words than for truly suffixed and pseudo-suffixed words. Again, there was no difference between the two suffixed conditions. In addition, we found a stronger late N400 effect for both affixed and non-affixed nonwords than for words. The latency of the onset of this effect varied between the three experimental conditions: the word-nonword difference occurred earliest in the truly suffixed condition, slightly later in the pseudo-suffixed condition and latest in the non-suffixed condition. Both behavioural and EEG data concurrently suggest that spoken words with a genuine morphological structure and words with a pseudo-morphological structure are decomposed into morphemic sub-units, independently of semantics. Moreover, the earlier appearance of the N400 effects in the truly suffixed condition suggests that morphological information is more rapidly available in words with a genuine morphological structure.
Using experience sampling data to examine the independence of scales in episodic memory

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The current study examines whether memories of different time scales (i.e., week, day, hour) are used independently (i.e., independence of scales). Previous studies examining the problem have relied on using historical events, media events, and events logged in personal diaries. However, these events usually happened only once and are more salient (e.g., John F. Kennedy’s assassination) than the events people encounter in everyday life. To overcome the limitations of previous studies that have low ecological validity in selecting the test stimuli, we used experience sampling technology. In the study, participants wore a smartphone around their neck for two weeks, which was equipped with an app that automatically collected time, images, GPS, audio, and accelerometry. After a one-week retention interval, participants were presented with an image that was captured during their data collection phase and tested on their memory of when the event happened (i.e., week, day of week, and hour). Using pointwise mutual information between different time scales, we find that, in contrast to previous studies, memories of different time scales were not retrieved independently in everyday life between all scales. Additionally, we replicated previous laboratory findings such as correlations between confidence rating and memory performance, and patterns found between valence rating and memory accuracy.
Do emotional images change how we direct our attention?

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Although healthy individuals direct more attention to the left, a phenomenon known as pseudoneglect, these asymmetries can be modified by the presence of distracting stimuli. We know that both visual and auditory distractors have the ability to influence the strength of leftward biases; however, does the emotional content of a distractor impact its "distractibility"? Across two experiments, we examined whether emotional distractors impact attentional asymmetries, and whether these effects are dependent on the visual field location of the distractor. We presented emotional distractors in conjunction with line stimuli. In Experiment 1 we varied the valence of the images, and controlled for arousal ratings. By contrast, we varied both valence and arousal in Experiment 2. Experiment 1 findings revealed distractors in the upper visual field increased leftward biases, regardless of valence. Although our data from Experiment 2 suggest positively valenced images increase asymmetries more than negatively valenced images, we also found arousal ratings mediated this finding. Overall, our data provide corroborating evidence that the visual field location of a distracting stimuli is important in determining how this stimulus directs our attention. Further, we provide novel findings that show both the emotional content and the arousability of distractors impact how strongly our attention is directed toward a particular spatial location.
Visual cues to sound source distance do not necessarily increase loudness constancy in a simulated reverberant environment

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Sound waves reduce in intensity over distance. Because of this, signals reaching the ear are affected by both the intensity of the sound produced and by the distance between the sound producer and the sound receiver. Loudness constancy involves discounting the intensity changes at the ear that are due to distance, allowing perception of the intensity of a sound at its source (its loudness). Loudness constancy has been demonstrated in reverberant environments, where individuals can identify the loudness of a sound source across different distances. Although visual cues have been found to influence auditory cues in a range of multisensory tasks, the role of vision in forming loudness percepts has not been resolved. Here, we tested the hypothesis that vision can contribute to loudness constancy by providing an estimate of sound source distance. We delivered sounds (noise bursts), via headphones, from a recording of a loudspeaker in a semi-reverberant hall at four distances (2.44m, 3.44m, 4.88m, and 6.9m). We used a two-interval forced-choice task to measure the points of subjective loudness equality with sounds from a reference distance (1.22m). There were two between-subjects conditions: audio-only (n=36) and audio-visual (n=34), with the latter showing a visual depiction of the loudspeaker during auditory presentation. We find that participants exhibited intermediate levels of loudness constancy in both conditions, with little indication of an influence of visual cues. Our findings corroborate evidence towards loudness constancy being a capability that is solely supported by auditory cues.
Visual statistical learning of diagnostic features in match-making decisions

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Our ability to learn visual statistical information from the environment is innate and unconscious. It underlies many important cognitive processes, such as language development and second language acquisition. It may also improve the pattern-matching performance of forensic science examiners who evaluate complex visual evidence (e.g. fingerprints). Knowledge of statistical information may be key to the accuracy of examiners on pattern-matching tasks. The statistical frequency of visual features provides information about how likely it is that two samples of evidence ‘match.’ For example, if two samples share a rare feature they are more likely to ‘match’ than two samples that share a common feature. However, no research has examined whether pattern-matching performance is associated with statistical learning.

Participants were exposed to 120 exemplars of complex patterns across two experiments. We then measured their statistical learning and pattern-matching accuracy. In Experiment 1, participants were able to differentiate between rare and common features yet statistical learning was not significantly associated with pattern-matching ability. Furthermore, patterns that shared rare features were mistakenly considered less likely to ‘match’ than those sharing common features. This suggests that participants misunderstood the diagnosticity of rare and common features. In Experiment 2, we attempted to correct this misunderstanding through training. The results will be discussed. This is the first research to examine whether statistical learning is associated with pattern-matching performance and has important practical applications for the training and selection of forensic examiners.
A meta-analysis of the size-weight illusion: Quantifying the contribution of visual and haptic/somatosensory information

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The size-weight illusion (SWI), whereby the smaller of two objects of equal mass feels heavier, is a robust and well-studied illusion, although the underlying mechanisms remain unclear. One account attributes the SWI to bottom-up processes, proposing that during lifting, the body directly perceives certain object-related variables that are interpreted consciously as weight. These theories include a critical role of haptic/somatosensory size-information in the illusion; however, evidence regarding the relative contributions of haptic and visual input is mixed. We conducted a meta-analytic review of the SWI literature to quantify the contribution of visual and haptic information to illusion strength. Following literature searches and emails to authors, we included data from 27 studies (4 unpublished) comprising perceptual heaviness estimates for SWI stimuli (same mass, different volume). We compared mean perceptual estimates for stimulus pairs (i.e., smaller vs larger) within each experiment, and calculated 157 effect size observations ($d$), weighted by sample size. Results demonstrated a comparable SWI across the following conditions: with vision, without haptic feedback ($k=21$; mean weighted $d = 2.09$, 95% CI 1.90-2.28), with haptic feedback, without vision ($k=30$, mean weighted $d = 2.19$, 95% CI 2.07-2.32) with both visual and haptic feedback ($k=106$, mean weighted $d = 1.95$, 95% CI 1.89-2.01). Findings suggest that visual and haptic information elicit a comparable SWI, with no additive effect of the modalities. Results do not support views that haptic/somatosensory information is critical to the SWI, instead suggesting an alternative mechanism. Publication bias remains an issue and will be investigated in future analyses.
Fractal statistics in multisensory aesthetics

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Our aesthetic preferences are partly shaped by a unique response to fundamental statistical properties that characterize natural scenes. These properties appear to be intrinsically fractal in nature – both in regards to their intensity and geometric variations. At certain optimal levels, our brains respond to and process these properties with remarkable efficiency. The investigation of fractal statistics has so far been restricted mainly to art stimuli and the visual modality – however, it can also manifest in other sensory modalities. We will outline the development of techniques for creating stimuli with parametrically equivalent fractal scaling properties across different sensory modalities, specifically vision and touch. We will describe three recent exploratory studies, which investigated the perception and aesthetic evaluation of fractal scaling properties in tactile surfaces and compared them to that of visual fractals. Studies 1 and 2 address the subjective perceptions of fractal surfaces and identify the specific properties that predict aesthetic preference for these surfaces. Study 3 directly compared the tactile and visual modalities to determine whether preference for specific fractal scaling statistics is a cross-modal phenomenon. We capitalize on both 2AFC methods and rating scales to gauge aesthetic responses across the two modalities. We also adopt two forms of dimensional reduction analyses to systematically investigate the patterns of individual variations both within and across different sensory modalities. Overall, our studies introduce the importance of fractal scaling statistics and interindividual differences in aesthetic research and elucidate their potentially interconnected contributions in multisensory perception and aesthetics.
Does Attentional Engagement and Disengagement Bias to Angry Faces Change after Attention Bias Modification Training?

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It has been established that attention bias to disorder related stimuli is an important factor in the aetiology and maintenance of disorders. The dot-probe task (DPT) is the most widely used task to measure and modify attention biases. Recently, gamified attention bias modification training (ABMt) has emerged and gained a lot of interest as it is more acceptable to clinical populations than the DPT. The chase the face (CTF) task is a new application of ABMt that has shown promising results. However, little is known about the processes underlying the change in attention bias after ABMt. Processes underlying attention bias are thought to be enhanced engagement and delayed disengagement. These processes were not dissociated in most previous research. The Attentional Process Assessment (APA) task does dissociate these processes, as it controls the locus of initial fixation and uses a neutral baseline. The present study assessed attentional engagement and disengagement bias towards neutral and angry faces pre-and post-ABMt using a modified version of the APA-task. Furthermore, both the DPT and CTF-task were employed as training between subjects. The main interests of this study were: a) to establish whether the modified APA-task could dissociate attentional engagement and disengagement bias towards faces, b) whether training would change the processes underlying attention biases and, c) whether the new gamified training alters similar attentional processes as the DPT. The modified APA-task did dissociate enhanced engagement and delayed disengagement of attention to emotional faces, however, there were no effects of ABMt in either training group.
Latency of imminent eye movements predicts the perceived position of their targets

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Transmission delays in the nervous system pose strong challenges on the localisation of moving objects, because the brain must rely on outdated information to determine their position in space. Effectively functioning in the present requires not only that the brain compensates for the time lost in the transmission and processing of sensory information, but also for the expected time that will be lost in the preparation and execution of motor programs. Importantly, in order to effectively interact with a moving object, the timing of the execution of the motor command must relate to the spatial location of its target – otherwise the target will be missed.

In the visuomotor system, where sensory and motor processes are tightly coupled, this makes the intriguing prediction that the perceived position of an object should be correlated with the latency of saccades aimed at it. Here we use the flash-grab effect to induce visual mislocalization, and show a simple linear relationship between saccade latency and target mislocalization. Although such a relationship in the flash-drag illusion has previously been interpreted in terms of a dissociation between “vision for action” and “vision for perception”, we show that the pattern of results is explained more parsimoniously by a direct, linear relationship between mislocalization and saccade latency. Altogether, we show that the visuomotor system uses both the spatial and temporal characteristics of the upcoming saccade to localize visual objects.
The semantic Stroop effect is controlled by endogenous attention

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The semantic Stroop effect refers to the interference caused by colour-related distractor words not in the response set (e.g., LEMON presented in red) relative to colour-unrelated words (e.g., MERCY presented in red). The finding that the size of semantic Stroop effect is not modulated (e.g., by colouring a single letter) has been used to argue that semantic retrieval is automatic and cannot be controlled. Here, we used a manipulation of endogenous attention assumed to modulate task control – namely, the proportion of non-linguistic neutral trials (###s). Neutral proportion magnified the interference for colour-neutral words relative to the neutral trials in all four experiments. The semantic interference effect was weak when colour associated words were presented in an incongruent colour (e.g., LEMON in blue), and it did not interact with neutral proportion (Experiments 1 & 2). However, when colour names not in the response set were presented in an incongruent colour (e.g., RED in blue, when red is not one of the response colours) there was a strong semantic interference effect, which interacted with neutral proportion (Experiments 3 & 4). We take these results as evidence that the semantic retrieval can be controlled using endogenous attention.
The remarkable independence of visual features... delimited

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Visual features could “float free” if no binding process intervened between sensation and conscious perception (Treisman, 1980). If instead a binding process precedes conscious perception, it should introduce dependencies among the featural errors that one makes. For example, when multiple objects are presented close in space or in time, an erroneous report of one feature from a neighboring object should more often than chance be associated with a report of the other feature from that neighboring object. Yet researchers have repeatedly found this not to be true, for features such as color, orientation, and letter identity (Bundesen et al., 2003; Kyllingsbæk and Bundesen, 2007; Holcombe & Cavanagh, 2008; Vul & Rich, 2010). These remarkable findings of free-floating independence raise difficult questions about when and how feature binding occurs. They have inspired surprising conclusions, such as that features are not bound until they enter memory (Rangelov & Zeki, 2014). In two experiments, we find independence of temporal errors when reporting simultaneous letters from two streams that are far apart, much like the independence observed in the literature for other stimuli. But when the streams were presented very close to each other, a positive correlation was found. Experiment 1 found this for English letters and Experiment 2 for Chinese character radicals tested with readers of Chinese. These findings suggest that, in this case at least, a distance-dependent visual process mediates binding and thus that binding is not post-perceptual. In discussion, a broader view of visual feature binding will be offered.
Preferential recall of autobiographical memories from 10-30 years of age by people over 30 years is termed reminiscence bump. We have examined the plausibility of the narrative/identity account, rooted in Erikson’s psychosocial development theory, of the reminiscence bump in three studies. The first study accumulated autobiographical memories activated by the fidelity- and love-related statements as Erikson’s two early stages, Fidelity (identity/role confusion) during adolescence and Love (intimacy/isolation) during early adulthood, roughly corresponded with the bump period. The results revealed distinctive bumps: fidelity-related statements activated significantly more memories from adolescence (10–19 years), whereas Love-related statements activated more memories from the first half of early adulthood (20–29 years). The second study accumulated autobiographical memories induced by the self-generated “I am …” identity statements and found bumps at 11-30 years for both positive and negative identity cues, revealing the fact that negative autobiographical memories could also form bumps if the memories are identity congruent. The third study gathered autobiographical memories activated by the participants’ dominant personality statements, showing a bump for 11-30 years as well. Findings from all three studies indicate that the bump is made up of periods when people develop their adult-identity, acquire dominant personality traits, and form social relationships, thus lending further support to the narrative/identity account.
Attribute amnesia is greatly reduced (and possibly eliminated) with novel stimuli

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Attribute amnesia is the counterintuitive phenomenon where observers are unable to report a salient aspect of a stimulus (e.g., its colour) immediately after the stimulus is presented, despite both attending to and processing the stimulus. Almost all previous attribute amnesia studies used highly familiar stimuli. Our study investigated whether attribute amnesia would also occur for unfamiliar stimuli. We conducted four experiments using stimuli that were highly familiar (colours or repeated animal images) or that were unfamiliar to the observers (unique animal images). Our results revealed that attribute amnesia was present for both sets of familiar stimuli, colour (p < .001) and repeated animals (p = .001); but was greatly attenuated, and seemingly eliminated, when the stimuli were unique animals (p = .02). Our findings impose an important limit on attribute amnesia: it occurs only when the distractor stimuli in the test phase of the surprise trial are familiar. This finding contradicts the consolidation theory of attribute amnesia and cannot be accounted for by proactive interference either. Although attribute amnesia is a very robust laboratory finding, it doesn’t seem to occur as readily in real life. Our experiments explain why. Because observers are able to notice even minor changes to the presentation of an object, for attribute amnesia to occur in real life the observer would need to be repeatedly shown the exact same objects in the exact same states. In practice, this generally doesn’t occur, which is why attribute amnesia rarely occurs in the real world.
Eating with eyes – comparing eye movements and food choices between overweight and lean individuals in a real-life buffet setting

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Researchers have long sought to pinpoint factors underpinning individual differences in eating behaviour. Emerging data from eye-tracking studies have suggested that attentional biases to food exist among individuals and food types. However, such studies have thus far relied on the use of food images and computerised tasks, limiting real-world implications. Whether there is a causal relationship between attentional bias and food intake remains unclear. In this presentation, we will introduce a study that tested 32 healthy male participants (16 being overweight) for attentional biases in an ad libitum buffet setting, using wearable eye-trackers. The eye-tracking analyses suggested that food types (e.g., sugar) moderated visual fixation biases (p<0.05), whereas BMI was associated with pupil responses to food (p<0.05). In addition, findings from the study revealed tripartite relationships between eye-tracking, self-reported measures, and ad libitum intake. Although visual fixation in the “view” condition was correlated with liking for high-calorie food, further analyses showed that this measure was not a strong predictor of food selection. Instead, visual fixation during a goal-oriented task might be a key predictor for food selection. In contrast, neither eye-tracking nor self-reported measures could adequately predict selection of desserts, implicating distinct decision-making processes for different types of food. Overall, this study provides important insights into individual differences in attention and decision-making process for food.
Why are faces more attractive in a group? Multiple mechanisms underlie the cheerleader effect

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The ‘cheerleader effect’ occurs when the same face is perceived to be more attractive when seen in a group than alone. Group displays are automatically summarised by the visual system to create an average of the ensemble. Encoding of group displays occurs hierarchically, which results in an individual item from the group being recalled as more similar to the ensemble average than it truly was. Crucially, averageness is a highly attractive trait in faces. Therefore, does the cheerleader effect occur because an individual face seen in a group is recalled as being similar to the ensemble average, which is a highly attractive, average face? To investigate whether hierarchical encoding causes the cheerleader effect, observers gave attractiveness ratings for target faces shown in groups with two distractor faces or objects, and once alone. A significant increase in attractiveness occurred for faces presented in groups for which the ensemble average had average facial characteristics: those with two unique distractor faces, and groups consisting of different photographs of the same person. However, the cheerleader effect was only significantly reduced, but not eliminated, when the ensemble average was not an average face, and hierarchical encoding could not occur: groups containing identical images of the target face, and groups that presented images of houses as distractors. Curiously, we also observed a significant cheerleader effect for groups of entirely non-human stimuli. Although hierarchical encoding appears to contribute to the cheerleader effect, our findings demonstrate that hierarchical encoding is not the only mechanism that underlies the effect.
Vergence eye movements direct others’ attention in 3D space

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Vision is an active sense and, as we explore the world with our eyes, the direction of our gaze provides others a signal as to the focus of our attention. Research has established that others’ direction of gaze reflexively guides our attention within our visual field, serving as a crucial social cue when coordinating attention with others during joint action and word-object association learning. A forward-facing pair of eyes in humans and other animals not only enables us to converge our gaze to the precise depth at which an object is located, but also potentially informs others about how far away we are looking. However, very little is currently known about the perception of others’ gaze vergence, and whether the vergence of an individual’s eyes can be used by others to determine the precise focus of that person’s attention in 3-dimensional space. Here, we applied an attentional orienting paradigm in a 3-dimensional stereoscopic setting and found that observers consistently detect targets more quickly when they are at a depth congruent with another person’s eye vergence compared to when they are at an incongruent depth. These findings reveal that our representation of others’ gaze is specific not just to their line of sight but rather to particular locations in 3-dimensional space signalled by eye vergence.
Energy drink consumption is increasing worldwide, especially among young adults, and has been associated with negative health outcomes, ranging from headaches and anxiety, to fatal caffeine toxicity. In two experiments, we tested the prediction that energy drink consumption is in part driven by automatic cognitive processes (attentional and approach biases), with a view to modifying these to reduce consumption. Young adults (18-25 years) who regularly consume energy drinks completed the dot probe (Exp.1; N=116) or approach-avoidance task (Exp.2; N=110) to measure attentional and approach bias for energy drink cues, respectively. They then underwent a cognitive bias modification protocol where they were trained to direct their attention away from pictures of energy drink cans (Exp.1), or to push a joystick away from themselves in response to these pictures (Exp.2). Following a post-training assessment of attentional (Exp.1) or approach bias (Exp.2), energy drink consumption was measured by an ostensible taste test. Regular energy drink consumers showed both an attentional and an approach bias for energy drink cues. Cognitive bias modification successfully reduced both biases. Approach bias modification, but not attentional bias modification, reduced energy drink intake, although not statistically significantly so. The results lend support to dual-process models which emphasise automatic processing as a key driver of consumption. At a practical level, approach bias modification could offer potential scope as an intervention for reducing energy drink consumption. However, more extensive training may be required beyond the single session used here.
Social Categorisation but not Individuation Motivation is related to the Own-Age Bias

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We tend to be more accurate to recognise faces of people similar in age to us than people much younger or older than us, an effect termed the own-age bias. One explanation for this bias is that unfamiliar own- and other-age faces are quickly categorised by their age when first encountered. Based on this initial categorisation, other-age faces are deemed less socially relevant and are processed more superficially, with attention to category relevant characteristics, whereas own-age faces are processed in more detail with attention to individuating characteristics. This subsequently leads to better recognition of own-age than other-age faces. Based on this explanation, the own-age bias should be reduced when participants are instructed to individuate of other-age faces. Additionally, the magnitude of the own-age bias should be related to relatively faster categorisation of other-age than own-age faces. To test this, participants were presented with a number of young and older adult faces to remember. Half of the participants were given instructions to individuate the older adult faces. In a separate task, participants also categorised the same faces by their age as quickly and accurately as possible. In a subsequent recognition phase, participants were more accurate recognising young adult than older adult faces. The magnitude of this own-age bias was not influenced by individuation instructions but it was positively correlated with a tendency to categorise other-age faces more quickly than own-age faces. These results suggest that social categorisation processes (but not individuation motivation) contribute to the own-age bias.
Wrapping up Sentence Comprehension: The Role of Task Demands and Individual Differences

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Successful discourse comprehension requires integration of information within and between clauses and sentences. This study uses ‘wrap-up effects’ on eye movements – increased fixation durations at clause and sentence boundaries - to investigate how integrative processes are modulated by reading comprehension demands and differences in reading proficiency. Skilled adult readers, assessed on independent measures of reading, spelling and vocabulary ability, read 2-3 sentence passages that manipulated whether a syntactic boundary was unmarked by punctuation cues, weakly marked by a comma, or strongly marked by an end of sentence period. Comprehension demands were manipulated by comparing counterbalanced blocks in which moderately demanding comprehension questions were presented after either 25% or 100% of sentences. Consistent with previous research, wrap-up effects were principally due to regressions to earlier in the sentence, suggesting that they reflect processes involved in integrating the information retrieved from the words of the sentence. High comprehension load was associated with longer total reading time and more fixations, but had minimal impact on the pattern of wrap-up effects. Average comprehension accuracy was equivalent under high and low comprehension demands but performance in the two conditions was only weakly correlated at the individual level (r=0.13): some readers showed poorer performance in more demanding conditions, while others performed substantially better in the high demand condition suggesting that they applied shallow reading strategies when comprehension demands were low. The implications of these findings for understanding how the processes involved in self-regulating comprehension are modulated by reading proficiency and comprehension goals will be discussed.
Investigating predictive and counter-predictive cueing effects in a spatial orienting paradigm with eye tracking

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Inhibition of return (IOR) is a robust cognitive phenomenon thought to facilitate novelty-seeking behaviour that inhibits attention from returning to recently attended locations. However, when the first stimulus provides predictive information regarding the location of an upcoming target, behavioural responses to the target are normally facilitated rather than inhibited. In order to investigate the manner in which these facilitatory and inhibitory mechanisms interact over time, the current study manipulated cue predictability in a traditional spatial cueing paradigm and tracked the time course of both cueing and predictability effects on saccadic reaction times (SRTs). Participants (\(n = 55\)) completed a computerised target localization task that involved either predictive (75\%), non-predictive (50\%), or counter-predictive cues (75\%) and randomly varied cue-target onset asynchronies (CTOAs) (900 ms, 1200 ms, 1500 ms). The time it took for individuals to move their eyes to the target was recorded with an eye tracking device. Planned comparisons were conducted between cued and uncued trials to examine behavioural cueing effects in each condition. SRTs were also analysed with separate 2 (Cueing) \(\times\) 3 (CTOA) ANOVAs for each level of cue predictability and it was found that both non-predictive (\(p = .007, \eta^2 = .69\)), and counter-predictive cues (\(p < .001, \eta^2 = .86\)), resulted in behavioural inhibition, whereas predictive cues did not lead to any significant cueing effect (\(p = .297, \eta^2 = .06\)) under these conditions. These findings suggest that cue predictability leads to facilitatory cueing effects that are additive with IOR.
Experimental design can induce apparent cross-species differences in decision-making strategy

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Theories of perceptual decision making have been dominated by the assumption that decisions involve a process of accumulating evidence in favour of different alternatives until some fixed threshold level of evidence is reached, which triggers a decision. Recent theories have suggested an alternative strategy where thresholds are not fixed during each decision, but rather decrease as time passes - an assumption known as "collapsing thresholds". Previous findings have suggested that humans appear to use fixed thresholds, and non-human primates appear to use collapsing thresholds. There are many potential explanations as to why humans and monkeys might use different decision-making strategies. Here, we focus on a previously overlooked feature of the experimental procedure from a high-profile study that has been widely used as a pivotal evidence base for collapsing thresholds (Roitman & Shadlen, 2002, Journal of Neuroscience): when monkeys made decisions, their trial-by-trial feedback, and its associated reward for correct responses, was withheld until a response was registered or a minimum time post-stimulus onset had elapsed, whichever came later. This feedback delay is atypical from the perspective of almost every perceptual decision-making task in the human literature. When experimentally tested, we found that feedback delays mirroring the non-human primate methods caused humans to switch decision-making strategy from fixed to collapsing thresholds. We conclude that simple aspects of the experimental procedure can have large effects on theoretical conclusions. We also caution against over-reliance on particular data sets in the literature.
The effects of concurrent action on imagined walking duration: A dual-process theory of mental locomotion

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Mentally simulating an action and actually performing it follow similar temporal dynamics, suggesting that they engage some of the same motor and cognitive mechanisms. However, mental simulation of walking might challenge this notion, as the duration of imagined walking is often underproduced compared to the duration of real walking. Further, marching in place during imagined walking aligns these times, raising a question as to what mechanisms cause the underproduction of imagined walking duration and its elimination by concurrent action. The current study addressed this question by performing imagined walking, with no leg movements, under two conditions. First, it was hypothesised that marching externalises the rhythmic elements of walking, allowing for accurate scaling of imagined walking duration. To test this, participants made the rhythmic elements explicit by clapping their hands in time with imagined steps. Imagined walking duration remained underproduced, rejecting the rhythm externalisation hypothesis. Second, it was hypothesised that marching activated implicit representations of walking from procedural memory, where timing of relevant movements is accurately expressed. To test this, explicit representations of walking were supressed through a distractor task, allowing implicit representations to control imagined walking. Imagined walking duration became equivalent to real walking duration, supporting the implicit representation hypothesis. These results revealed involvement of explicit and implicit representations in imagined walking, suggesting that the underproduction of imagined walking duration is a property of explicit representations, while accurate production is attributable to implicit representations. Future research could assess the applicability of this dual-representation theory to other types of motor imagery.
Individual differences in temporal anticipation and adaptation during rhythmic interpersonal coordination

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Skilled joint actions such as musical ensemble performance showcase the human ability to coordinate movements with rhythms produced by other individuals by anticipating and adapting to each other’s action timing. While temporal anticipation and adaptation are grounded in fundamental sensory-motor mechanisms, the capacity for precise interpersonal coordination is nevertheless characterized by individual differences. The current study investigated these individual differences in a joint drumming task requiring paired participants (N=80) to synchronize with one another under conditions of varying difficulty (constant vs. variable tempo) and leadership (leader assigned vs. not assigned). Results indicated that interpersonal synchrony was lower for the relatively difficult variable-tempo task than the constant tempo task, especially when leader-follower relations were assigned. Application of a computational model that quantifies the degree to which each individual engages in temporal anticipation and adaptation revealed that leaders generally did not adapt to followers, creating an asymmetry that apparently was not conducive to coordination. Furthermore, while leadership assignment did not reliably influence the degree of anticipation, unrelated individual differences in anticipation between pair members affected interpersonal synchrony (asymmetrical anticipation was associated with low synchrony). Additional analyses examining potential contributions of personality to these asymmetries suggested that effects related to adaptation were associated with locus of control (attribution of life events to internal causes) while anticipation was linked to empathy (perspective taking). Temporal anticipation and adaptation thus work together during complex forms of real-time interpersonal coordination, but the degree to which their interaction is beneficial is modulated by individual differences in personality.
How does foveal processing difficulty affect parafoveal processing during reading?

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Models of eye movement control during reading assume that the difficulty of processing a fixated word modulates the depth of processing of the upcoming word (or words) in the parafovea. This foveal load hypothesis is widely accepted in the literature despite surprisingly few replications of the basic effect. We sought to establish whether observing a foveal load effect depends on the type of parafoveal preview used in the boundary paradigm. Participants’ eye movements were recorded as they read sentences in which a high- or low-frequency word (word n) preceded a critical target word (word n + 1). Prior to the reader making a saccade to word n + 1, the parafoveal preview was either identical to the target; an orthographically similar word or nonword; or an unrelated word or nonword. The results revealed that the critical effect—an interaction between word n frequency and word n + 1 preview—was entirely attributable to the unrelated nonword baseline. The remaining conditions produced completely additive effects of the two factors. These findings raise questions about the presumed mechanisms underlying the foveal load effect. Implications for theories of reading are discussed.
Bias of non-spatial attention: Effects of dominance and prestige based social status

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The dual pathway theory of social status posits that status can be attained through either dominance (power & intimidation) or prestige (skill & respect) pathways. Individuals high in either dominance or prestige are known to more readily attract gaze and spatial attention than their low status counterparts. However it is not known if social status also influences attention capture in the absence of attentional shift requirements. To address this issue, the present research used an attentional blink paradigm to explore non-spatial attentional biases in response to variations in levels of dominance and prestige. The results of the series of studies indicate that participants were biased to allocate attention to low dominance individuals relative to their high dominance peers, but that prestige manipulations had no effect on attention allocation. Outcomes from these studies suggest that workings of comparatively earlier processing stages are tuned to physical features associated with low dominance.
Assimilative serial dependency on aesthetic ratings of artworks

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Our current visual perception can be systematically biased towards that of the recent past. Known as positive serial dependency, it has been shown for various low-level visual features and facial attractiveness. In the current study, we tested whether serial dependency is present in aesthetic ratings of artworks. A set of 100 paintings describing scenery and still life was collected through online archives. For each of 24 participants, 40 paintings were randomly selected from the set and each was rated 20 times in a random order. Paintings were presented for 1 s followed by a slide bar that was used to rate attractiveness. For each participant, we averaged the 20 ratings of each painting and classified the 40 painting into one of 5 attractiveness levels. Serial dependency was measured for each observer by categorizing their response on each trial according to the attractiveness distance from the previous trial (difference in attractiveness between the current and previous paintings). The data were pooled across participants and fitted with a serial dependence model. Results showed that the current painting earned significantly higher aesthetic ratings when participants viewed a more attractive painting on the previous trial, compared to when they viewed a less attractive one. The serial dependency magnitude was greatest when the attractiveness difference between consecutive paintings spanned two attractiveness levels. This finding shows that positive serial dependencies in perception are not limited to low-level stimuli: high-level judgements such as aesthetics are also assimilated towards the recent past.
Event-Based Prospective Memory (EVPM) requires remembering to perform intended deferred actions when particular stimuli or events are encountered in the future. In the laboratory, the EVPM paradigm engages participants in an ongoing task, with a requirement to make an alternative response to occasionally presented PM target stimuli. These paradigms typically present a simple, static stimulus on each trial, with no time pressure to respond. We recently put forward the ‘Prospective Memory Decision Control’ (PMDC) model (Strickland et al., under review), which uses the linear ballistic accumulator (Brown & Heathcote, 2008) to measure possible effects of capacity sharing between PM and ongoing tasks, proactive control over thresholds and reactive control on PM trials. We have already fitted PMDC to basic paradigms, and found that EVPM leads to tonic proactive control over ongoing task decision thresholds, as well as reactive inhibition of ongoing task processing on PM trials. We have not found capacity sharing between PM and ongoing tasks. In the current study, we fitted PMDC to an applied task: simulated maritime surveillance. The task required classifying ships travelling along a display in the presence of significant time pressure and perceptual noise. The EVPM intention required an alternative response to ships with certain target features. Consistent with basic PM paradigms, we found reactive inhibition of ongoing task processing on PM trials. We also found proactive control over ongoing task thresholds with PM load. In contrast to basic paradigms, we found evidence of capacity sharing between PM monitoring and the ongoing task.
Assessing the cost-free account of ensemble processing with spatial cueing

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Decades of research shows that withdrawing attention from a visual stimulus leads to an impairment in the processing of that stimulus. However, the processing of ensemble statistics suffers very little, or even not at all, from attentional withdrawal (e.g., Bronfman, Brezis, Jacobson, & Usher, 2014): a result consistent with a “cost-free” account of ensemble coding (Huang, 2015). Notably, most of the studies in the ensemble coding literature have used the dual-task paradigm to manipulate attention. However, this paradigm is limited in its ability to control the locus of attention and yield results that can be attributed solely to attentional processes. Previous studies have also tended to operationalize ensemble coding with stimuli that lack ecological validity. In light of these limitations, we used the well-established Posner (1980) cueing procedure to investigate the effect of attentional withdrawal on the perception of ecologically valid ensemble statistics: Glass patterns and global motion stimuli. For both tasks, performance was significantly worse when attention was misdirected than when the cue guided attention to the location of the stimulus. In view of these results, we refute the strong version of the cost-free hypothesis and encourage the need to consider attentional manipulations other than the dual-task paradigm.
A capacity limit on processing words, revealed by visual field effects

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When two letters embedded in serially presented streams are presented concurrently and briefly, and the task is to report both letters, participants make more errors on one stream than the other. The capacity limit that prevents accurate report of both letters has been linked to implied reading order (left to right in English, yielding a right-side deficit). Does the capacity limit occur at a stage at which individual letters are processed, or where representations of words have been formed? We investigated this by comparing deficits found when the two stimuli are letters with those found when the two stimuli are words. When streams were presented to the same hemifield (in a vertical configuration), report accuracy for both letters and words was poorer for the lower stream, indicating that the capacity limit is likely to occur at a stage after letters are combined to form words. Intriguingly, presenting the streams in a horizontal configuration replicated the previously documented right-side deficit for English letters, but resulted in a left-side deficit for the English words. While the left deficit for words is superficially explained by an influence of lateralised language centres in the brain, many theories of hemispheric specialisation suggest that this influence ought to extend to letters, too. A nuanced account of visual field effects for linguistic stimuli will be proposed.
Media multitasking, dual task ability and inhibitory control

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With recent development in technology, media multitasking is an ever-increasing phenomenon. Although most studies associate frequent media multitasking with poorer cognitive performance, findings in the literature have been mixed, with some studies suggesting the opposite. The aim of the current study was to investigate the relationship between media multitasking, dual task ability and inhibitory control. In Experiment 1, 83 participants completed a media use questionnaire, and a psychological refractory period (PRP) task in which they were presented with a letter and a tone task at varying intervals. In Experiment 2, 144 participants completed the media use questionnaire, cognitive measures of impulsivity (go/no-go task and stop signal task) and self-report measures of impulsivity (Barratt Impulsivity Scale and Self-Control Scale). Results showed that heavy and intermediate media multitaskers performed better on the PRP task than light media multitaskers. Despite their higher impulsivity, heavy media multitaskers were also better at inhibiting already initiated motoric responses in the stop signal task. However, they were less attentive and made more omission errors than light media multitaskers in the slow-paced go/no-go task. These results suggest that media multitasking may have benefits as well as drawbacks, highlighting the complexity of the relationship between media multitasking and cognition.
Can you keep a secret or fight red dragons? Children’s use of subtle facial displays of emotion to make trait judgements of trustworthiness and dominance is not adult-like

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We examined whether children’s implicit trait judgements are influenced by subtle expressions of emotion. In the context of a digital storybook, adults and children (4-10 years) were shown two images of the same identity (n=6 identities) and asked which ‘twin’ they would prefer to help them meet a challenge that required a trustworthy or dominant partner (n=36 trials). One twin displayed a neutral expression and the other a subtle (30%) expression of happiness, fear, or anger. Whereas adults’ selection of angry and happy partners was modulated by trait, children’s selection was not; children simply preferred happy expressions and avoided angry expressions—a pattern that was replicated by a second group of children tested with intense (60%) expressions. Two follow-up studies investigated why children failed to use facial expressions. We verified that children use expressions to make explicit trait judgements; when asked ‘Who looks nicer/stronger?’ children selected the happy twin more on trust than dominance trials and the angry twin more on dominance than trust trials. We also verified that children understand the relevant trait for each scenario; they selected partners from a red planet (where people are strong) for dominance scenarios and from a blue planet (where people are nice) for trust scenarios. Our findings show that although the pieces of the puzzle (linking expressions to traits and traits to behavioural choices) are in place early, a direct link from expressions to choices develops slowly. Collectively these findings have implications for the development of emotion and trait perception.
Visual search within working memory

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Attention and working memory are two key pillars of cognition. Despite much research, there are important aspects about the relationship between the two constructs that are not well understood. Here we explore the similarity in the mechanisms that select and update working memory to those that guide attention during perception, such as in visual search. We use a novel memory search task where participants memorize a display of objects on a 4x4 grid. During memory maintenance, participants are instructed to update the spatial positions of a subset of objects. This updating process is self-paced—its speed reflecting the accessibility of the to-be-updated subset. Using this task, we explored whether landmark findings in visual search would hold true for memory search. In Experiment 1 (n=12), we found a search asymmetry—it was easier to access memory representations defined by a feature than defined by the lack of a feature. In Experiment 2 (n=12) we found target-distractor similarity effects—updating a single target was easier when the distractors were farther away in feature space. In Experiment 3 (n=12) we found a feature versus conjunction benefit—access times were much faster for instructions to move objects defined by only one feature (e.g., all triangles) as opposed to a conjunction of features (e.g., all red triangles). Taken together, our results suggest a common coding and selection scheme for working memory and perceptual representations.
Learning word meaning with little means: An investigation into the inferential capacity of paradigmatic information

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To what extent can the similarity structure of categories be inferred based on paradigmatic vs syntagmatic information? We explore this question in two studies that aim to capture paradigmatic information directly: first by having participants generate near-neighbors to exemplars from 15 basic categories, and second by having them partially rank the most similar exemplars. After constructing neighborhood graphs of the items in each category, we derived a local measure (based on direct neighbors) and a global measure (including indirect paths as well) of paradigmatic information. Both measures predict independently-obtained human pairwise similarities for each category, but incorporating indirect information substantially improves this prediction. In a third study, we contrast these measures with syntagmatic information obtained from a vast semantic network derived from 3 million judgments. The paradigmatic graphs are better predictors of similarity despite only encoding a fraction of these data. Broad implications for word learning and meaning are discussed.
Individual Differences in Preferred Attentional Breadth Predict Attentional Resizing Efficiency

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One of the core ways that attentional resources can be regulated is the breadth of attention: the tendency to concentrate one’s attentional resources over a small region of space (i.e., ‘narrow scope’ or ‘tunnel vision’), or to spread them over a larger region of space (i.e., ‘broad scope’). Evidence indicates that these different attentional breadths facilitate performance on different types of tasks (e.g., the resolution of fine spatial detail versus processing overall gist for narrow versus broad attentional scopes). This means that in contexts that demand performance on different types of tasks, it is vital to be able to efficiently switch between different attentional breadths. Therefore, the factors that predict an individual’s ability to efficiently resize the scope of attention were examined here. Individual differences in preferred attentional breadth were tested using a standard Global-Local figures task, in which participants’ correct response time to identify the target at the global or local level was used to infer a preference for broad or narrow attentional breadth. Resizing efficiency was measured using a modified Global-Local figures task, where blocks of trials compelled participants to attend to the global or local level on the majority of trials, and then measured their efficiency in resizing to the local or global level on the minority of trials. There was an asymmetric relationship between attentional preference and resizing efficiency, such that a preference for a narrow scope of attention predicted contraction efficiency, but a preference for a broad scope did not predict expansion efficiency.

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Many human behaviours are performed in social settings and involve two or more agents coordinating their actions to achieve a shared goal. Such coordination affords more efficient behavioural performance and is fundamental to human social functioning. Due to rapid advances in virtual-reality (VR) and human-machine systems, cyber-based social interaction has become increasingly ubiquitous. Similar to human-human coordination, the effectiveness of cyber-based collaboration depends on artificial technologies incorporating natural, human-like patterns of behaviour that both support and enhance real-world task outcomes. Ensuring the kind of dynamic, real-time coordination necessary for effective human-machine interaction, requires identifying and modelling the perceptual-motor processes that underlie human multiagent coordination. However, very little research has attempted to model the dynamics of these processes due to the assumed complexity of multiagent activity and the historic computational limits of system identification and optimization techniques. In contrast to this assumption, a growing body of research suggests that many human perceptual-motor behaviours can be modelled using a small, fundamental set of dynamical perceptual-motor primitives (DPMP). At the same time, recent advances in computational power and machine- and deep-learning have resulted in a range of readily accessible tools capable of identifying and optimizing models of complex agent-environment systems. Motivated by these advances, we present recent work illustrating how a fundamental set of DPMP (low-dimensional, differential functions) could potentially be employed to generatively identify and model the behavioural dynamics of multiagent perceptual-motor, and moreover, how such DPMP models could be implemented in artificial systems for effective human-machine interaction.
Is multitasking just a difficulty increase?

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Multitasking has become a way of life. We can listen to music, read a book, or communicate with friends and family at any time thanks to portable devices. Yet this technology comes at a cost. Human capacity for processing information is inherently limited and trying to complete multiple tasks at once (such as driving and conversing on a mobile phone) may over-tax our cognitive resources. Interestingly, much of the literature investigating cognitive overload does not distinguish between multi-tasking and the more general concept of task difficulty or complexity. Indeed, many studies of cognitive workload use a standard n-back or other experimental task with a single-factor manipulation. However, there is some evidence that multitasking incurs a cost in excess of a difficulty increase (Franz, Zelaznik, Swinnen, & Walter, 2001), and limited evidence for neurological processing differences between single and dual-tasks (e.g., Kok, 2001). Our study uses a common framework to manipulate workload through both difficulty increases and additional tasks. We implement decision making models to capture the change in underlying cognitive processes when workload increases. We find that although information processing rate decreases regardless of how load is manipulated, there is a systematic difference between multi-tasking and single-task difficulty increases that is captured by a change in response caution. Our results highlight a theoretically meaningful difference between two sources of cognitive workload and suggest caution should be applied when generalising results from one source to the other.
Changes to eye-hand coordination during online control with healthy ageing

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Although there are notable changes to visual processing and motor control with healthy ageing, there is currently limited evidence about how it affects eye-hand coordination during online control. To address this, we quantified differences in eye-hand coordination between older and younger people during a double-step reaching task implemented under time pressure. Target perturbations could occur at different times during the reach (200, 400 and 600ms), and participants were instructed to point to the final target location. We measured eye and hand position and used chronometric, kinematic and gaze position analyses. Both groups could compensate for a target perturbation that occurred at 200 or 400ms into the reach and accurately touch the final target location. However, both groups demonstrated incomplete updating for the 600ms perturbation. Older participants had significantly increased movement times compared to the younger group. Saccade latencies were generally longer for older participants despite shorter eye-hand latencies. Interestingly, older participants also produced a greater proportion of secondary saccades within the target perturbation condition. This is perhaps a compensatory mechanism as there was no significant group effect on final saccade accuracy. Overall, the pattern of results suggests that eye-hand coordination during online control may be qualitatively different in older participants.
Maybe they’re born with it, maybe it’s the task.

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Are people slower because of slowed processing speed or increased caution? This is the kind of question decision making models such as the linear ballistic accumulator (LBA) can answer. As such, this type of analysis has been increasingly used across multiple tasks and applied contexts. An often implicit, and mostly untested assumption is that the parameter estimates identify the individual’s underlying cognitive processes regardless of the task choice. For example, if you are a cautious responder you will always produce a higher measure of caution, whether in a perceptual motion task or a lexical decision task. We tested this assumption by examining relationships between LBA parameter estimates for the same individuals across two tasks: a visual search task and a match-to-memory task. These tasks had the same stimuli and within-subject manipulation of set size, however required the different cognitive domains of attention and working memory. We found strong evidence of correlations in both the estimates of the model parameters and the observed measures of response time and accuracy across the two tasks. This suggests that when keeping surface level traits of the tasks the same, the parameter estimates of the LBA are sensitive to detecting underlying decision processes regardless of the cognitive domain being tested. Future work examining the effect of stimuli is recommended to further test the reliability and generalisability of parameter estimates.
The unexpected intrusion of new information (e.g., cell-phone ringing) into a person’s immediate environment requires the re-allocation of attentional resources that have already been invested in an ongoing activity, such as performing a problem-solving task. Research examining the impact of that re-allocation on cognitive performances has produced inconsistent results. The aim of the present study was to examine the effect of cell-phone ringing on performance in an arithmetical problem-solving task. We were also interested in whether the effect of cell-phoning ringing on arithmetical problem solving would differ for males and females. It was hypothesized that performance in the arithmetic task would be lower during the presence of cell-phone ringing than in the absence of cell-phone ringing. We also predicted that males would have higher scores than females in the arithmetic task. Sixty psychology students (30 males, 30 females; M = 21 years) participated in the experiment. Cell-phone ringing (present vs. absent) was manipulated within-subjects, with order of presentation of experimental and control conditions counterbalanced across participants. Participants were presented with letter-number sequences, each consisting of 21 uppercase English letters and 6 digits (e.g., AMC6TIDEP9LH4PD2GLXY7HRQ3KI) on a computer screen and asked to add the numbers using a specified rule. The results supported the hypotheses that cell-phone ringing would have a negative impact on performance and that males would outperform females in the arithmetic task. These main effects were modified by a significant gender by distraction interaction, indicating the effect of distraction from cell-phone ringing was greater for males than females.
Look at me! Exploring scan paths and general distraction in gaze-linking.

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‘Gaze-linking’ is a collaborative strategy in which two team members scan separate computer monitors simultaneously while their eye movements are tracked and projected on the other’s display. The current gaze-linking literature contains some inconsistent results pertaining to the effectiveness of gaze-linking. The present study posits that two mechanism are most likely to account for these inconsistencies: general distractibility of the gaze cursor and overlapping scanning patterns. The aim of the current research was to disentangle general distractibility and overlapping scanning patterns by slightly modifying traditional gaze-linking methodology in one experimental condition. Participants completed an unguided search task within an independent and two gaze-linked conditions. One gaze-linked condition consisted of traditional gaze-linking, whereas the other consisted of a gaze-linking procedure with an inverted gaze cursor (reversed gaze-linking), such that the gaze position of each team member was projected to their partner in the opposite position of the monitor. The current study found no difference between traditional and reverse gaze-linking procedures, which suggests that the gaze cursor is generally distracting and reduces collaborative visual search performance.
Scene recognition across variations in illumination caused by time of day

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Variation in the prevailing illumination presents a challenge for the visual system when attempting to identify and retain information about the environment. Although the perception and recognition of objects tends to be tolerant to changes in illumination, costs have been reported in the accuracy and speed of behavioural judgements. However, few studies have investigated the impact of illumination change on the capacity for recognising physical locations from visual information. Here, we investigated the effect of illumination variation, caused by different times of day, on the capacity of human observers to recognise the physical locations depicted in short video sequences. Participants studied a set of locations from the viewpoint of a car that was navigating a suburban neighbourhood at either midday or in the afternoon. Recognition sensitivities when the time of day of the video sequences differed between study and test were similar to those obtained when the time of day of the video sequences was the same between study and test. This is consistent with participants being able to discount the effects of differing illumination when performing scene recognition in this particular scenario.
Even Arbitrary Norms Influence Moral Decision-Making

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We have a strong tendency to copy other people when making decisions. This tendency to conform to the norm has been used to influence behaviour in a variety of applied settings, from decreasing tax evasion to increasing organ donation. Despite this, we still do not have a good idea of why people tend to follow the norm. One explanation is that people follow the norm because the normative option is likely to have the greatest utility. Another common explanation is that people follow the norm because they fear incurring social sanctions if they do not. Fundamental to these explanations is the assumption that norms always reflect people’s values and preferences. In a series of experiments, we presented participants with descriptive norms that were said to have arisen due to errors in a random-allocation process. Crucially, the presented norms were understood not to reflect other people’s preferences or values. Surprisingly, we repeatedly found that participants had a strong tendency to follow these arbitrary norms when confronted with moral dilemmas. Our data convincingly demonstrates that people do not just follow norms due to their presumed utility or due to a fear of social sanctions. Other mechanisms, such as self-categorisation, are needed to explain our findings.
To pass or not to pass: how ethnicity influences interpersonal distance

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When interacting with others, we maintain a personal space boundary. This is an individual “buffer zone” that influences the amount of physical space we require between us and others in order to feel comfortable. This interpersonal distance can differ depending on whether we are encountering others from our ingroup or outgroup, how comfortable we are in social settings, and how we feel about our body. We investigated the effects of ethnicity, social anxiety and body dissatisfaction on interpersonal distance. Full body photographs of Asian and Caucasian people, facing each other, were projected onto a screen. The space between the images formed an aperture, which varied in width. Participants saw either photographs or silhouettes and imagined walking through the aperture. They judged whether they could pass without rotating their shoulders. Interpersonal distance was the spatial requirement deemed necessary for collision-free passage. Social anxiety and body dissatisfaction questionnaires were also completed. Caucasian participants’ interpersonal distance was significantly smaller for Caucasian compared to Asian stimuli, whereas Asian participants required similar distances for both Asian and Caucasian stimuli. For both groups, social anxiety and body dissatisfaction were unrelated to interpersonal distance. Hence, the ethnic majority (Caucasians) required a smaller interpersonal distance from their ethnic ingroup, compared to their outgroup. Conversely, the ethnic minority (Asians) did not demonstrate this ingroup favouritism. This is likely because it assists them to develop cross-race friendships and therefore feel less socially isolated.
No support found for the action-specific account of perception in a golf field setting

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The action-specific (AS) account of perception states that a person’s experience of their environment is dependent on their ability to perform in that environment. We conducted an investigation into a known robust effect of apparent size of golf-holes changing depending on putting performance (Witt et al., 2008). We also investigated apparent size of the golf-ball. The study included 14 golfers and 14 non-golfers who putted balls into the holes across 18 course greens, emulating the putting component of a typical round of golf. Following each putting round, the participants completed a size perception task where they were asked to select a ball and a disc from an array of differed sized 3D replica of balls and discs that best corresponded to the apparent size of the real ball and real hole. According to the AS account of perception, the holes and balls should be perceived as being larger if participants performed well. ANOVA indicated that there was no relationship between putting performance and size perception in either group (puncorr = 0.44 – puncorr = 0.80). Correlations between average putts and average size perception was not significant for golf-balls (n = 28, r = .07, puncorr = 0.70, BF01 = 3.97) or golf-holes (n = 28, r = .23, p = 0.24, BF01 = 2.20). We did not replicate past findings, thus action for perception effects may have poor external validity and should be used with caution when implementing training interventions for athletes.
Temporally relevant visual cues improve timing accuracy and coherence of ancillary movements in musical synchronisation

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Ensemble music presents a large-scale case of joint action, wherein many musicians coordinate movements, usually with a conductor who provides a visual beat. We investigated the cognitive and motor mechanisms underlying the link between a conductor’s visual cues and musical timing. Our first experiment tested whether a conductor visual cue improves temporal anticipation and the regularity of ancillary head movements in experts (ensemble musicians, n= 28) and non-experts (no music performance experience, n = 29), and whether these factors improve rhythmic timing. We designed a virtual conductor derived from motion capture recordings of human conductors. Participants observed the virtual conductor, a simple visual metronome, or a stationary circle while completing a synchronization drumming task. We measured asynchronies and temporal anticipation using a drum pad, and head movements using motion capture. Results showed that the conductor visual cue yielded lower asynchronies, higher temporal anticipation, and more structured head movement than the other two visual cues. Multiple regression revealed that high temporal anticipation predicted lower asynchrony (i.e. better performance) in non-experts, while highly rigid head movements predicted higher asynchrony, suggesting that temporal anticipation and non-rigid movements facilitate synchronization. Experiment 2 had participants (N = 30) drum in pairs with different spatial arrangements to investigate how seeing a partner influences synchronization and movement coherence. Preliminary results show that seeing the conductor increases interpersonal coherence of head movements, even when partners cannot see each other. Overall, we found that conductor gestures improve synchronization by increasing temporal anticipation, and improve interpersonal coherence of ancillary movements.
Recognizing speech in noise: Effects of listener age, seeing two talkers and knowing where to look

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Seeing a talker’s face helps speech recognition in noise compared to an auditory only baseline (a visual speech advantage). This advantage is the same for younger and older adults, even though the latter do worse on speech recognition overall. We investigated whether the visual speech advantage is reduced when two talkers (one relevant and one irrelevant) are shown; and whether cuing the relevant talker minimises this disruption. We also tested whether younger and older adults would show the same effects. Twenty younger (9 Females, MAge=24) and 20 older adults (12 Females, MAge=71) were tested. Spoken sentences were mixed with speech shaped noise at -1/-4dB SNRs and randomly presented in four visual display conditions: Baseline (a still face image); Standard visual speech (a video of a single relevant talker); Valid cue (videos of relevant and irrelevant talkers side-by-side); and Ambiguous cue (same as condition 3). The cue consisted of a white box that appeared before the sentence and remained visible until the trial finished. The valid cue surrounded only the relevant talker; the ambiguous cue both videos. Participants were instructed to attend to the space inside the white box and type what they heard. Overall, younger adults performed better than older adults. For both age groups, recognition rates were highest for the Standard condition, and were poorer than Standard but better than Baseline when two talkers were presented. Younger adults benefited from the Valid cue; older adults did not. The role of attention in auditory-visual speech perception will be discussed.
Preparing to access event-based prospective memories

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Event-Based Prospective Memory (PM) tasks require individuals to remember to perform deferred task actions in the future when target events are detected. I will provide a broad overview of experiments that we have conducted to examine the memory access control structures involved in PM retrieval. In the first experiments, we used a PM paradigm in combination with a delayed recognition procedure, and found evidence that participants change how they process ongoing tasks items when they have semantic or multi-target PM task requirements. In further experiments, we used a combined version of a probe recognition test and a delayed recognition test, and found evidence that the memory access requirements differ when attempting to recognise an item from a previously studied multi item set, compared with a single item. We also found evidence that memory access is required, or are at least desirable, even when an individual only needs to recognise a single item that has just been studied. We conclude that during the inter-trial interval between presentations of stimuli of the ongoing task in PM paradigms, participants prepare the memory access control structures that allow ongoing task retrieval and PM retrieval (evidence accumulation) to proceed in parallel after the stimulus is presented. If individuals are not prepared to treat ongoing task stimuli as PM cues by preparing the required memory access control structures, they may not necessarily accumulate evidence for the PM task at all.
Emotional Expressions Reduce the Own-Age Bias

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We are better at recognising faces of our own age group compared to faces of other age groups. It has been suggested that this own-age bias (OAB) might occur because of perceptual-expertise and/or social-cognitive mechanisms. While there is evidence to suggest a role of perceptual-expertise, little research has explored the role of social-cognitive factors. To do so, we looked at how the presence of an emotional expression on the face changes the magnitude of the OAB. Across three experiments young adult participants were presented with young and older adult face to remember. Neutral faces were first presented alone (Experiment 1) to validate the proposed paradigm, and then presented along with angry (Experiment 2), sad or happy faces (Experiment 3). The presence of an emotional expression improved the recognition of older adult faces, reducing the OAB which was evident for neutral faces. These results support the involvement of social-cognitive factors in the OAB, suggesting that a perceptual-expertise account cannot fully explain this face recognition bias.
Forewarning upcoming distractors paradoxically increases emotional distraction.

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Irrelevant emotional stimuli are potent distractors. To what extent can we ignore emotional distractors when we are pre-warned that they will appear? In three experiments, we explored how pre-cueing upcoming distractors influences control of distraction. In Experiment 1, 62 participants responded to a target letter while attempting to ignore unpredictably presented distractor images. Distraction was indexed by slowed responding on distractor-present relative to distractor-absent trials. On half of distractor-present trials, a visual pre-cue indicated with 100% validity that a distractor would be presented on the upcoming trial. The distractors were equally likely to be emotionally negative, positive, or neutral. Despite instructions to use the cues to help ignore the images, cues actually enhanced distraction. Impairment is not simply due to the cues interfering with task performance; in a second pre-registered experiment (n = 62), we found that cues had no influence on distraction when the distractors were all emotionally-neutral, suggesting that the detrimental effect of cues depends on the emotional context. In a third pre-registered experiment (n = 62), cues indicated the specific valence of the upcoming distractor. Findings replicated that of Experiment 1, with enhanced distraction on cued trials for all three distractor valences. Taken together, these findings suggest that, in emotional contexts, warnings create an attentional set that leaves people open to distraction.
Do Confidence Ratings Unintentionally Prime Confidence?

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Confidence ratings have often been integrated into reasoning and intelligence tasks as a means for assessing metacognitive processes. It is often assumed that eliciting these judgements does not influence participants’ underlying cognitive performance. The current set of studies examines whether eliciting confidence ratings from participants during a fluid-reasoning task influences their performance and how this effect is moderated by participants’ pre-existing self-confidence in their own reasoning abilities. We will present data from four experiments that suggests that confidence ratings influence performance by priming participants’ pre-existing self-confidence, rather than enhancing their metacognitive monitoring. Implications for the measurement of metacognition and possible avenues to minimise the unintentional effects of confidence ratings will be discussed.
Complexity matching during the disclosure of a concealable stigmatized identity

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This current study is the first of its kind to incorporate concepts from dynamical systems theory and embodied social cognition to propose a framework for exploring experimental social psychological phenomena. Namely, we investigate how information during disclosure of a concealable stigmatized identity (CSI) may be embodied during social interaction. Concealable stigmas refer to any identity or group membership that has the potential, when revealed, to be social devaluing and is related to a host of negative interpersonal, cognitive, and psychological outcomes. The present research investigated changes in the complexity of interpersonal postural activity (PA) during a disclosure. In Study 1, 42 participants with a CSI enacted a disclosure event to both a close-other and a professional-other. PA was recorded at the head and waist using Polhemus motion tracking sensors. Depth array videos were recorded using an Xbox Kinect. Detrended fluctuation analysis (DFA) was employed to index the complexity of PA and revealed differences as a function of target. Videos created in Study 1 were shown to 90 participants in Study 2 and PA was again captured at the head and waist. DFA was then used to index the complexity of participants’ PA as well as the degree of correlation between the complexity PA of Study 2 participants and the PA exhibited by the Study 1 participants (i.e., simulated discloser and confidant complexity matching). The results provide evidence that disclosure context is indeed embodied in our complexities of postural activity. Implications for promoting positive disclosure experiences will be discussed.
Since 1979, probe tone experiments have procured insight into the cognition of tonality in music. Participants are first played context setting stimuli, after which a probe tone is sounded and participants are asked to rate how well it “fits” the context. The context is normally composed in order to establish a tonal centre and ratings are assumed to describe the resulting stability profiles. Data from these experiments has been modelled by the statistical prevalence of notes in a tonal music corpus but more accurately by the spectral pitch similarity of the probe to the notes in the context. Exploring the hypothesis that the stability profiles might emerge intrinsically from the notes of the context stimulus, the notes of the context – those of several scales commonly, and rarely employed in Western tonal-harmonic music – are uniformly, randomly distributed. All chromatic notes are probed, along with common triads; participants rate either goodness-of-fit or stability on a 7-point Likert scale. Goodness-of-fit ratings were found to differ insignificantly from stability ratings apart from in a few specific cases, including the leading-tone and leading-tone triad. For probe tones, models of the data based on spectral pitch similarity outperform models considering statistical prevalences of notes in appropriate corpora, but for triads the opposite is true. Either tonality indeed emerges intrinsically or learnt stability profiles are robust enough to be triggered by such a stimulus design. The experiment provides a modus operandi for further work testing novel microtonal scales to explore possible bottom-up explanations for tonality.
Biting off more than you can process: Group differences in cognitive workload

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Cognitive workload is crucial when operating in environments which require keen concentration and continual task switching. These environments require operators to be able to effectively detect and respond to important task-relevant stimuli. Cognitive workload is restricted by capacity and is generally assumed to be higher in groups that experience these environments on a daily basis. 53 participants, which included 25 RAAF personnel and 28 undergraduate students, completed our dual task design. The RAAF personnel were JTAC trainees who had been selected for their higher cognitive processing (as indexed by RAAF testing procedures). The two simultaneous tasks were completed online and included a detection response task (DRT) and a multiple object tracking task (MOT). The DRT required participants to detect and respond to a short visual stimulus which occurred frequently throughout the task. The MOT required participants to track several moving objects and had three levels of load; no load, low load and high load. Results indicated that the DRT was sensitive to measuring the changes in load elicited by the MOT. Furthermore, the RAAF personnel were faster and more accurate on the task than the students across all conditions, indicating a higher cognitive capacity. Results should be taken with caution as participants completed the task in varying environments, however, follow up experiments will address these issues.
The importance of subsyllabic structure in visual word recognition.

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Monosyllabic words (e.g., PREACH) include a vowel (e.g., EA) optionally preceded by a consonantal onset (e.g., PR) and followed by a consonantal coda (e.g., CH). Further, it has been argued that the vowel adheres more closely to the coda than to the onset in the proficient reading of English. The research reported here examined this idea by presenting unique vowel-coda combinations (i.e., "bodies", such as -EBT from DEBT) and onset-vowel combinations (i.e., "antibodies", such as SOI- from SOIL) and asking participants to decide whether a real word is created when a single letter is added to the fragment in the indicated position. It was found that fewer errors were made to body fragments than to antibody fragments, supporting the idea that onset-body structure is represented in lexical memory. Moreover, the magnitude of the body advantage correlated with reading proficiency on the RT measure, suggesting that better reading is associated with greater sensitivity to the onset-body structure of words.
Differential Effects of Task Type on the Localisation of Manual Tactile Stimuli in Dual-Task Scenarios

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Trojan et al. (2014) contended that few studies have concerned the localisation of tactile stimuli at the fingertips – the same can also be said for studies concerning dual-tasks in tactile perception. The current study aims to add to this small battery of findings – in particular, if mislocalisation occurs in a biased manner, and if the allocation of attentional resources affects tactile dual-tasks in the same way found in other senses. Each experiment in the current study uses vibrotactile stimuli. A series of pilots used to choose the task for the main experiment partially or fully replicated the results from previous experiments conducted by the current authors. In the main experiment, a localisation task is conducted on one hand whilst a simultaneous task is conducted on the other, either the same type (i.e. localisation) or a different type (i.e. low-level discrimination). The pilots and the main experiment revealed that sensitivity varies as a result of finger (i.e. fingers on the periphery are localised more reliably than fingers in the centre of a hand), and also as a result of task (i.e. an increase in the number of stimuli and temporal cluttering will result in poorer outcomes). In the main experiment, the effect of the secondary task on sensitivity is severe when the secondary task is the same task type, also washing out the peripheral benefits observed in the primary task alone – however, that is not the case when it is a different task type.
Evidence for response-boundary adaptation in two-choice decision tasks

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Diffusion models of two-choice decision tasks must adapt their boundary and starting point parameters across task conditions in order to maximize their rates of reward (e.g., correct responses per second). These parameters determine the speed-accuracy tradeoff and response bias. Several publications have documented that when tasks emphasize rewards, young healthy people tend to act similarly, maximizing reward rates by adapting starting points and boundaries. We previously proposed a diffusion model that heuristically approximates the optimal parameter values, and that can adapt speed-accuracy tradeoffs rapidly (achieving near-optimality in about 5 trials after a change in task conditions). It predicts specific patterns of response time autocorrelation, and of negative cross-correlation between response times and estimated reward rates. These patterns mimic “long-range dependence” phenomena previously observed in the literature for response times; they also include cross-correlation phenomena not previously described, at least to our knowledge. We tested human participants in decision tasks in three modalities and found that participants produce the sort of sequential response time dependencies predicted by this model.
Can inhibitory training produce reductions in drinking? Evaluating the validity of previously reported training effects

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Background: Training inhibitory control has produced reductions in alcohol use amongst heavy drinkers. However, the longevity of effects remains unknown, and much research has used suboptimal control conditions. Here, we assess the effectiveness of “Beer-NoGo” inhibitory training to reduce consumption up to four weeks post-training, compared to a “Beer-Go” control task, an online version of the Brief Alcohol Intervention (BAI) and an Oddball control condition.

Methods: 79 regular drinkers were randomised into one of four training conditions. In the Beer-NoGo condition, participants responded to a letter superimposed on water-related images and refrained from responding to another letter superimposed on beer-related images. The mapping was reversed for the Beer-Go condition, while the Oddball control condition was presented with letters only, and inhibition was not required. The last condition was an online BAI. Alcohol use was assessed using a bogus taste test and weekly alcohol consumption.

Results: Taste test consumption was greater in the Beer-Go condition than the Oddball, which did not differ from the Beer-NoGo and BAI conditions. All groups reduced alcohol intake during the study; however, the Beer-Go group reduced their drinking while the Beer-NoGo group increased in the first week. No group differences were apparent at the fourth week.

Conclusion: The Beer-NoGo task did not produce effects beyond simple assessment on reducing alcohol use, and previously reported training effects may be artefacts of the Beer-Go task as a suboptimal control. More robust forms of inhibitory training are necessary for becoming a useful clinical adjunct for managing alcohol abuse.
Towards equivalent inhibitory tasks across neuroimaging contexts

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The Go/NoGo task has been used for decades to investigate inhibitory capacity in healthy adult controls as well as developmental changes across the lifespan, and in many psychiatric disorders, using neuroscientific techniques such as event-related potentials (ERPs) and functional magnetic resonance imaging (fMRI). fMRI techniques often require a slower presentation of stimuli (about 1 every 3-4 seconds) due to the slow nature of the BOLD response, in comparison to many ERP studies which have a faster presentation rate (about 1 every second). However, recent research has shown that a slow presentation rate makes the task very easy and fails to tax the inhibitory processes of interest. In three studies, we investigate feedback parameters designed to be used with a slow (fMRI-like) presentation rate, but to elicit inhibitory processing more similar to a fast (ERP-like) presentation rate. All studies are expected to be complete before the conference. In the first study, subject-specific reaction time deadlines produced processing most like the fast rate gold standard; the second study showed that a deadline at the 90th percentile of RT produced the best behavioural results. The third dataset is currently being collected. The outcome of the study will be a set of guidelines concerning feedback parameters for fMRI researchers to ensure that they sufficiently tax inhibitory capacity in studies designed to measure this construct.
What does Temporal Frequency tell us about Continuous Flash Suppression?

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In continuous flash suppression (CFS), a 10 Hz dynamic sequence of Mondrian patterns presented to one eye suppresses a static target in the other eye for several seconds at a time. Its suppressive effectiveness has seen its rising popularity in studies of unconscious perception, but the mechanisms underlying CFS remain unclear. Here, we present work on the role of temporal frequency in CFS. Typically defined as the rate of pattern updates in the CFS literature, we adopted a more precise definition of temporal frequency in this work (i.e., cycles/second), and varied the temporal rate of luminance changes using Fourier filtering techniques. Our results showed that the suppression of static targets is largely driven by high spatial frequencies and low temporal frequencies. Faster masker rates, on the other hand, worked best with transient targets. This sensitivity to target/masker compatibility was also observed when we varied the spatial and temporal predictability of the Mondrian masker. Together, these findings offer plausible explanations for a number of observations in the CFS literature, highlighting the importance of evaluating definitions of independent variables. Importantly, the results also resemble early, feature-selective suppression processes in binocular rivalry, suggesting that a unified framework may account for suppression in both paradigms.
Measuring workload capacity with a continuous task: a novel experimental design

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Workload capacity and the consequences of overloading it have been the focus of research in psychology, human factors and aviation. Many studies of workload capacity have utilised a trial-by-trial structure, with response time as the primary indicator of performance. However, real-life multitasking behaviour, such as driving a car or flying an airplane often requiring continuous vigilance and ongoing responses. We developed and tested a novel measure of workload capacity with continuous response and measurement. Participants were asked to follow a moving target along a one-dimensional gauge. Tracking error, defined as the distance from a user-controlled needle and the target, is then the continuous dependent variable. The load can be manipulated by adding a second target to be tracked simultaneously with the first target. Differences in performance between two levels of load indicate changes in the participant’s workload capacity. The task was delivered alongside a virtual detection response task (DRT), a standardised workload measure that indexes the participant’s residual capacity, or those cognitive resources unused by the main task, thus allowing multiple dimensions of workload capacity to be measured.
The effect of relational information on backward evaluative conditioning

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Backward evaluative conditioning occurs when a conditional stimulus (CS) follows a valenced unconditional stimulus (US), resulting in either assimilation effects; where the CS acquires the valence of the US, or contrast effects; where the CS acquires valence opposite to the US. We used the forward and backward conditioning (CS1-US-CS2) procedure and instructions from Moran and Bar-Anan (2013) and Moran, Bar-Anan, and Nosek (2016) to determine the effect of relational information on assimilation and contrast effects in a picture-picture paradigm. Experiment 1 investigated whether highlighting the relationship between stimuli would lead to contrast effects. Two groups of participants provided explicit valence ratings and completed an affective priming task before and after conditioning. One group (n = 52) was told to pay attention to the order of picture presentations, while the other group (n = 44) was told to learn which CSs started or stopped pleasant or aversive USs. Assimilation effects were found for forward and backward conditioned CSs in both groups, suggesting that relational information emphasising ‘role’ may not overpower associative learning effects in this paradigm. Experiment two (n = 97) investigated whether emphasising the emotion the US should evoke as well as the role of the CS would overpower associative learning leading to contrast effects, and whether measuring CS valence before conditioning influences this. Regardless of premeasure, results replicated previous findings, showing assimilation effects for forward conditioned CSs and contrast effects for backward conditioned CSs. This suggests that emphasising emotional relational information may drive contrast effects in backward evaluative conditioning.
AIM. It has been known for decades that motion direction selectivity in primates and carnivores arises in primary visual cortex. The mechanisms underlying this selectivity are, however, still mysterious. It has been shown recently that the relative sensitivity to light and dark is an important organising principle in cortex. We therefore investigated the effect of contrast polarity on psychophysical and neuronal responses to moving edges and bars. METHODS. Psychophysical subjects were visually normal adult humans. The neurophysiology used anaesthetised cats: multi-port electrodes were inserted parallel to the surface of primary visual cortex. RESULTS. Human subjects were more sensitive and responded faster to light stimuli than to darks of the same contrast magnitude. The advantage for lights declined as speed increased from 1 to 10 deg/s, and reversed to an advantage for darks at 30 deg/s. These results are surprising, given that responses to stationary stimuli are stronger for darks than for lights. We sought to corroborate these findings with multi-unit recordings from cat primary visual cortex. We found that responses to light bars preceded responses to dark bars when stimuli moved at 5 deg/s but not at higher speeds. The psychophysics and neurophysiology are therefore in agreement. DISCUSSION. Why are light stimuli dominant for moving stimuli? The answer may lie in the receptive field structure, if the preferred direction is from an on- to an off-subfield. An alternative possible cause is intracortical inhibition: most neurons in primary visual cortex are off-dominated, and dark stimuli may therefore evoke greater inhibition.
Visuospatial Cognition and Dimensions of Autistic Traits: Reduced Lateralization of Attention and Superior Search Relate Specifically to Social Difficulties

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Research has linked two cognitive characteristics to high levels of autistic traits (AT): facility in embedded figures search and reduced left-visual-field (LVF) bias. However, AT are multi-dimensional, with social and non-social dimensions essentially independent. Therefore, to advance understanding of atypical cognition on the autism spectrum, we isolated contributions of two AT dimensions - Social Difficulties (SD) and Patterns/Interests/Details (PID). 702 volunteer undergraduate students were screened for SD and PID using the Autism-spectrum Quotient (AQ). Next, 101 volunteers were selected to form a 2 x 2 (High/Low SD x High/Low PID) design and complete the Lueven Embedded Figures Test (L-EFT) and a greyscales task assessing LVF bias. On the greyscales task, High SD students showed a reduced LVF bias whereas High and Low PID students did not differ in LVF bias. Similarly, on L-EFT accuracy, High SD students outperformed Low SD students whereas High and Low PID scorers were close in accuracy. Facility in embedded figures search and reduced LVF bias are characteristics of individuals who report pronounced social difficulties rather than of individuals who report pronounced attention to patterns, special interests or sensory details. The independence of the social and non-social AT dimensions, and their contrasting patterns of association with visual search and attentional bias, caution against investigating autistic traits as a single spectrum. The superior visual search and reduced attention to the left side of space associated with social difficulties support speculation that each effect reflects reduced involvement of the right hemisphere in visuospatial cognition.
Generalisation learning responds to instructed acquisition and instructed extinction in a picture-picture evaluative conditioning paradigm

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In evaluative conditioning, if one neutral shape (conditional stimulus; CSp) is paired with pleasant unconditional stimulus (US) images, while, another shape (CSu) is paired with unpleasant US images, differential CS valence and US expectancy develops, such that participants evaluate the CSp as more pleasant and more predictive of pleasant images than the CSu. This learning generalises from the specific shapes used during conditioning (e.g. black outline on white background) to perceptually different shapes from the same category (e.g. coloured, striped, or patterned shapes). Across two experiments, we examined whether differential generalisation learning in evaluative conditioning is subject to instructed acquisition and extinction. In Experiment 1, participants were informed before acquisition that the CSp would be followed by pleasant images and the CSu by unpleasant images (instructed acquisition). Immediately after the instruction (before any CS-US pairings), participants evaluated both the specific CSp and the CSp category as more pleasant and more predictive of pleasant images than the CSu shape and the CSu category. In Experiment 2, after an acquisition phase in which CSp was paired with pleasant images and CSu was paired with unpleasant images, participants were informed that the CSp and the CSu would no longer be paired with pleasant and unpleasant images (instructed extinction). This instruction immediately abolished differential CS valence and US expectancy for the specific CS shapes and their wider category. The findings suggest that the acquisition and extinction of generalisation learning in evaluative conditioning can occur via verbal instructions.
Effects of Age on Mimicry and Prosocial Behaviour

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Experiencing empathy rather than emotional contagion is important for successful social interaction as well as the facilitation of prosocial behaviour. However, the degree to which older adults experience empathy versus contagion remains unclear. In the current study, young (n = 40) and older adults (n = 39) watched short film clips of individuals expressing pain or no pain. Mimicry of the painful expressions was recorded using facial electromyography. After being led to believe they had finished the study early, participants were asked if they would spend the remaining time helping the experimenter compile some pamphlets for a pain-related campaign. Self-reported trait suppression and reappraisal emotion regulation tendencies were assessed, along with measures of both trait and state empathy and emotional response. There was an age-related increase in corrugator activity (brow furrowing) in response to another’s pain and this was associated with reduced tendency to regulate emotion using suppression in the older group. The experimental condition (pain versus no-pain) and facial expression mimicry did not influence helping behaviour. However, older adults were more helpful overall relative to young adults, including when controlling for psychomotor speed. Increased helping among older adults (number of pamphlets compiled) was associated with greater trait personal distress, but not empathy or theory of mind. The effects of age-related differences in emotion on prosocial behaviour will be discussed.
Neurophysiological bases of sensorimotor entrainment to auditory and visual rhythmic stimuli

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Behavioural studies have shown that human movements are spontaneously entrained to auditory and visual environmental rhythms. Without intention, motor responses are thus automatically attracted towards synchrony with external rhythmic stimuli. However, the neural mechanisms underlying such sensorimotor entrainment remain largely unknown. Here we investigated with electroencephalography (EEG) and electromyography (EMG) the modulation of neural and muscular activities induced by the presentation of visual and auditory metronomes presented at different frequencies while participants were required to maintain constant pressure on a force sensor with their right index finger. Preliminary results suggest neural entrainment in the visual and auditory systems at the frequency of the stimulus presented (e.g., 1 or 2 Hz) together with time-locked power modulations in the alpha (8-12 Hz) and beta (12-35 Hz) frequency bands, depending on the sensory modality involved. Furthermore, preliminary results suggest that although participants maintained constant finger force pressure and EMG activity when visual or auditory sequences were presented, some individuals exhibited time-locked modulations of EEG-EMG coherence in the beta (12-35 Hz) frequency band that could reflect the occurrence of motor entrainment. These preliminary findings provide new insights into the neurophysiological mechanisms underlying the occurrence and stability of sensorimotor entrainment.
Surprise? Surprise! A categorization advantage for pleasantly surprised faces

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Happy facial expressions are recognized faster than negative expressions like anger and this happy face advantage is more pronounced for female than male faces. The evaluative congruence account suggests that this occurs as relatively positively evaluated female faces prime categorization of positive expressions (happiness). Under this account, a categorization advantage for female faces should emerge for other positive expressions. To investigate this, participants categorized the emotion present on male and female expressing pleasant and unpleasant surprise along with happiness or anger (Experiment 1) and pleasant surprise with happiness and or fear (Experiment 2). Participants in Experiment 1 were faster and more accurate to categorize pleasant surprise than anger on female faces and slower and less accurate to categorize unpleasantly surprised than happiness on female faces. No such surprise advantage or disadvantage emerged for male faces. There was no difference in the speed or accuracy of categorizing anger or unpleasant surprise, and happiness was categorized faster and more accurately than pleasant surprise for faces of both sexes. Experiment 2 confirmed the pleasant surprise advantage indicating that pleasant surprise was categorized more accurately (although not faster) than fear on female faces, with the inverse pattern emerging for males. Again, happiness was categorized faster than positive surprise for both sexes. The pleasant surprise advantage is consistent with the evaluative congruence account for emotion categorization and indicates that past reports of a happy face advantage reflect the positive valence happiness and not the preferential recognition of happiness specifically.
The relationship between wellbeing, depression and anxiety symptoms, and cognitive-emotion processing using behavioural tasks in a twin sample

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Alterations to emotional and cognitive function are often reported with depression and anxiety symptoms, yet few studies have examined the same associations with mental wellbeing. In a sample of 1,600 healthy adult MZ and DZ twins, the associations between mental wellbeing, depression and anxiety symptoms, and emotional and cognitive function was examined using linear mixed models. Multivariate twin modeling was also used to evaluate the shared versus unique contribution of genetic (G) and environmental (E) variance between the measures. Mental wellbeing was significantly associated with several cognitive measures including higher sustained attention, inhibition, cognitive flexibility, motor coordination, working memory, and faster reaction time to happy emotional facial expressions. Multivariate twin modeling suggested that genetics and environment had varying roles in these relationships. In addition, some of these relationships between wellbeing and emotional and/or cognitive function were shared with depression and anxiety symptoms, and others were independent. Together, these findings therefore highlight the importance of examining both of these constructs in mental health research.
The Influence of Positive Affect Differing in Motivational Intensity on Reinstatement in Evaluative Conditioning

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Increasing positive affect before extinction reduces relapse rates in fear conditioning. We examined whether affect differing in motivational intensity (impulse to move toward/away from a stimulus) would influence relapse in evaluative conditioning. In Experiment 1, one conditional stimulus (CSp; picture of a shape) was paired with pleasant unconditional stimulus (US) images, while a second (CSu) was paired with unpleasant US images. During acquisition, differential US expectancy and CS valence was acquired, such that prediction scores of pleasant pictures were higher following CSp, prediction scores of unpleasant pictures were higher following CSu, and the CSp was evaluated as more pleasant than CSu. After acquisition, participants watched a happy, sad, or neutral video (low motivational intensity), before undergoing extinction, in which the CSp and CSu were presented alone. Throughout extinction, differential US expectancy and CS valence reduced in all groups. After extinction, a reinstatement manipulation (presentation of the US pictures) was used to induce relapse. Relapse of US expectancy and CS valence was observed but did not differ between the groups. In Experiment 2, an affect induction with high motivational intensity was used, such that participants were presented with dessert images (positive), threatening images (negative), or neutral images (control). Differential US expectancy and CS valence was acquired during acquisition and reduced during extinction. After reinstatement, relapse of US expectancy was observed only in the negative group, while, relapse of CS valence was present in all groups. The findings suggest that negative affect with high motivational intensity enhances expectancy relapse in evaluative conditioning.
Crossmodal Correspondences (CMCs): Context dependent modulation of early sensory processing

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We examined two well known audio-visual crossmodal correspondences (CMCs: pitch/lightness and pitch/elevation), using signal detection theory to identify crossmodal congruency effects on sensitivity and criterion in a visual discrimination task. Participants were presented with an audio-visual stimulus that varied randomly from trial to trial along two visual dimensions (lightness: black/white; elevation: high/low) and one auditory dimension (pitch: high/low). Participants were split into two task groups with one discriminating lightness and the other, elevation. To determine if any congruency effect on sensitivity was due to simple attentional orienting, we both masked the visual stimulus and varied its duration (from 50ms to 250ms in 50ms increments) with each participant group split into five duration groups. There were four main findings. First, sensitivity was significantly higher for visual targets paired congruently (compared with incongruently) with auditory tones while criterion was unaffected, ruling out decisional factors. Second, the sensitivity increase occurred for all stimulus durations, ruling out attention. Third, the sensitivity increase was such that only the congruency that related to the task influenced sensitivity, suggesting context dependency. Finally, the benefit of congruence on sensitivity was inversely related to participants’ overall sensitivity, suggesting a subtle effect. We suggest that these congruency effects likely result from a top-down context dependent biasing of low-level sensory processes.
Evidence for the continued development of endogenous orienting in later childhood

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Landry et al. (2009) presented a model of endogenous orienting in which two mental processes occur when a cue appears on a screen – what is it (a left arrow) and what do I do with it (I should look left). This distinction between perception and response selection aspects of orienting is supported by Coull et al (2000), who found distinctions in the neural networks underlying different aspects of orienting, specifically motor preparation areas of the brain that were activated for longer cue-target intervals; targets that appeared earlier than expected activated visual areas, whereas targets that appeared later than expected activated frontal areas. In the present study, 12 children (mean age = 11.5) and 12 adults (mean age = 21) were tested on two endogenous orienting tasks; one a classic Posner-type task with non-predictive arrow cues, and the second a modified version in which the cue exposure was decoupled from SOA. The SOAs matched between the two conditions, ranging from 200 ms to 1100 ms. While children demonstrated significantly faster RTs to targets following congruent than incongruent cues in both conditions, the adults demonstrated significantly faster RTs to targets following congruent than incongruent cues in only in the classic condition; no congruency effect was found in the modified version among adults. Previous research based on the classic Posner design suggested that endogenous orienting was fully mature before adolescence. The present findings suggest that neural networks underlying visual orienting continue to develop later than previously suggested.
Neural tracking of the musical beat is enhanced by low-frequency sounds

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Music makes us move, and using bass instruments to build the rhythmic foundations of music is especially effective at inducing people to dance to periodic pulse-like beats. Here, we show that this culturally widespread practice may exploit a neurophysiological mechanism whereby low-frequency sounds shape the neural representations of rhythmic input by boosting selective locking to the beat. Cortical activity was captured using electroencephalography while participants listened to a regular or a more complex syncopated rhythmic sequence conveyed either by low tones (130 Hz) or high tones (1236.8 Hz). We found that cortical activity at the frequency of the perceived beat is selectively enhanced compared to other frequencies in the EEG spectrum when rhythms are conveyed by bass sounds. This effect cannot be explained by early cochlear processes, as revealed by auditory physiological modelling, and was particularly pronounced for the complex rhythm requiring endogenous generation of the beat. The bass superiority effect is likewise not attributable to differences in perceived loudness between low and high tones, as a control experiment manipulating sound intensity alone did not yield similar results. This evidence for greater entrainment of neural populations to the musical beat by bass sounds provides a neurobiological basis for the widespread practice of using bass instruments to carry the rhythmic foundations of music and drive people to move to the beat.
Recent focus on standards of methodology and analysis has increased interest in Bayesian inference, a powerful tool that has several major advantages over null hypothesis significance testing. One advantage is that it gives researchers the opportunity to incorporate their prior beliefs about their hypotheses, in the form of prior probability distributions, or priors. There are two general approaches to take when selecting priors – informed and uninformed. When an informed prior is used, with a distribution of values more or less likely chosen based on previous research findings – the cumulative effects of past and present data can be taken into account. Informed priors can also reduce researcher degrees of freedom, by ruling out inconsistent hypotheses. When the prior selected is uninformative, every possible value is equally likely, and analysis begins from scratch. In certain situations, the choice of an uninformative versus informative prior does not matter. However, when it comes to model selection, such as choosing one regression model over another, priors do matter, and can influence results. The issues is knowing what prior to choose. The current project seeks to collate numerous model analyses across cognitive data sets, to establish sensible priors for cognitive decision making models such as the Linear Ballistic Accumulator. These models are used to make inferences about how people are making decisions – fast due to low response caution, or fast due to faster processing? With sensible priors, uncertainty as to which model most accurately reflects how a decision was made, can be reduced.
A novel method for the measurement of vergence eye movement speeds in stereoscopic displays.

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Stereoscopic displays and virtual-reality (VR) often require viewers to rapidly change fixation between objects at different depths. This is performed through horizontal vergence eye movements. While there has been some research investigating factors influencing these movements, such as target size, there has been limited research into how much time it takes to make the movements. Previous research has employed cumbersome and invasive methods (e.g. scleral search coils), which do not lend themselves to use within head-mounted displays. The current experiment employed non-invasive psychophysical methods to measure the speed of vergence movements as a potential measure to predict sickness or discomfort when using VR. Participants fixated a stereoscopic nonius stimulus. Once aligned, a button press elicited a target, displayed in front of, or behind, the fixation plane for one of three durations (100, 300 or 500ms), before being replaced by nonius lines that were offset by 50%-150% of the disparity. Participants responded to whether the upper nonius line was left or right of the lower line, with the point of subjective equality providing an estimate of how much of the vergence movement completed in that duration. The percentage of the disparity covered by the vergence movements increased with display duration. Uncrossed vergence movements were faster (approximately 95% complete at 500ms for 18minarc disparity) than crossed movements (approximately 80%). This method provides a convenient, non-invasive method of measuring the speed of vergence eye movements, which can be used to identify individuals whose vergence eye movements are too slow for comfortable VR use.
Music, language, and gesture: Neural oscillations and hierarchical relations

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Human perception of music, like in language, involves the ability to flexibly combine sequences of discrete elements into hierarchical structures. It is possible to track the formation of these structures as the entrainment of brainwaves—steady-state evoked potentials (SSEPs)—in EEG/MEG, and this has been done in both music (Nozaradan et al, 2011) and language (Ding et al, 2016). While in music, this neural entrainment has often been interpreted in terms of broadly nonrepresentational theories of neural resonance (Large & Kolen, 1994), recent computational work in language (Martin & Doumas, 2017) has suggested mechanisms for learning structured hierarchical relations that predict similar patterns of neural oscillations as observed in empirical data. We suggest ways these theories can be aligned. In an empirical study, we recorded EEG from 12 participants as they listened to an isochronous beat while either imagining musical meter (strong and weak beats), making small hand gestures (up and down), or reading words (appearing on a screen in time with the beat) in binary or ternary patterns. We observed significant neural entrainment at frequencies of both the stimulus rate as well as frequencies of higher-order structures specified in the experimental conditions. We discuss these results in terms of theory and simulations in the domain-general computational model DORA (Doumas, Hummel, Sandhofer, 2008), ultimately suggesting a unified framework for how hierarchical representations may be learned and processed in the brain in both music and language (Patel, 2003).
Early development of a model of corporate influence on science and the use of science in policymaking – a critical interpretation

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Non-communicable diseases caused by consumption of unhealthy commodities (including tobacco and alcohol); exposure to chemicals; and environmental factors (e.g. global warming) account for significant global health problems. Effective policymaking is needed to confront such problems, yet industry actors use many strategies in attempts to prevent policymaking. One way this happens is through corporate influence on science. This scoping review purposively selected and synthesised literature (from electronic database searches/reference lists/expert recommendations). 52 studies were coded in NVivo10, themes illustrating industry strategies were formed, and a taxonomy of corporate influence on science was created. From here, a model representing a critical interpretation of the processes used by industry to influence science and the use of science in policy was produced. In this ‘post-truth’ era, corporations attempt to influence science in interconnected and mutually reinforcing ways (including supporting favourable evidence; suppressing/blocking unfavourable evidence; emphasising doubt about harm of products/practices; and creating echo chambers to amplify corporate rhetoric). This model illustrates the processes through which industry promotes: misinformation/biased evidence bases; industry-friendly scientific norms; and libertarian values within science. Industry actors promote ‘problematic’ science in numerous ways, and frame themselves as authentic partners in scientific/policymaking processes. This can contribute to inaction in public health governance. Using this model as a foundation, my next research stages involve investigating the perceptions of different stakeholders in society (e.g. public, policymakers, scientists) when faced with potential conflicts of interest in science (i.e. the social and psychological contexts within which evidence is understood).
Working memory load affects early affective responses to concrete and abstract words differently: Evidence from ERPs

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Early posterior negativity (EPN) is an early occurring event related potential elicited by pictures and words that have highly arousing characteristics. In reading tasks, however, EPN is generally only elicited when single words are presented in isolation and not within sentences. One possible reason for this is that sentence processing has higher working memory and attentional demands than reading words in isolation. This was investigated by examining the silent reading of negative and neutral words presented in isolation using a dual phonological working memory task. The results showed that negative concrete words did not significantly modulate EPN, even in a low memory load condition. In contrast, negative abstract words did significantly modulate EPN, with a similar sized effect being found in both low and high memory load conditions. These differences appeared to affect later processing. The results are arguably due to the early processing of features in negative concrete words being more affected by working memory demands than the early processing of features in abstract words. Thus, the extent to which words elicit EPN appears to be dependent on both their semantic representations and competing cognitive processes.
Capture and control: Working memory modulates attentional capture by reward-related stimuli

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Previous research suggests that executive control processes can act to reduce distraction by physically-salient but task-irrelevant stimuli in the visual scene. However it is not only physically-salient stimuli that grab our attention - stimuli paired with high-value rewards involuntarily capture eye gaze more often than stimuli paired with low-value rewards, an effect known as value-modulated-attentional capture (VMAC). In the current study we investigated whether resource-dependent control processes can modulate the effect of reward on attentional capture, much as they do for the effect of physical salience. To this end we measured eye gaze during the VMAC task under conditions of both high and low working-memory load. In line with our previous studies we found a VMAC effect – more involuntary attentional capture by a distractor signalling high relative to low reward. Furthermore, this effect was more pronounced under conditions of high working memory load - highlighting the causal role of executive control processes in directing attention away from stimuli that signal reward. These results are important for understanding how availability of cognitive resources can modulate the relationship between attentional bias for rewarding stimuli (such as drugs) and compulsive reward-seeking behaviour.
Emergence of spontaneous auditory-motor synchronisation to complex frequency ratios

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Humans display an impressive ability to synchronise their movements with external auditory rhythms. Such synchronisation also emerges spontaneously, without instructions to do so: listening to an auditory rhythm can entrain and modulate the intrinsic tempo of an individual’s periodic movement. Previous studies investigated a wide variety of movements and auditory rhythms but they mainly focused on synchronisation toward a 1:1 frequency ratio between the movement and the auditory rhythm. However, it remains unclear whether synchronisation toward more complex frequency ratios can occur. Here we investigated in three experiments the emergence of spontaneous movement synchronisation toward complex frequency ratios, its sensitivity to concurrent rhythmic auditory stimuli and individual differences in intrinsic perception. Experiment 1 showed that participants performing index finger oscillations at their preferred tempo entrained not only toward 1:1 relations but also to less stable frequency ratios such as 1:2. Results also revealed a hysteresis effect where spontaneous synchronisation dynamics depended on transitions from less stable ratios to more stable ratios. Experiment 2 demonstrated that the occurrence of synchronisation at 1:2 and 1:3 frequency ratios benefit from accentuation of the auditory metronome. The less stable the ratio, the greater the benefit. Nevertheless, marked differences between participants were observed in these experiments. Preliminary results of Experiment 3, which examined EEG and movement responses together, suggests that these individual differences may originate from variations in neural responses to the accentuated rhythms. These findings provide new insight into the dynamics of spontaneous auditory-motor synchronisation, paving the way for improved motor learning and rehabilitation.
The effect of diversity on generalization of associative learning

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When reasoning about how a particular property generalizes from one instance to another, diverse evidence is usually better at promoting generalization than non-diverse evidence. Although this kind of property generalization shares some similarities with stimulus generalization as assessed in the associative learning literature, it is unknown whether this diversity principle applies when the property to be generalized is a predictive relationship. Participants learned a discrimination where exemplars from different categories (e.g. fruits vs. vegetables) predicted different outcomes (e.g. shock vs. no shock). Our results suggest that diversity in the training exemplars does promote generalization to novel exemplars. However, the effect appears to depend on the category in which the diversity was experienced (i.e. shock vs. no shock category).
We frequently encounter stress in our daily lives, with chronic stress resulting in significant health burdens and lost productivity. Evidence indicates that stress also significantly interferes with various aspects of cognition. However, relatively less is known about the factors that might mitigate the impact of acute stress on physiological responses and executive functions (EF). Individual differences in emotion regulation (ER) – the process by which individuals manage their emotional experiences via distinct strategies – may be a modulating factor in how stress affects cognition. We investigated the impact of trait and instructed reappraisal on physiological stress responses and cognitive flexibility – a key EF - following a well-established lab-stressor. In Study 1 (N=60), participants high in trait reappraisal exhibited dampened cortisol reactivity following the stressor compared to participants with low trait reappraisal. Study 2 (N=119) contrasted the impact of two instructed-reappraisal strategies, Perspective Taking and Arousal Reappraisal, on physiological stress responses and task-switching. Our findings indicate a dissociation in the impact of Perspective Taking and Arousal Reappraisal on our outcome measures, with arousal reappraisal impacting the physiological stress response, and perspective taking impacting EF. The impact of instructed ER also differed across control versus stress inductions. These results indicate that the utility of certain ER strategies depends on the context in which they are used. Additionally, these studies suggest that variations in trait or instructed ER may impact on stress resilience, including preservation of EFs, which has implications for reducing the adverse impact of stress in daily life and psychopathology.
The dimensionality of reasoning: Re-examining the evidence for dual-process models using state-trace analysis

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A popular account of how people evaluate arguments in inductive and deductive reasoning tasks assumes the operation of two qualitatively different cognitive processes (often referred to as Type 1 and Type 2 processing). The primary form of evidence for such dual-process accounts involves functional dissociations where particular task manipulations are found to selectively impact performance on one type of reasoning task but not the other. We re-examined this evidence in three experiments where participants were presented with arguments that varied in logical validity and consistency with background knowledge (believability), and evaluated them according to deductive criteria (whether the conclusion was necessarily true given the premises) or inductive criteria (whether the conclusion was plausible given the premises). We examined factors, which, according to dual-processing theories should modulate the contribution of Type 1-heuristic and Type 2-analytic processes to reasoning: working memory load (Experiments 1 and 2), individual working memory capacity (Experiments 1 and 2) and decision time (Experiment 3). Conventional analyses (e.g. ANOVAs on proportion of argument endorsements) revealed a number of functional dissociations. However, state-trace analyses (Dunn, 2008), found that only a single underlying dimension was required to explain inductive and deductive responses in each study. The results challenge dual-process accounts, suggesting that only a single latent dimension is often required to explain human reasoning.
Asymmetric talker adaptation effects in first and second language

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Speech perception is strikingly robust: listeners easily understand talkers never previously encountered. Adaptation to unfamiliar talkers is achieved by perceptual learning whereby existing knowledge disambiguates speech uncertainties. This learning is reliably achieved not only in native languages (L1) but also in second languages (L2), especially when listeners are immersed in L2 environments; long-term immersion may even produce better L2 than L1 adaptation. We here compare L1 and L2 adaptation without immersion, and report an unexpected directional asymmetry. English-speakers learning Mandarin as L2 in Sydney heard both English and Mandarin material sets (already shown to induce adaptation in L1). The language conditions were presented at least two weeks apart, with language order counterbalanced. Learning was induced by an auditory lexical decision task with some words containing an /s/-/f/ ambiguous sound; embedding this sound in disambiguating words trained participants to classify it either as /f/ (traffic) or as /s/ (gossip). Testing by phonetic categorisation showed that for L1 (English), the training produced expansion of the trained phonetic category, signifying adaptation. In L2 (Mandarin), the adaptation was somewhat weaker but nonetheless also significant. This was surprising since Mandarin-native English-learners in China hearing the same two materials sets had shown robust adaptation only in L1 (Mandarin), and none at all in L2 (English). Although complexity of the ambiguous sounds’ actual phonetic contexts was controlled here, we suggest that applying a known adaptive process anew may generally be easier (hence quicker) if the new phonology is simpler (e.g., Mandarin) rather than more complex (e.g., English).
The Effect of Alcohol Intoxication on Emotion Perception and Perceptions of Ability

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Alcohol-fuelled violence has become increasingly reported in and ‘exploited’ by the Australian media. While links between alcohol consumption and violence are well established, the possible mechanisms underlying these negative social behaviours are poorly understood. This study aimed to ascertain whether alcohol intoxication impairs individuals’ emotion perception abilities in a manner similar to other clinical populations, such as schizophrenia and traumatic brain injury (TBI), which demonstrate similar neuropathological profiles. A supplementary aim of the study was to examine whether accuracy of appraisals of emotion perception ability are impaired. Following quasi-random assignment to counterbalance for gender, 64 participants were administered either an alcohol (Mage = 24.55, SD = 3.38) or placebo (Mage = 22.70, SD = 4.80) beverage. Emotion perception abilities were then assessed using the Emotion Recognition Task (ERT). Insight into performance was also measured by obtaining confidence ratings from zero to 100% for each viewed emotion. The study found that alcohol intoxicated individuals were less able to correctly identify negative emotions than the non-intoxicated individuals at moderate-to-high levels of emotion intensity. They also demonstrated significantly less insight into their performance regardless of emotion type. These results offer invaluable information to further our understanding of the possible mechanisms underlying alcohol-fuelled violence.
Recognition of Japanese-accented English by older native English listeners: Adaptation and maintenance

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Older listeners have greater difficulty understanding foreign accented speech than younger listeners. Nevertheless, studies have shown that they can perceptually adapt after a brief exposure to the accent. This study investigated whether such adaptation can be maintained over time; and if so, whether adaptation and maintenance is associated with older adult’s perceptual/cognitive abilities. Twenty native Australian-English healthy older listeners (M_{age} = 73 years, SD = 6.6) were given perceptual/cognitive tests and a speech recognition task with English sentences spoken by a Japanese-accented talker. The cognitive tests examined hearing acuity, working memory, attention-switching, and processing speed. The speech recognition task consisted of a pre-training speech recognition test, accent training (with written feedback), an immediate post-training recognition test, and then a delayed post-training recognition test after 4 months (with 13 of the 20 older adults). At each test, participants listened to each sentence and typed what they heard. Adaptation was measured as the immediate post-training recognition scores minus the pre-training ones. Seventeen older listeners showed adaptation, and the size of this effect positively correlated with scores on the attention-switching measure. As a measure of the maintenance of adaptation, delayed and immediate post-training recognition scores were compared for the thirteen older listeners who returned for testing. All thirteen maintained their improved level of recognition performance. The role of cognitive processes in speech accent adaptation will be discussed.
SUPPRESSION OF AUDIOVISUAL INTEGRATION DURING THE ATTENTIONAL BLINK

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To investigate the role of attention in the integration of visual and auditory information, we used event-related potentials (ERPs) to examine integration processes in the context of the attentional blink. The attentional blink refers to an impairment in detecting a second target (T2) when it appears shortly after an initial one (T1) within a rapid serial presentation stream. We recorded and extracted ERPs following the presentation of audiovisual (AV), visual (V), and auditory (A), T2s which were presented during or after the attentional blink period (200-300 ms or 600-700ms after the onset of T1 respectively). AV Integration processes were quantified as the difference between the audiovisual ERP (AV) and the sum of the separate visual and auditory ERPs (A+V). The results showed that AV and A+V responses were more similar during the attentional blink than outside of it, suggesting that, during the attentional blink, AV integration was suppressed and visual and auditory information processed independently. AV integration (the difference between AV and A+V ERPs) occurred both before and during the time window of the P3 ERP component (300-500 ms), which is well-established as the earliest time window for attentional blink ERP effects. The fact that the attentional blink - which is thought to reflect a late-stage information bottleneck - influences AV integration at early latencies suggests the action of top-down feedback mechanisms, and points to the existence of attentional blink effects that might not be observable in a unisensory paradigm.
Can elaboration explain why guessing improves verbal learning?

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Deliberately retrieving a memory can increase its strength. In a similar phenomenon, attempting to guess the answer to a question can help in learning its correct answer when it is later presented, even if the guess was incorrect. Elaboration accounts suggest that guessing causes activation of related information in memory which then helps with the encoding of the subsequently presented answer. Guessing may also help by making the experience of the correct answer more surprising. We tested these accounts with a paired associate learning task in which the cue words were homographs. Participants learned by viewing a cue word, attempting to guess its associate, and then viewing a target associate as feedback. In control conditions, participants simply viewed cue-target pairs without guessing. In Experiment 1, we presented targets that were weakly related to cues in either their dominant sense (bark-hound) or subordinate sense (bark-oak). Most guesses are in the dominant sense, so subordinate-sense targets are often surprising. In Experiment 2, we allowed participants to view targets at their own pace rather than a set pace. In Experiment 3, we used a single set of dominant targets but manipulated participants’ guesses by first showing them prime phrases. Results showed that incorrect guessing always improved learning, but especially when guesses were in the same sense as the target word. This finding supports elaboration accounts, but also suggests a role for non-elaborative processes, as guesses in the incorrect sense still improved learning.
Altered perceptual processing in violent video game players: Evidence from emotion-induced blindness

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The violence within many video games has raised questions about their impact on the people who play them. Most research has assessed impacts on aggression and desensitization in the moral domain, but here we find that frequent violent video game play may be linked with individual differences in perceptual processing. In an emotion-induced blindness task – wherein graphic images typically outcompete and impair perception of targets that people search for – violent video game players suffered less perceptual disruption following aversive images than non-players did, even though the groups did not differ in performance following neutral images. This difference persisted when controlling for sex and other violent media consumption and despite no group differences in trait aggression, disgust propensity, or disgust sensitivity. Further, the recruitment method ensured that participants did not know the relationship between the experiment and their video gaming history. Although a causal relationship has yet to be established, the findings suggest situations in which desensitization might lead violent video game players to literally see the world differently.
Using crowd meta-knowledge to identify expertise in the single-question domain.

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When trying to predict whether a future event will occur, one will often solicit predictions from multiple individuals. Contemporary forecast aggregation algorithms typically use external information such as individuals’ past performance in order to select and weight individuals. In practice, such information may not be available and can be cost-prohibitive to obtain. The SP algorithm (Prelec, Seung, & McCoy, 2017, Nature, 541, 532) has been proposed as a solution to this problem. The SP algorithm generates predictions using forecasters’ actual predictions as well as forecasters’ meta-predictions about the percentage of other people endorsing each response. We present the results of an experiment investigating the SP mechanism using a novel dataset of US grade school questions, with questions varying systemically in difficulty according to their grade. We find that the algorithm’s performance relative to other forecast-aggregation algorithms is largely dependent on question difficulty. We show that the SP algorithm mechanism exploits the differences between each person’s predictions and their meta-predictions in order to identify and leverage expertise in the crowd. The SP algorithm outperforms other algorithms for questions of moderate difficulty, where differences in individual expertise exist and can be leveraged effectively. However, when questions are very difficult, little or no expertise is present in the crowd, and the SP algorithm does not outperform other algorithms. Our findings provide valuable guidance for those seeking to maximize forecast accuracy under conditions where the individuals’ past performance is unknown.
Testing unfamiliar voice discrimination ability over time

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Compared to faces, the ability of humans to perform voice discrimination remains relatively unexplored. Further, the stability of this ability over time hasn’t been established. This study explored how well humans can tell if two voice recordings are the same or different speakers, and how stable accuracy in this task is. Participants heard a series of voice pairs, and had to decide if they were the same speaker or two different speakers. A week later, participants were tested again. They received either the exact same stimuli or different stimuli, and had to perform the same-different discrimination task. We found that accuracy for the same stimuli condition was 74.02% (SD = 8.19%) at Time 1 and 75.16% (SD = 8.37%) at Time 2. For the different stimuli condition, average accuracy at Time 1 was 74.73% (SD = 8.43%) and 73.63% (SD = 8.45%) at Time 2. Interestingly, the correlation between performance at Time 1 and Time 2 was higher for participants who completed the same stimuli [r(64) = .592, p < .001] than those that had different stimuli [r(75) = .301, p < .01]. These results confirm that voice identification skill is relatively stable across repeated tests taken one week apart. However, evidence for a stable ability that generalises across different sets of voices is limited. This raises the possibility that voice identification ability is specific to samples included in a given test, which may have important implications for understanding voice identification processes, and interpretation of voice identification in legal settings.
The influence of voluntary attention on illusory contour formation

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The visual brain is tasked with segmenting visual input into a structured scene of coherent objects. Illusory figures, like the classical Kanizsa triangle, reveal the minimum conditions necessary for the visual system to compute illusory contours that form multiple surfaces at varying depths, a process known as figure-ground segmentation. Studies of the perception of illusory contours have greatly advanced our understanding of how the brain infers structure from partial information, but the role of voluntary visual attention in illusory contour formation is unclear. Here we used a psychophysical response classification technique to test the influence of voluntary attention on illusory contour perception by exploiting a variant of the classical Kanizsa figure. Observers allocated their attention to one of two spatially overlapping Kanizsa triangles and reported whether its edges appeared to bend outward or inward. We generated competing predictions about the influence of attention with a machine classifier, and tested these predictions by measuring classification images to reveal the spatial structures used for perceptual decisions. We found that illusory contours extend between attended elements of the figure, despite these contours conflicting with equally plausible structure implied by unattended image features. These data are best explained by the machine classifier model in which voluntary attention determines illusory contour formation. Our study thus reveals that the neural systems involved in figure-ground segmentation are influenced by an observer’s attentional goals. These psychophysical data provide a renewed challenge to the understanding and modelling of the neural computations involved in perceptual organisation.
Levels of cortical inhibition in human primary visual cortex predict interindividual diversity in illusory perception.

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Electrophysiology in non-human primates has shown that neural responses to visual stimuli are modulated by spatial and temporal context. For example, in primary visual cortex (V1), neural responses to an oriented target grating are suppressed when embedded within an oriented surround. In human perception, the Tilt Illusion and the Tilt After Effect demonstrate similar effects of context on perceived orientation. In this study, we examined the link between neural and perceptual processing of context. In each participant, we measured context-induced suppression of cortical responses in V1 and the size of their Tilt Illusion and Tilt After Effect. We found direct evidence for a significant relationship between the magnitude of cortical suppression and the size of perceived tilt elicited by the contextual stimulus. Specifically, participants who showed stronger context-induced cortical suppression in V1 also perceived stronger Tilt Illusions and Tilt After Effects. Our data also revealed that a participant’s susceptibility to the Tilt Illusion was predictive of their susceptibility to the Tilt After Effect. Together, these findings suggest a shared mechanism mediating both spatial and temporal effects of context on perceived orientation, which involves the inhibition of cortical responses in human V1.
Contrast adaptation in face perception revealed through EEG and behaviour

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Recent work has demonstrated face adaptation in neural responses monitored with electroencephalography and frequency tagging (Retter & Rossion, 2016). We examined factors controlling this EEG adaptation and their relationship to face aftereffects measured behaviourally. An average female face was contracted or expanded along the horizontal or vertical axes to form four images. Observers viewed a sequence of the four faces presented at a rate of 6 Hz, resulting in a 6 Hz signal over occipital channels. Adaptation to two faces (horizontal contracted and expanded) introduced an additional occipito-temporal signal at 3 Hz, indicating a difference in the neural responses to adapted and unadapted faces, despite the adaptation pair having the same mean (undistorted) as the test sequence. This response was similar to the mean bias induced by adaptation for a single face with a novel distortion (e.g. both horizontal and vertical expanded). The two effects appear to reflect response changes induced by the mean (one face) or contrast (face-pairs) of the distortions. The observation of contrast adaptation is novel in face perception and we further demonstrate that it can also be observed behaviourally, as aftereffects biased or “tilted” away from the adapting (e.g. horizontal) axis. Contrast adaptation provides an alternative explanation for contingent face-aftereffects, in which opposing aftereffects occur in faces paired with opposing features. These are typically interpreted in terms of separate norms for different face categories, but could also reflect tilt-aftereffects relative to a single norm.
The role of facial mimicry in fast evaluative processes

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Humans continuously monitor the environment extracting relevant information to detect potentially friendly or threatening individuals and to guide behaviour. Research in the domain of fast evaluative processing investigates such phenomena mostly implementing evaluative priming paradigm. I hypothesize that differential activity of facial muscles accompanying evaluative processes serves as proprioceptive cue producing the known ‘affective priming effect’ in classifying emotional-face targets with faster responses if the target is preceded by a congruent emotional-face prime compared to an incongruent prime. A set of three experiments will be presented. In experiment 1, participants engaged in an evaluative priming task with photos of angry and happy facial expressions as target and primes, while their facial muscle activity was recorded via facial electromyography. Muscle activity, as expected, systematically varied in the distinct trial types. Experiment 2 showed, as hypothesized, that when proprioceptive information is experimentally inhibited then the evaluative priming effect disappears. In experiment 3 participants performed a priming task with either classifying the emotion or the gender of the target. According to the results, priming effects in an emotion-categorization condition only occurred when proprioceptive information was available to participants. Priming effects disappeared when such feedback was experimentally inhibited. In contrast, inhibition of proprioceptive information had no impact on the priming effect in gender-categorization. These results support the connection between mimicry, proprioceptive feedback and evaluative priming. Moreover, the present results suggest that proprioceptive feedback plays a critical role in fast evaluative processes as those captured by the evaluative-priming paradigm.
Individual differences in dynamic complex problem solving: Too soon to give up on intellect!?

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The burgeoning increase in the importance given to the role of non-cognitive factors in complex dynamic decision making has led to calls to dethrone intelligence as the primary explanatory model of success. Even within more traditional cognitive domains, there are moves to incorporate a broader range of conative dispositions. Notably, Dörner and Funke (2017, doi.org/10.3389/fpsyg.2017.01153) proposed a revised definition of complex problem solving as “not only a cognitive process but ... also an emotional one strongly dependent on motivation ... [and other] self-regulated psychological processes”. The current study uses a combined experimental-differential paradigm and business microworld simulations to investigate the incremental value of non-cognitive predictors of performance. Of particular focus was the extent to which “facilitating” personality traits, growth/motivational mindsets, and emotional-regulation abilities moderate the impact of complexity and experience on performance and learning trajectories, over and above cognitive ability. Results of mixed-level modelling of data from 142 experienced mid-level senior managers suggest the microworld was successfully manipulated to be sensitive to individual differences in domain-specific reasoning. As expected, intellect moderated learning effects and the capacity to deal with complexity. Of the 16 non-cognitive factors investigated, only performance-motivated mindsets moderated performance trajectories beyond intellect. These sobering findings give reason to temper claims that non-cognitive factors provide the primary explanatory model of success in learning and problem-solving in complex, dynamic tasks. However, rather than discount non-cognitive factors entirely, our analyses suggest that with refinement, microworlds and mixed-level modelling may well-support the experimental methods needed to understand moderators of real-world problem solving.
Language dynamics when disclosing a concealable stigmatized identity

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The present study is an exploration into the dynamics of language use when disclosing a concealable stigmatized identity (CSI). Unlike visible stigmas, CSIs are any identity that can be concealed yet socially stigmatizing if revealed. These identities, such as a mental health disorder or LGBT+ status, carry with them different stereotypes and devaluation, particularly in different contexts (e.g., workplace or family setting). Despite the unique characteristics of different CSIs, people living with such identities have the shared experience of disclosing their CSI. This experimental investigation seeks to uncover the unique language dynamics when disclosing a CSI to either a close friend or family member or to someone with whom they have a professional relationship in order to further understand how context impacts the disclosure experience. 36 participants were prescreened for living with a CSI and participated in the lab study. Participants first wrote letters disclosing to both a close other and a professional other and were primed with either approach goals (aimed at achieving positive outcomes such as trust) or avoidance goals (avoiding negative outcomes including rejection). They then were instructed to role-play the disclosure as if the person they chose was in the room. The transcribed disclosures were subjected to cross recurrence quantification analysis (cRQA) which quantifies the language dynamics of the disclosure event. Results revealed a difference in language dynamics when comparing professional other and close other disclosures. However, there was no difference as a function of goal priming. Implications for practical and clinical applications will be discussed.
How long are you distracted? An investigation of residual impairments in simulated driving

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While there has been significant research examining the factors which influence recovery from interruptions, there has been less focus on how much time is required to recover performance following a distraction. Answering this question is particularly important in the context of driving, where distractions are a leading cause of accidents. In a driving simulator environment, participants were presented with a series of distractions followed by a peripheral detection task (PDT) to assess participants’ resource availability and potential capacity to respond to hazards. Other continuous measures of driver performance that may take time to recover after a distraction, including the ability to maintain a consistent speed and lane position, were also recorded. We examined recovery on these measures following three different types of distraction: cognitive only, cognitive-visual, and cognitive-visual-manual, where the distraction involved answering simple addition problems on a tablet device. Since driving safely involves a combination of cognitive, visual, and manual resources, recovery is predicted to take longer when the distracting task uses more of these resources. Participants drove at 50km/h for 40-min and experienced 10 one-min distractions. The recovery interval spanning 0-40s post-distraction was examined. Each added level of distraction significantly slowed PDT responses and increased speed variability during 0-10s post-distraction. PDT accuracy was similarly impaired for all conditions during 0-20s post-distraction. Lane position maintenance from 0-10s was only impaired when the distraction included a manual component. Despite finding that all three conditions exhibited some degree of post-distraction impairment, only the cognitive-visual-manual condition reduced their speed to compensate.
The spatial and temporal properties of attentional selectivity for saccades and reaches

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The preparation and execution of saccades and goal-directed movements elicits an accompanying shift in attention at the locus of the impending movement. While there is evidence sensitivity is improved at the target location when making either a reach alone or a saccade alone, it is not clear how attention shifts over space and time around the movement target when a saccade and a reach are made to the same target. Determining this spread of attention is important for understanding how attentional guidance works in relation to movement planning in real-world tasks. We compared performance on a perceptual discrimination paradigm during a saccade-alone task, reach-alone task and a saccade-plus-reach task to map the temporal profile of the premotor attentional shift at three locations around the movement target. The probe (an oriented line) could appear at one of three locations around the target with equal probability, after a SOA ranging from 13-306ms. We calculated proportion correct as a function of SOA and movement onset for each location and each condition. The results suggest the temporal profile of the attentional shift relative to SOA and relative to movement onset is similar for the two tasks involving saccades (saccade-alone and saccade-plus-reach tasks), but is very different for a reach alone. These results suggest attention resources for eye and hand are not independent; they are either drawn from a common pool, or, there may be separate resources for each that interact, such that the attention profile of the saccade modulates that of the reach.
Multiple measures show a negative relationship between schizotypy and creativity

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Positive schizotypal traits (e.g. superstitious beliefs, making connections between random events) are often linked to creativity, with a meta-analysis showing a small, positive association ($r = .14$; Acar & Sen, 2013). This relationship is thought to reflect enhanced associative processing; a “looseness” in thinking that facilitates creative output. However closer examination of the literature shows large heterogeneity in effect sizes (varying from -.42 to +.83), which could be attributable to wide variability in how creativity has been defined and assessed, and to the inclusion of underpowered studies using small samples and potentially questionable research practices. To better determine the relationship between schizotypy and creativity we conducted a large N pre-registered study using two measures of schizotypy (Schizotypal Personality Questionnaire and the O-LIFE) and two measures of creativity (Remote Associates Test and the Alternate Uses task) in 428 community participants recruited using Mechanical Turk. Contrary to conclusions drawn from meta-analysis, there was a negative association between measures of positive schizotypy on both questionnaires and performance on both creativity tasks ($r$’s ranging from -.042 to -.233). One possible explanation for this negative association is that our creativity tasks tap associative processing, but also require executive control, which has been negatively associated with schizotypy. Based on these findings, we propose a series of laboratory studies to discover the underlying cognitive processes that mediate the complex relationship between schizotypy and creativity.
Is shape coding elementary?

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Scenes are a collection of edges representing objects and their backgrounds. Vision concatenates edges to form the boundaries of contours so that objects can be segmented from each other to recognize and interact with them appropriately. Integration of shape information around contours has been demonstrated with low radial frequency (RF) patterns, deformed circular shapes, but not more elaborate patterns. Biederman suggested that matched concavities can trigger segmentation of a contour. This project uses integration to examine when matched concavities segment contours into elemental parts. RF patterns, which drive global integration of shape in contours, are used to extend previous work to more complex shapes. Three, psychophysical shape discrimination experiments were conducted, investigating integration within patterns, between two separate patterns, and in patterns that are overlapped to vary the depth of contour concavities, forming either a single object or an interpretation of two components. The results from 6 observers show that integration was not found for information interpreted as from an unsegmented complex contour but was found when the contour perceptually segmented into elemental RF patterns. It was integrated within an element but the elements were separately processed and performance was predicted by probability summation between patterns with two separately integrated shapes. The research suggests that while integration is seen when observers are detecting elementary shapes, more complex patterns do not always yield results reflecting such integration. Segmentation at matched deep concavities does allow the integration process on the constituent elements but without the segmentation integration is not observed.
Training recognition familiarity does not improve visual working memory performance

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Visual working memory (VWM) is limited in the amount of visual information it can retain and the rate at which it encodes that information. VWM capacity is robustly correlated with cognitive measures, which is one reason that researchers are interested in factors that enhance memory performance and whether training is one such factor. Observers performed a change-detection task with both familiar English letters and the unfamiliar Brussels Artificial Character Set (BACS)—an artificial alphabet matching the number of junctions, strokes, and terminations of English letters. We used the Courier New font similar to BACS in perimetric complexity—an objective estimate of the number of visual features contained within the letter. The delay between memory array and mask was varied, allowing measurement of VWM capacity as a function of encoding time. We found a higher encoding rate and capacity for English letters relative to the BACS, reflecting an effect of familiarity. We then used a training protocol shown by Blalock (2015) to produce enhanced change-detection performance for random polygons. During training, observers were presented a target BACS letter for a short duration before having to recognise the target in an array of four letters. We found high recognition accuracy following the training, showing observers became familiar with the trained BACS letters. However, memory performance on a change-detection task did not differ between trained and novel BACS letters, and was significantly worse than the highly familiar English letters. This suggests a boost to memory performance requires more substantial experience with stimuli.
No influence of naïve intelligence beliefs on judgments of learning

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Students who believe intelligence can be developed over time (i.e. Incremental Theorists) have superior educational outcomes compared to students who do not hold these views. Previous research suggests however that Incremental Theorists may experience difficulty in accurately gauging the progress of their own learning (i.e. they have impaired metacognitive monitoring). As incremental views of intelligence are being promoted to educators and policy makers, it is important to understand the nature of these impairments so that compensatory interventions can be implemented, if required. Three experiments were conducted in which participants studied word-pairs of differing difficulty, and provided confidence judgments about the likelihood of their future recall. Participants then completed cued-recall tasks (to indicate the accuracy of their judgments), and naive intelligence beliefs were measured using Dweck’s (1999) Theories of Intelligence Scale for Adults. Experiments 1 and 2 were designed to replicate the finding of impaired metacognitive monitoring for Incremental Theorists in university (Experiment 1, N = 112) and online (Experiment 2, N = 192) samples. Experiment 3 (N = 79) also investigated whether having an incremental view of intelligence influenced the selection of items for restudy. Overall, reporting more incremental views of intelligence was not systematically associated with poorer metacognitive judgments or sub-optimal study behaviours. These results suggest that endorsing an incremental mindset is unlikely to result in difficulties monitoring one’s learning, at least when considering study materials of differing difficulty.
Metacognition for well-learned information: I know this now but will I remember it later?

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The capacity to understand what one knows is integral in allocating study time that best promotes effective learning, but can students accurately determine how much they know? Evidence suggests otherwise, especially when information processing is perceived to lack fluency or when memory for information is strong. The current study examined the effect of learning strategies on metacognitive monitoring and memory performance. Participants were presented lists of Lithuanian-English word pairs and then asked to complete a cued recall task where items were learned to a specified criterion. Thus, word pairs were repeated until the target was correctly recalled either 1, 3, or 9 times. The number of intervening items between each presentation of a given item (i.e., lag) was also manipulated to be either short (8 items) or long (35 items). Once learned to criterion, participants made a confidence judgment regarding the likelihood they would remember the item on a cued recall task one week later. This was made on a binary (yes-no) or continuous scale (0-100%). Consistent with previous research, memory performance was better when learning to a higher criterion, indicating that students’ knowledge benefits from the repeated successful recall of information. A novel finding was that metacognitive monitoring was more accurate in the long lag, irrespective of judgment scale (i.e., binary vs. continuous). This suggests that a longer lag not only enhances memory but also leads to superior metacognitive monitoring of information.
Effects of acute physical exercise on metacognition

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Exercise generally benefits memory but this relationship is complex (e.g., effects vary depending on timing of exercise and type of memory test). Little research has examined the effects of exercise on metacognition (i.e., knowledge and monitoring of memory performance). Here, we show that a single bout of exercise can impair metacognition in paired-associate learning. Participants completed 30-min of moderate-intensity exercise or watched a video before studying a series of word pairs (cloud-ivory). Participants completed a cued-recall memory test (cloud-?) and recognition memory test (cloud-? spoon; ivory; drill; choir). Participants made two types of metacognitive judgments: judgments of learning (JOLs; predicted likelihood of recalling the second word of each pair when shown the first) prior to the cued-recall test, and feeling-of-knowing judgments (FOK; predicted likelihood of recognizing the second word of each pair from four alternatives) prior to the recognition test. Exercise did not affect memory performance but did affect absolute metacognitive accuracy, increasing overconfidence for JOLs and reducing under-confidence for FOK. Exercise also impaired participants’ ability to discriminate items they would remember from items they would not (relative metacognitive accuracy) for JOLs but not FOK. Exploratory analyses showed that exercise selectively increased JOLs for items answered incorrectly on the cued-recall test, but not items answered correctly. These results are consistent with dominant models of metacognition, and show that although exercise generally enhances cognition, it can negatively affect learning under some circumstances.
Examination of processes underlying biases in simple decision tasks

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There are two main types of bias in simple decision tasks, response bias and stimulus bias. Response bias is based on knowledge about the outcomes of the responses and stimulus bias is a tendency to evaluate stimulus information more heavily in favour of a biased response. Differences in the relative frequency of presented stimuli have typically been used to induce response bias, however there has been some disagreement in previous research regarding the degree to which relative frequency manipulations also influence dynamic bias. Our current research uses a 2 alternative forced choice brightness discrimination task to examine the effect of relative frequency manipulation on response bias and stimulus bias, and analyse these biases using diffusion models. We also manipulate the discriminability of the stimuli and the length of time they are presented to see if they interact with response and stimulus biases. The results show the expected response bias based on the relative frequency manipulations, but also greater stimulus bias in trials where participants are presented with limited stimulus information.
Older adults’ perception and production of facial emotion: a tantalising link

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It has been well documented that aging is associated with declines in the ability to recognise emotion. Here, we investigated whether older adults’ ability to recognise facial emotion is related to their ability to produce it. We selected eight older adult participants from our previous perception study based on their average correct face emotion recognition scores: Four had relatively high scores (74% accuracy) – the High perception group; and four had relatively low scores (61%) – the Low perception group. These older adults and eight younger ones were video recorded (head and shoulders, front facing pose) expressing various emotions (i.e., anger, disgust, fear, happy, sad, surprise, and neutral) while saying emotionally neutral phrases. We then ran an emotion recognition experiment in which these recordings (segmented sentence by sentence) were presented to 27 younger participants in auditory-only (AO), visual-only (VO), and auditory-visual (AV) formats. We found that for AO and VO formats, participants showed better emotion recognition of the stimuli from the younger and the High perception older adults compared to that of the Low perception older adults. For AV presentation, the expressions of the younger adults were better perceived (more accurately) than those of the High perception older adults, whose expressions were recognised better than the Low perception older adults. These findings suggest that the problems older adults experience in recognising emotion may also manifest in emotion production.
General transfer in young drinkers: do alcohol cues and craving promote food-seeking?

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The Pavlovian-to-instrumental transfer paradigm has shown in animals that alcohol cues can exert a non-specific (general) increase in other available appetitive responses. In human studies, this general transfer effect has been replicated with food cues on non-drug reward seeking (Watson et al., 2014; Quail et al., 2017). However, an alcohol dependent sample recently showed a reduction—rather than an increase—in responses for money when presented with alcohol cues (Sommer et al, 2017). This may have been specific to people who are trying to reduce their alcohol intake. Therefore, the first aim of this study was to observe the general transfer effect of alcohol cues on food seeking behaviour in a sample of non-alcohol-dependent human drinkers. The second aim was to further understand how alcohol craving might impact the general transfer effect. The dominant account is that outcome motivation is the driver of general transfer (e.g. Cartoni et al, 2013), and thus we predicted that greater desire for alcohol elicited during a craving induction would correspond with greater general transfer effects. The data confirms that alcohol cues can enhance response frequency for food above baseline levels. Craving for alcohol rated during cue-exposure is also associated with the general transfer effect. However, the relationship is weak. Further research is necessary to determine the stability of this correlation, and whether craving for alcohol can have a meaningful impact on other appetitive behaviours.
Visual Attention Interferes With Visual Working Memory Regardless Of Eye-Movements

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There is currently a debate about the relationship between visual attention and visual working memory (VWM). One theory proposes that the two constructs should be synthesised into a single concept/notion as both rely on the same resource. In this theory memory and attention can be defined as attention directed towards either internal representations or external objects. When capacity limits are reached in either domain there will be a tradeoff, resulting in performance impairments. Contrary to this theory, Tas, Luck & Hollingworth (2016) found that only eye movements, not covert attention shifts, interfered with VWM performance. However, in their study attention was not tightly controlled, so that it is possible that stimuli were only attended in the eye movement condition, not in the covert attention condition. In the present study we tightly controlled attention and compared the effects of eye movements and covert attention shifts on memory performance, as assessed with the standard change detection paradigm. The results of two experiments showed that memory interference was not selectively caused by eye-movements, but was due to attention being directed to the features of a peripheral object. In experiment 1 interference was found in both fixation and saccade conditions. Experiment 2 furthered these results by showing that interference was not due to decision making processes but as a direct result of attending object features. These results show that attending to a visual object directly interferes with VWM performance, suggesting that the two systems indeed rely (in part) on the same attentional resource.
Deception detection using a task switching paradigm: An ERP study

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Compared to repeating a cognitive task, switching between two different tasks results in a response time cost, labelled the switch cost. Switching also produces event-related potential differences such as a sustained switch positivity after a task switch has been cued, and a switch negativity on switch trials following target presentation. The aim of this study was to determine whether switch costs and switch-related ERPs occur when a person switches between responding truthfully and responding deceptively. Participants completed a “sincerity switching” paradigm in which they memorised a list of objects, and then repeated and switched between responding truthfully and deceptively about whether each presented stimulus had been on the list. Participants also completed a traditional task switching paradigm, in which they repeated and switched between responding to the direction each stimulus object was facing and the environment in which it was most commonly used. Behavioural and electrophysiological measures of switch costs were examined in both paradigms. Results suggest that switching between responding truthfully and deceptively does produce a switch cost. Preliminary data also suggest that similar switch-related ERPs occur in both the sincerity switching and traditional paradigms. Results are discussed in terms of the potential for task switching to be used as a new method of lie detection.
Threshold uncertainty, early-warning signals, and the prevention of dangerous climate change

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A central challenge for a climate change agreement is to implement an effective enforcement mechanism to ensure compliance amongst its parties. However, more than twenty five years after the establishment of the United Nations Framework Convention on Climate Change, climate negotiators have failed to identify an effective, strategic solution to this enforcement problem. Instead, in the contemporary climate negotiations the enforcement problem is consigned to “Mother Nature”—the Copenhagen, Cancun, and Paris climate agreements rely on the fear of crossing a dangerous climate threshold to enforce cooperation between countries. However, there are deep uncertainties about the location of the threshold for dangerous climate change, and recent theoretical and experimental evidence indicates that this threshold uncertainty is a major impediment to collective action. Early-warning signals of approaching climate thresholds are a potential remedy to this threshold uncertainty problem, and initial experimental evidence suggests that such early-detection systems may help improve the prospects of cooperation. Here, we provide a direct experimental assessment of this hypothesis. Using a dangerous climate change game, we show that wide initial, and subsequently unabated, threshold uncertainty undermines cooperation, consistent with earlier studies, but additionally that a marked subsequent reduction in threshold uncertainty—emulating the action of an early-warning signal—does little to improve the prospects of cooperation. Regrettably, our findings suggest that early-warning signals indicating that a critical climate threshold is approaching are unlikely to offer the leverage necessary to motivate countries to take the necessary action to avert disaster.
Thin and Plus-Size Models Differentially Modulate Pseudoneglect

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As part of our daily life, particularly when we are online, we are constantly confronted with advertisements, which results in the frequent viewing of idealised, and unrealistically thin bodies, as few plus-size models are present within mainstream media. As prior research supports different attentional patterns when viewing thin versus plus-size bodies, we were interested to determine if models of different body weights impact attentional asymmetries (i.e., pseudoneglect). Pseudoneglect is an attentional phenomenon wherein neurologically normal individuals overattend to the left side of space. Participants (N=36 females) completed an initial landmark task, to determine their baseline attentional asymmetry. Following this, participants completed a second task wherein a pair of images was presented (one in the left visual field, one in the right) prior to the landmark task. Image pairs consisted of a combination of thin female underwear models, plus-size female underwear models, and colour-matched handbags (neutral image). When the thin models appeared on the left, leftward biases were stronger than baseline. In contrast, when the plus-size models were presented on the left, pseudoneglect was nullified, as no significant asymmetries emerged. Importantly, these differences only occurred when the pair consisted of one thin and one plus-size model. Therefore, it appears that participants’ attention was attracted to the thin models, but also directed away from the images of the plus-size models. Our findings suggest that thin and plus-size bodies differentially modulate pseudoneglect, with the socially desirable thin body catching the eye of young women.
The role of choice in probability estimation

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People tend to search for environmental regularities that they can exploit in their choices in order to maximize their gains. In environments where regularities are absent, such pattern-seeking has been shown to lead to deviations from optimality in both people’s choices and probability judgements. This bias is enhanced when people make consequential choices and estimate probabilities simultaneously, compared to when they only give probability judgements. In the current study we investigated what the source of this increased estimation bias is: the higher attentional demands of the dual-task, or some other characteristic of the choice task, such as an additional belief reinforcement. We investigated this by manipulating the secondary task that complemented the probability estimation task: either a related choice task, an unrelated memory task, or no additional task. The results replicated the difference in estimation bias between the choice task and the no-task condition. People’s judgements in the unrelated task condition were more similar to the no-task condition. This suggests that the source of the bias is not the additional attentional requirements. Implications for current models of probability learning are discussed.
Facial mimicry is related to facial expression recognition ability in children

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The ability to recognise facial expressions develops gradually throughout childhood. Facial mimicry, the process of imitating an observed facial expression, is thought to facilitate the recognition of observed facial expressions. To date, limited research has examined facial mimicry in children. Here, we investigated whether children’s facial mimicry differs to that of adults. We also sought to determine whether the degree of facial mimicry is related facial expression recognition ability in children. Participants comprised 29 children (6 to 10 years) and 31 adults (18 to 35 years) who passively viewed a series of facial expressions (i.e., angry, disgusted, fearful, happy, neutral and sad) while facial mimicry was indexed from the zygomaticus major and corrugator supercilii facial muscles using facial electromyography (EMG). Facial expression recognition ability was then assessed using a forced choice facial expression labelling task. Analysis of facial EMG responses revealed that children displayed adult like facial mimicry, displaying heightened corrugator supercilii activation to negatively valenced faces, compared to happy and neutral faces. With heightened zygomaticus major activity observed when viewing happy faces, relative to neutral and negatively valenced faces. For children, degree of mimicry was associated with facial expression recognition ability. Specifically, heightened corrugator activity when viewing negatively valenced faces was associated with more accurate recognition of negatively valenced facial expressions. No such relationship was observed for adults. Findings suggest facial mimicry may be an important mechanism that underpins the development of facial expression recognition ability during childhood.
Higher levels of autistic traits are linked to poorer face recognition performance in 6-8 year-old children

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The ability to recognise people from their faces is very important for successful social interaction. Recognition of faces is impaired in individuals with autism and is also poorer in typical adults who report higher-levels of autistic traits on self-report questionnaires, such as the Autism Quotient (AQ). Here we asked whether associations between autistic traits and face recognition are also present during development, when social experience is accumulating and performance on face tasks is improving. We tested 6-8 year-old children (N=163, 77 males) on a battery of tasks. Face performance was assessed with the Cambridge Face Memory Test–Kids and Dartmouth Face Perception Test and the Cambridge Bicycle Memory Test was included to calculate ‘face-selective’ residuals. The AQ-Child measured parent-reported autistic traits. Children with higher levels of autistic-traits had poorer face-selective memory performance, after controlling for age and sex. The direction of the associations did not differ for boys and girls, though the association between autistic-traits and face-selective memory was significant only for boys. Face-selective perception was not associated with autistic traits. These results suggest that the association between autistic traits and face recognition ability emerges early in development, consistent with findings that children with autism have impaired face recognition skills.
Nap effects on preschool children's learning of letter-sound correspondences

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There is increasing evidence that a period of sleep is associated with consolidation of learning in both adults and children. For young children, who take daytime naps, there is great potential to apply these findings to maximising acquisition and retention of new information; however, our understanding of the nature and extent of benefits in this population is limited. This study examined whether a short daytime nap enhances preschool children's learning of letter-sound correspondences, a key foundational skill in reading acquisition. A group of 32 children (mean age 4y; 3m) were trained on simple letter-sound mappings (e.g. "The letter C makes a /k/ sound"). Each child completed two training sessions, one followed by a daytime nap (Nap condition) and the other by a period of wakefulness (No Nap condition). Learning was measured using tasks assessing the children's explicit knowledge (e.g., "What sound does this letter make?") and also their generalisation of learning to novel material (e.g., "Here are two printed name tags: Tav and Cav, which one is /kav/?"). There was no evidence of any nap benefit on the explicit learning task. However, the results from the generalisation task revealed superior performance in the Nap condition compared to the No Nap condition, and this benefit was retained the following day. We conclude that the results provide initial evidence that a daytime nap may support the learning of letter-sound correspondences in preschool children, but that further research is needed to confirm these findings and understand their basis more fully.
What drives individual differences in statistical learning? The role of perceptual fluency

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Decades of research reveal that humans have the ability to learn surprisingly complicated statistical information in a variety of modalities and situations, often based on relatively little input (Rebuschat & Williams, 2012). These statistical learning skills probably underlie many kinds of learning, from linguistic to causal to conceptual; however, despite their ubiquity, we still do not fully understand precisely what they are and what individual differences in them reflect. Although such differences are robust and reliable within individuals, they do not appear to correlate with IQ (Kim et al., 2009; Siegelman & Frost, 2015). Moreover, performance on statistical learning tasks in one modality does not appear to correlate with performance in the same task in a different domain (Conway & Christiansen 2006, 2008; Frost et al., 2015). So what exactly do individual differences in statistical learning reflect, and how do statistical learning abilities support other kinds of learning? Here we present experimental work suggesting that at least some of these individual differences arise from differences in perceptual fluency — the ability to rapidly or efficiently code and remember the stimuli that statistical learning occurs over. Our results may mean that a key component in statistical learning tasks is perceptual and not related to statistical learning per se at all. They also may suggest that poor correlations across modality and with IQ arise in part because of differences in stimulus processing rather than differences in the underlying ability to track or calculate statistical relationships.
The Effect of Auditory and Visual Salience on Cross-Situational Word Learning

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Because novel words are often encountered in the presence of many candidate referents, it is not always clear what the referent of a newly encountered word is. Cross-situational word learning (CSWL) models word learning in these scenarios, proposing that we track the frequency with which words and candidate referents co-occur. Across encounters, correct word-referent associations are strengthened. Perceptual salience facilitates word learning in unambiguous learning scenarios by emphasising auditory words, or directing attention towards an object that is being labelled. It is unclear, however, how salient features affect word-referent learning in ambiguous word learning situations. Thus, we investigated how salience of auditory words and visual referents affects CSWL. Participants were taught eight novel word-object pairings, and were assigned to one of three conditions where half the words (auditory salience) or objects (visual salience) were salient while the remaining were non-salient, or none of the words and objects were salient (control). Each learning trial presented two auditory words and two visual objects without indication of the correct word-object association. Per test trial, participants were asked to select one of two objects that corresponded to a single auditory word. Preliminary data suggest that both auditory and visual salience promotes better word learning of salient items, but not necessarily overall word learning. Ongoing research examines the facilitative and impeding effects of auditory and visual salience in CSWL, the interaction of both types of salience, and their effects on encoding specific features in words.
What do the experts know? Calibration, precision and the wisdom of crowds among forensic document examiners

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Forensic handwriting examiners currently testify to the origin of questioned handwriting for legal purposes. However, forensic scientists are increasingly being encouraged to assign probabilities to their observations in the form of a likelihood ratio. In this talk we present empirical evidence examining whether handwriting experts are able to estimate the frequency of US handwriting features more accurately than novices. We find that experts do produce superior performance, but the size of the effect is modest, and the overall error rate even for experts is relatively large. To shed light on the psychological processes underpinning these decisions we develop a hierarchical Bayesian framework for aggregating expert opinions, and show that a genuine "wisdom of crowds" effect emerges as long as the expert opinions are aggregated in an appropriate fashion. Finally, we discuss an extension of this framework to more traditional categorical ("match/non-match") judgments used in document examination.
Representational and sampling assumptions drive individual differences in single category generalisation

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Human activity requires an ability to generalise beyond the available evidence, but when examples are limited – as they nearly always are – the problem of how to do so becomes particularly acute. In addressing this problem, Shepard (1987) established the importance of representation, and subsequent work explored how representations shift as new data is observed. A different strand of work extending the Bayesian framework of Tenenbaum and Griffiths (2001) established the importance of sampling assumptions in generalisation as well. Here we present evidence to suggest that these two issues should be considered jointly. We report two experiments which reveal replicable qualitative patterns of individual differences in the representation of a single category, while also showing that sampling assumptions interact with these to drive generalisation. Our results demonstrate that how people shift their category representation depends upon their sampling assumptions, and that these representational shifts drive much of the observed learning.
Interactions between implicit learning and explicit knowledge in visual search

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One controversial hypothesis about the relationship between implicit and explicit learning is that explicit awareness is an emergent property of implicit learning. Inspired by this, we tested whether implicit learning can facilitate later emergence of explicit knowledge. We used contextual cueing, a form of learning in visual search where participants improve if the search display is repeated. Contextual cueing with artificial array-based distractors is associated with very low levels of explicit knowledge whereas much higher levels of awareness accompany contextual cueing with natural scenes (or displays combining scenes and artificial distractors). Participants first completed array-based search, including several repeated distractor patterns. These repeated patterns were then used in a more explicit contextual cueing task with combined array and scene displays. Performance on an explicit generation task was significantly higher when the array-based distractors had been pre-trained, even though this pre-training by itself generated chance-level performance on a generation task. These results provide evidence that implicit learning can give rise to explicit knowledge.
A common mechanism processes auditory and visual motion

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Neuroimaging studies suggest human visual area V5, an area specialised for motion processing, responds to movement presented in the visual, auditory or tactile domains. Here we report behavioural findings strongly implying common motion processing for auditory and visual motion. We presented brief translational motion stimuli drifting leftwards or rightwards in either the visual or auditory modality at various speeds. Using the method of single stimuli, observers made a speed discrimination on each trial, comparing the current speed against the average of all presented speeds. Data were compiled into psychometric functions and mean perceived speed was calculated. A sequential dependency analysis was used to analyse the adaptive relationship between consecutive trials. In a vision-only experiment, motion was perceived as faster after a slow preceding motion, and slower after a faster motion. This is a negative serial dependency, consistent with the classic ‘repulsive’ motion aftereffect (MAE). An audition-only experiment revealed the same negative serial dependency, showing that auditory motion also produces a repulsive MAE. A third experiment presented auditory and visual motion in alternation to test whether sequential adaptation was modality specific. Whether analysing vision preceded by audition, or audition preceded by vision, negative (repulsive) serial dependencies were observed: a slow motion made a subsequent motion seem faster (and vice versa) despite the change of modality. This result shows that motion adaptation is supramodal as it occurs despite the modality mismatch between adaptor and test. We conclude that a common mechanism processes motion regardless of whether the input is visual or auditory.
Evidence against a linear rule bias in multiple cue judgment using alternative and directional cues.

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Many everyday activities require individuals to predict a continuous criterion from multiple changing cues, known as multiple cue judgment. Research on multiple cue judgment has focused on the role of psychological representations: when do individuals form judgments based on the combination of abstracted cue-criterion relationships and when do they store whole exemplars of previously encountered objects and make judgments based on the similarity of a probe to these stored exemplars. Two important conclusions have been made from past findings. The first is that cue abstraction models are limited to additive linear functions, known as linear rules. Second is the proposal that there is a universal bias towards using linear rules, which is overridden by similarity-based processing only after initial attempts at fitting the linear function fail. We use an experimental procedure known as iterated learning to argue that neither conclusion is well supported. First, we present a large dataset based on a typical multiple cue judgment task to show that the ability of individuals to use multiplicative cue abstraction rules has been underestimated by past research. We then address a limitation of this dataset, based on the criticism that our stimuli involved “alternative cues” (e.g. a bug’s head is green or blue) rather than “directional cues” (e.g. a patient does or doesn’t have a headache), which have been shown to encourage linear rule use in previous research. We show that when stimuli with directional cues are presented in our task, individuals don’t rely on linear rules to any greater extent.
Illusory causation: Effects of causal framing and outcome representation

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Illusory causation is the erroneous belief that the presence of one event (a cue) causes or prevents another (outcome). This effect greatly increases when the outcome occurs more frequently, a characteristic known as outcome density bias. Prediction-error models account for this bias by predicting greater learning when salient cue and outcomes are present rather than absent. However, applications of this model oversimplify the complex assumptions about how characteristics of the outcome are mentally represented. Furthermore, illusory judgements appear to be highly susceptible to causal framing of the instructions, suggesting the outcome representations that support the effect are flexible. This study investigated whether similar outcome density effects emerged when using a continuous and variable outcome in a contingency learning task framed as a trial for a medical treatment. Causal framing was varied so that high values of the outcome were 1) desirable (and potentially generated by the cue) or undesirable (and potentially prevented by the cue), and 2) medically normal or abnormal. We found outcome density effects in judgements of treatment efficacy. However, the effect differed as a function of causal framing. We will discuss potential explanations and implications for the generation of illusory beliefs.
Beyond "reward": Dopaminergic control of neutral-valence learning

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The neurotransmitter dopamine has been heavily implicated in reward-related learning and motivational processes, making it of key interest in the study of addiction and other motivational and emotional disorders. Recent evidence points to at least a partial dissociation in the roles of distinct dopamine receptor subtypes, with dopamine D1 receptors (D1R) appearing critical for learning predictive relationships between contingent events in general, and dopamine D2 receptors (D2R) being involved more in motivational aspects of learning and performance. This idea was explored further in the present research, using a procedure that is able to isolate learning processes from motivational considerations. Rats were trained on a sensory preconditioning task in which they were first exposed to pairings between 2 neutral stimuli (S2-S1). On a subsequent session, S1 was then paired with a mild foot-shock (S1-Shock). The amount that had been learned about the S2-S1 relationship could then be assessed by measuring fear to S2 (which was never directly paired with shock). The importance of D1R and D2R for learning about these neutral stimuli was examined by administering a relevant antagonist (SCH39166 for D1R; Eticlopride for D2R) during the S2-S1 training. Results indicate that activity at both dopamine D1- and D2-receptors is critical for S2-S1 learning. This is consistent with prior reports regarding the role of phasic dopamine activity (targeting D1R) in reward learning, but additionally indicates that the role of D2R also extends beyond relationships that involve motivationally salient events.
Oscillations in subjective timing: the intentional binding effect modulates over time

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In a phenomenon called ‘intentional binding’, the perceived temporal interval between a voluntary action (e.g., a button press) and a subsequent sensory event (typically 250 ms later) is subjectively compressed. We investigate this effect in light of recent work which shows that perception is an oscillatory process exhibiting peaks and troughs in sensitivity, and that the perceptual oscillation cycle is reset by a voluntary action to align with the action. We tested whether ‘intentional binding’ oscillates over time after the voluntary action by testing the effect at a range of time points. Participants viewed a rotating clock-hand and voluntarily pressed a button to start a trial, after which a brief tone sounded at a random time (0-800 ms, in 5 ms steps). Participants reported the clock position when they heard the tone. The clock rotation period was either 2.5 s/cycle (Experiment 1) or 5 s/cycle (Experiment 2) and we measured the clock-reading error as a function of time. Consistent with previous ‘intentional binding’ results, both experiments showed that the perceived time of the tone (inferred from the clock position) was attracted towards the voluntary action. The magnitude of ‘intentional binding’ decreased as the action/tone interval increased. Interestingly, the ‘intentional binding’ effect oscillated along this linear decreasing trend, oscillating at 1.8 Hz in Experiment 1 but 3.8 Hz in Experiment 2. We suggest the oscillations of ‘intentional binding’ reflect the dynamic modulation of attention, which samples information at a faster rate when the tracked target moves at a slower speed.
Show me more versions of you and I’ll remember what you really look like: Effects of within-person variability in face learning

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Influential theories claim that exposure to within-person variability is essential for robust learning of new faces. A recent study shows that people performed better on a matching task after learning faces from highly variable photos, compared to learning faces from less variable photos (Ritchie & Burton, 2016). Here, we tested whether the benefit of within-person variability for face learning extends from matching task to recognition task. Participants (N = 48) learned 4 individual faces in a high variability condition (12 photos per face) and another 4 in a low variability condition (3 photos, each repeated 4 times). To ensure that high and low variability photos did not differ on aspects other than variability, photos in the low variability condition were a subset of those in the high variability sets. Further, to assess if variability promotes robust learning of invariant facial features (e.g., eyes, nose), we tested matching and recognition performance with cropped photos showing only internal features of faces. We found a large benefit of variability in the recognition task, and a smaller effect on matching task. Our study suggests that within-person variability facilitates robust face learning based on invariant features, and that the effects likely involve processes of both perception and memory.
Measuring the Vergence Horopter

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The longitudinal horopter can be measured using many different criteria including; identical visual directions, the apparent frontoparallel plane, the locus of fused images, maximum stereoscopic acuity and the locus of zero dichoptic motion. Ogle (1950) suggested another criterion, the position of stimuli that do not induce fusional movements of the eyes, the Vergence horopter. The Vergence horopter would consist of a range of disparities which do not reliably elicit a vergence movement of the eyes in response to the stimulus. To test this, we measured the range of horizontal disparities which did not elicit reliable vergence movements at a range of eccentricities between 1° and 10°. Using the method of constant stimuli, participants responded to the subjective alignment of nonius lines after presentation of a texture patch at a range of crossed and uncrossed disparities. Results suggest that the range of disparities that do not elicit a vergence movement is small (< 4.5 min arc) and is not affected by changes in eccentricity.
Decision-making in source memory: reevaluating threshold models of source memory retrieval

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Source memory is memory for the context in which items were previously encountered. Past research has largely aimed to establish whether source memory retrieval is better characterised as a threshold or continuous process in two-alternative forced choice tasks, using ROC functions. Recently, Harlow and Donaldson (2013) introduced a continuous report paradigm to study performance in source memory tasks, and found evidence of a retrieval threshold underlying response accuracy. However, this account does not consider response time (RT) distributions. To investigate the role of decision-making in source memory retrieval, this study used the Smith (2016) circular diffusion model to introduce diffusion analogues of the threshold and continuous models of source memory retrieval in a replication of the Harlow and Donaldson (2013) task. Model selection done using the BIC found support for a circular diffusion model where memory discretely fails, as both RT and response accuracy data suggested that there were two components in performance.
Social learning vs. outgroup bias: Minimal group effects in emotion categorization

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Happy faces are categorized faster and more accurately than faces with negative expressions. This happy face advantage is moderated by social category cues, such as sex and race, in evaluative congruent ways. The happy advantage is larger for the more positively evaluated faces. With a minimal group paradigm, we examined whether recent and artificially acquired group membership will be sufficient to elicit a comparable evaluative bias in an emotion categorization task. To test this, group membership was created with a bogus personality test, where participants were assigned different personality types, indicated by the colour green or orange. Caucasian male faces presented on a green or orange background, indicating their personality type, were then categorized as happy or angry as quickly and accurately as possible. Consistent with the suggestion that emotion recognition can be affected by arbitrarily assigned social categories, a larger happy face advantage was predicted for the ingroup compared to the outgroup faces. A minimal group effect was evident in the error rates, where fewer errors were made categorizing happy than angry ingroup faces. There was no effect of group membership on categorization times or explicit ratings of the faces. The results suggest that artificially created groups can elicit an evaluative bias in emotion perception and provide some support for the evaluative congruence account as an explanation for the effects of social category cues on emotion categorization.
Modeling the speed-accuracy tradeoff in probabilistic categorization

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In many perceptual decision-making tasks, such as judging the orientation of a line as horizontal or vertical or judging a luminance patch as bright or dark, people respond to time pressure by requiring less evidence than they normally would when making a choice. In these types of tasks, there is often little to no need to learn how stimuli are mapped onto response outcomes, and people’s response to time pressure is usually viewed as a purely decision-related phenomenon. We investigated how speed-emphasis affects performance when people must learn how stimuli map onto different response outcomes. We reasoned that it is possible that speed emphasis, in addition to lowering decision thresholds might also influence learning rates. People completed alternating blocks of learning trials in a simple probabilistic categorization task. We analyzed learning performance using both the diffusion model as well as a new model that combines an associative learning front end with a diffusion decision process. We consider the theoretical implications in terms of the relative separability of learning- and decision-level phenomena.
Do Judgements of Learning affect memory? A meta-analysis and systematic review

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Judgements of learning (JoL) are often used in memory research as a means for assessing an individual’s metacognitive beliefs about their learning. JoL have been shown to reliably predict performance as well as learning behaviours and decisions (Rhodes, 2016). Participants may, however, modify their behaviour in response to performing JoL (Mitchum, Kelley, & Fox, 2016; Soderstrom, Clark, Halamish, & Bjork, 2015). There has, however, been little consensus as to the reliability and direction of the effect. We report on a meta-analyses that assesses the evidence that memory performance is reactive to JoL. The results indicate that overall providing JoL does not have a significant effect on memory performance (g = .054, 95% CI - .027 to .135). However, sub-groups analysis showed that this effect depends on the nature of the stimuli to be recalled, with moderate positive reactivity observed for related word-pairs (g = .323, 95% CI .083 to .563) and word-lists (g = .384, 95% CI .146 to .622) but no reactivity when pairs were unrelated or a mixture of related and unrelated pairs. These results indicate that researchers should be aware that eliciting JoL may well influence participants’ underlying encoding processes, especially when using related word-pairs or word-lists.
Disentangling the grasp and functional use mechanisms in the visuomotor associations of manipulable objects

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We constantly use manipulable objects such as keys, knives, or pens. This requires an interaction of mechanisms that are fundamental for object knowledge and goal-directed behavior. Evidence demonstrates that action-related properties such as the grasp and functional use of objects may contribute to the recognition of objects with similar properties. However, it is unclear if these properties can have an influence on the actions directed towards objects. Ten participants pantomimed the grasp and action of pairs of visually presented stimuli. Participants pantomimed the first and second images separated 2 seconds apart. The next pair was presented 14 seconds later. Grasps and actions to the second image were either the same or different than the first. Reaction times (RT) were obtained by key release when participants began to pantomime, and movement times (MT) were obtained by analyzing video recordings. RTs demonstrated an interaction between object presentation (first vs. second images) and the different pantomiming conditions, $F(1, 9) = 7.35, p = .024$. This was explained by the significant effect of the second object stimulus on participants’ reaction times. The condition where the presentation of objects were exactly the same also demonstrated the highest effect of priming and displayed a significantly different reaction time to all the other conditions. Differences in MT were not observed between conditions. Findings suggest that the effect of priming is highlighted in the time taken to initiate object-directed actions through the visual processing of the grasp and functional use properties of manipulable objects.
Modelling condition order effects: Interference, learning, and decision strategies

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The list length effect (LLE) – that recognition is poorer for items from long lists than short lists – is a benchmark finding in memory research. Recently, however, Dennis, Lee and Kinnell (2008) showed that previously observed LLEs were due to various confounding factors, and that when these are controlled, there is a null LLE. This finding was used to argue against the common belief that items are the primary source of interference in recognition. Contrary to this, Brandt and colleagues demonstrated that when analysis is restricted to the first study-test cycle in an experiment, a LLE results; and that it’s only once performance is averaged across multiple study-test cycles that a null LLE results. They explained that in the first study-test cycle, participants commit a short or long list of items to memory (e.g., 20 or 80 items); but that in the second study-test cycle, participants often study the opposite list type, meaning that each would have committed an equal amount of items to memory (i.e., 100 items). Their proposal was that this gradual equating of items that participants experience throughout testing effectively masks the LLE. The present study replicated Brandt’s results and used computational modelling to investigate the condition order effects, particularly whether they are caused by the accrual of item-noise, changes in learning or changes in response thresholds. The data was fit with variants of the Osth and Dennis (2015) model, now extended to include the decision-making and RT components of the drift diffusion model.
Effects of L2 proficiency on speech production in noise

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Lombard speech is a type of variation which talkers produce to adapt to noisy environments. Prior research has shown that native (L1) talkers alter their production such as increasing intensity, lengthening vowel duration, and changing formant frequencies. Other studies also suggest that proficient bilingual talkers can produce as L1 talkers do such as spectral enhancement in vowel production. Yet it remains to be understood how second language (L2) talkers acquire the variation specifically among EFL (English as a foreign language) learners whose exposure and usage of L2 speech are severely limited. The current preliminary study thus examined the influence of L2 proficiency on speech production in noise by Japanese EFL learners. Two groups of the learners (high and low proficiency groups, n = 16) were asked to produce English (L2) tense-lax vowels in both noise and quiet. The primary cue for the tense-lax vowel distinction is spectral in English whereas it is temporal in Japanese which led our hypothesis that Japanese EFL learners, particularly the low proficiency group, might rely on the temporal cue rather than the spectral cue to modify their speech in noise. The results showed that clear L2 proficiency effects on spectral enhancement were shown in most of the vowels but not in /u/. However, the lack of spectral enhancement was compensated by the temporal modification such that the high L2 proficiency group demonstrated a further lengthening when speaking in noise compared to in quiet.
Connectome modelling reveals brain networks associated with individual differences in rhythmic motor control and temporal prediction.

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According to the Adaptation and Anticipation Model (ADAM), successfully coordinating rhythmic actions with other people relies on; adaptive mechanisms that correct recent timing errors, and anticipatory mechanisms that adjust responses to correct predicted timing errors in upcoming actions. The present study combined connectome modelling with behavioural models of sensorimotor synchronisation to explore the functional brain networks associated with rhythmically timed action. Seventy participants completed auditory-paced finger-tapping tasks designed to elicit adaptive and anticipatory processes while brain activity was measured with fMRI. Behavioral estimates of adaptation were derived by fitting a reactive error correction model to responses obtained while participants synchronized actions with a virtual adaptive partner. Estimates of anticipation were derived by fitting ADAM to responses obtained when participants synchronized actions to a stimulus sequence with a tempo that fluctuated predictably between 400ms and 600ms. Additional noise estimates quantified the underlying variability of internal time keeping processes. Behavioural estimates were correlated against task-induced functional connectomes to identify neural networks associated with reactive and predictive correction mechanisms. To validate the identified networks, functional connectomes were used to predict behavioural model estimates in a hold out dataset. Cross-validation analysis demonstrated accurate prediction of only timekeeper noise and anticipatory error correction. The networks associated with each estimate were distinguished by connectivity between cortical and sub-cortical regions. The timekeeper network demonstrated strong cortico-striatal connectivity, consistent with basal ganglia involvement in rhythmic action and perception. In contrast, the anticipatory error correction network was characterised by cortico-cerebellar connections, consistent with cerebellar involvement in predicative internal models.
Small samples and messy data: Time for a new approach?

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A limited sample size is a common reality in experimental psychology research. Unique populations, complex testing requirements, and ethical considerations can all serve to restrict the number of participants able to be recruited for a given study. While these issues may have a limited, or at least controllable, impact on recruitment and testing in experimental research, the effect on analysis and inference can be much more pronounced. A small and diverse sample can greatly limit the complexity of any applicable analysis, and by extension, the complexity of possible research questions or hypotheses. Furthermore, the reliance of traditional statistics on normality and the central limit theorem can greatly reduce its ability to detect effects when the sample is small and non-normal. However, the increasing accessibility of Bayesian methods provides a uniquely suitable alternative that can overcome these limitations.

Several simulation analyses were conducted using Stan to demonstrate how Bayesian methods can detect relationships that would be dismissed or undetectable by traditional statistical approaches. The utility of these methods is then emphasised by applying them to the dataset from a randomised controlled trial of transcranial direct current stimulation (tDCS) and cognitive training in 42 individuals with Parkinson’s disease and mild cognitive impairment. This application to a real dataset illustrates the improvement in robustness and quality of inference that can be gained by using Bayesian statistics.

The focus is on the application and interpretation of Bayesian methods in an experimental psychology context; emphasising the practical, rather than the theoretical benefits.
Don't underestimate estimation: Why most of the time you should not do hypothesis testing

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Most of us were trained to do hypothesis testing above all else. I’ll try and argue that hypothesis testing really only makes sense when you have two competing hypotheses - a position in which we rarely find ourselves. Model selection, or hypothesis testing, is part of the research process, but should be reserved for when we have competing hypothesis rather than a null and a 'default' alternative. Until that point, we may be better served limiting ourselves to estimation, and using that information to build alternative hypotheses that combine the data we have observed and the theoretical principles we wish to imbibe. I'll then give a couple of examples from recent work where we used estimation, and discuss what little value having a hypothesis test would add.
Judgments in Moral Dilemmas: The Role of Uncertainty

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Empirical research illustrates that different types of moral dilemmas elicit discrepant decision patterns: some eliciting decisions to sacrifice one person to save a larger number of people, and some eliciting decisions to not sacrifice the individual and allowing the others die. We argue that both decisions can be rational in terms of maximising subjective expected utility. The present research focused on uncertainty in various dilemmas, which is one major cause of the discrepant decision patterns. Three studies were conducted to examine participants’ decisions and their perceived outcome probabilities across 18 moral dilemmas. Study 1 showed that probabilistic reasoning predicted moral decisions across all dilemmas, independent from various dilemma characteristics and individual differences in rational and intuitive thinking tendency. Study 2 further demonstrated that such findings were not results of methodological artefacts such as post-hoc justification or hypothesis space partitioning. Study 3 considered the impact of linguistic phrases such as modal verb ‘will’ used within the semantic content of moral dilemmas. Verbal expressions entail imprecise probability information and are liable to be construed with a high degree of variability between individuals. The results showed that changes to the presentation of the probabilistic information elicited significantly different choice behaviour in moral dilemmas.
Music and photo evoked autobiographical memories in people with Alzheimer's Dementia: Frequency, specificity and the reminiscence bump

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Music evoked autobiographical memories (MEAMs) can be preserved in people with Alzheimer's Dementia (AD), but it is unclear whether music is more effective than other familiar stimuli at evoking memories. We explored the frequency and specificity of memories in response to music and photos (PEAMs) in people with AD compared with healthy elderly controls, and whether a reminiscence bump exists for these memories. 10 participants with AD and 10 aged matched healthy people reported memories following exposure to 16 famous songs (longest duration at number one in Australian music charts) and 16 photos of famous events, from 1930 to 2010. Transcripts of reported memories were coded for specificity, ranging from 1 (semantic association) to 5 (specific event in time and place). PEAMS were more frequent and more specific than MEAMS in healthy people (p < .05), but no such differences were observed among people with AD. Relative to healthy participants, there was a significant decline in the frequency (but not the specificity) of PEAMS (p < .05), but no decline in the frequency or specificity of MEAMS in people with AD. A reminiscence bump (higher frequency of memories evoked by stimuli from when participants were aged 10-30 years compared with later decades) was evident for MEAMS but not PEAMS in AD, and for both memory types in healthy elderly. Our findings contribute further evidence of the preserved mnemonic effect of music in the face of AD.
Evidence-based evidence: Communicating forensic decisions and expertise

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For over 100 years, forensic science has been used as evidence in criminal trials despite the absence of any empirical evidence supporting their validity and reliability. Examiners generally make claims to the uniqueness and permanence of fingerprints - to “demonstrate” the infallibility of the fingerprint method. However, errors are not due to people having identical fingerprints, errors are due to examiners incorrectly matching highly similar but non-matching prints. After numerous erroneous identifications, these days examiners cannot testify that two fingerprints “match” to the exclusion of all other people and their testimony is beginning to reflect the uncertain nature of forensic science. However, the way in which forensic experts should now testify about the results of their comparisons is a contentious issue. Current proposals involve presenting evidence in ways that are scientifically or mathematically complex for the average juror to understand. We propose that presenting information about examiners’ performance is easier for jurors to understand and appropriately weigh forensic evidence. Here I will describe our model of expert testimony which draws from the diagnostic model in the medical field. To evaluate testimony effectiveness, prior research has compared participants’ judgments against theoretically “normative” standards of decision-making. However, this is problematic when comparing judgments about a methodology and judgements about experts’ performance. Instead, we examine people’s sensitivity to irrelevant cues (e.g. examiner attractiveness or confidence), as an ideal model of testimony would be one in which jurors do not rely on irrelevant cues to weigh the evidence.
Developmental tuning of the contrast-sensitivity function in larval zebrafish

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The zebrafish (Danio rerio) is a diurnal, visually guided predator, offering a compelling model of visual development. Within five days of fertilisation, zebrafish larvae will swim in the direction of a moving texture. This innate optomotor response can be exploited in the laboratory to characterise the spatiotemporal frequency tuning of the developing visual system. Here, we compared the optomotor response of larval zebrafish at 5, 6 and 7 days post-fertilisation (dpf). On each trial, a narrowband filtered noise texture drifted for 30 seconds beneath an arena containing approximately 30 larvae per lane. We captured images of their spatial distribution before and after presentation, and used an automated algorithm to determine the change in mean position (the 'optomotor index'). At all ages, the optomotor response was spatially bandpass within the presented range (0.005 to 0.32 cycles per degree), and the peak of the function shifted towards lower spatial frequencies as speed increased from 100 to 400 degrees per second. Previous studies have reported no change in visual acuity from 5 to 7 dpf, but we found that functions shifted towards higher spatial frequencies with increasing age. In addition, we found evidence of a more pronounced shift in visually experienced compared to visually naive larvae. While the lens and retina are well developed at 5 dpf, our results suggest that the spatiotemporal resolution of the zebrafish visual system may improve over the subsequent period through experience-dependent synaptic maturation.
Our memories of past events and the times at which they occurred are subject to change. Using data collected from a smartphone, we predict when people will believe events from their lives occurred on a person by person and stimulus by stimulus basis. Participants wore a smartphone around their necks for a period of two weeks. The smartphone collected images, audio segments, GPS and accelerometry data. These data sources were augmented with weather conditions, temperature, moon phase and audio tags derived from a machine learning model. After a week retention interval, participants were shown a selection of images and were required to indicate upon which day each image was taken. A conditional logit model predicted leave one person out judgements, leave one day out judgements and leave one observation out judgements. Audio segments, accelerometry, and GPS data were all shown to significantly contribute to the prediction of when a memory occurred. We highlight the importance of prediction in psychology and the advantages of using cross validation over other methods of model selection.
Depth Distortions as a Function of Viewing Distance

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3D images must be captured and displayed at the same distance for veridical depth perception. Previous research has shown that depth is significantly underestimated in 3D images that are displayed at a shorter distance than the distance from which they were captured. This is known as the cardboard cutout effect and is understood to exist due to a misapplication of depth constancy. This study aimed to test whether depth estimates would be significantly overestimated when display distances greatly exceed the distance for which the images were designed or captured, as in 3D imagery for laparoscopic surgery. Thirty participants took part in a 3 (disparity: 14.4, 28.8, 43.2 min arc) x 3 (display distance: 50, 150, 250 cm) study, with depth estimates forming the dependent variable. The findings indicated that depth estimates increased as a function of viewing distance, with all conditions indicating significant overestimates in depth at a Bonferroni adjusted alpha level of 0.008. These findings support the notion that capture and display conditions must be matched to allow for veridical depth perception. When the capture distance exceeds the display distance, depth is underestimated, and when the display distance exceeds the capture distance, depth is overestimated.
Consolidation and attentional refreshing: Separable or substitutable processes?

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This experiment examined whether short-term consolidation and attentional refreshing, two processes important for the maintenance of information in working memory, are separable or can be substituted for one another. The opportunity for consolidation was varied by manipulating the pace at which the processing activity was presented following each memory item in a working memory span task (fast-to-slow, slow-to-fast, constant) whilst equating the opportunity for attentional refreshing. 50 participants completed all three pace conditions in either an immediate context, which presented the processing activity immediately after each memory item, or a delayed context, which presented a blank delay interval after each memory item to allow for consolidation. Results showed no difference in memory performance across the three processing pace conditions, suggesting that consolidation and attentional refreshing may be substitutable, but better performance in the delayed context, consistent with a process of consolidation. Response times to the first processing item following each memory item also showed no differences between the three pace conditions, but were faster in the delayed context, consistent with a process of consolidation. These findings challenge strict attentional bottleneck models of short-term consolidation and instead favour a model in which the process of consolidation is under strategic control.
The Phenomenology of Truth: The Aha! experience predicts accurate decisions in contexts of uncertainty.

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Here we propose an explanation for the recent finding that insight phenomenology, or “the Aha! experience”, predicts objective problem solving. In experiment 1 we detect Aha! experiences in real-time using a dynamometer and show that—without any deliberation or conscious verification—the Aha! experience predicts substantially more accurate solutions to insight problems (d = 1.2) and remote associates tests (d = 1.9), but not analytic problems that depend on deliberate processing. The intensity of the feeling further predicts better performance. In experiment 2 we demonstrate that these results are not constrained to problem solving, and show that Aha! phenomenology in a multi-sensory identification task also leads to greater confidence and accuracy when there is uncertainty. It is possible that the feeling of Aha! is an adaptive intuition about the quality of an idea or solution, akin to a heuristic.
Face and object expertise in developmental prosopagnosia

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A prominent issue in visual perception centres on the nature of the mechanisms underlying face processing. One possibility is that faces are processed by specialised mechanisms that are not involved in object processing. Alternatively, faces might be processed by generic mechanisms common to all objects we are experts with. One way to test these possibilities is by investigating whether participants with impaired face processing due to developmental prosopagnosia can acquire expertise with novel objects called greebles. In this study, we tested 10 prosopagnosics and 10 controls. All participants completed a standard training program for acquiring expertise with greebles, as well as parallel training programs with upright and inverted faces. Prosopagnosics were able to acquire expertise with greebles to the same level as controls, but they showed deficits when learning upright faces. This result demonstrates that deficits for face processing in prosopagnosia are not associated with deficits in gaining expertise with objects, suggesting that face processing relies on specialised mechanisms. Moreover, compared to controls, prosopagnosics showed deficits in learning upright faces, however, despite these deficits, they still showed some evidence of learning. Similar to controls, prosopagnosics demonstrated better learning with upright faces than with inverted faces. These findings suggest that prosopagnosics may still possess face-specific mechanisms, which could potentially be developed for rehabilitation purposes. "This work is supported by Royal Society of New Zealand Marsden Fund 16-VUW-175."
Size contrast versus size assimilation in the Ebbinghaus illusion.

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Size perception is also prone to simultaneous /sequential contrast and assimilation. For instance, a target disk surrounded by smaller disks is perceived larger than the same disk surrounded by larger disks (Ebbinghaus size illusion). In our recent study for determining the temporal tuning of the Ebbinghaus size illusion, we found that the size contrast effect when the surrounding disks preceded the target disk but a (albeit weaker) size assimilation effect was observed when the surrounding disks followed the target disk (ECVP 2017). The present study aimed to further examine the contextual effect of the Ebbinghaus size illusion by presenting additional disks at the center of the surrounding disks. In the experiment, the smaller and larger surrounding disks were presented simultaneously with the additional disks on the left and right side of the fixation. Then, two target disks with equal size were presented at the various timings relative to the surrounding disks. Participants reported which target disk was larger. The size contrast effect was preserved when the target disks preceded the surrounding disks with the additional disks. However, the size assimilation effect observed in the previous study without additional central disks disappeared and even turned into the size contrast effect when the surrounding disks followed the target disks. The size contrast effect regardless of the presentation timing may indicate that size assimilation occurs between the successively presented central stimuli (i.e., the target and additional disks at the center), highlighting multifaceted spatial and temporal interactions between size contrast and assimilation.
Integrating facial, postural, and vocal cues to emotion

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In daily life, we perceive emotions via a variety of cues including facial expressions, postural movements, and emotional vocalizations. We integrate this range of emotional information into a single judgment, although how this is done is not well understood. Do we privilege particular cues in our judgments or simply average the emotional information we encounter? To determine whether we privilege or average emotional cues, we created stimuli that paired dynamic facial expressions, dynamic postural expressions, and emotional vocalizations. Stimuli were either congruent, with all cues expressing the same emotion, or incongruent such that two cues expressed one emotion while the third expressed a different one (e.g. a sad face and voice paired with a fearful posture). Emotion categories presented were happiness, sadness, anger, and fear. We found that participants largely averaged the cues they encountered although this varied with the emotion presented. However, particular emotion-cue pairings prompted participants to privilege cues, particularly fearful facial expressions, fearful body postures, and sad vocalizations. We argue that current models of emotion have largely been focused on isolating cues to emotion, but this focus has come at the detriment of understanding our multi-faceted real-world judgments. Here we argue for an initial framework describing how people integrate the variety of emotional information they encounter.
Psychometric properties of Emotion-Induced Blindness

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Attentional Bias tasks index how individuals allocate attention, primarily in relation to the valence of the stimuli, and clinically relevant individual differences. However, recent studies have shown that many of these tasks are lacking in key psychometric properties (e.g. Dot Probe reliability; Schmukle, 2005). A new emerging tool to investigate attentional biases is the Emotion-Induced Blindness (EIB; Most, Chun, Zald, & Widders, 2005). Therefore, we investigated several psychometric and usage-related properties to inform further studies (N = 99, Males = 38, Females = 61, Mage = 23.19). We investigated: a) test-retest reliability, b) internal consistency, c) the optimum number of trials a session to maximize power, d) which of the many published EIB indices tap into attentional bias best, e) whether valence or arousal drive the effect, and f) how performance fluctuates over time. In addition, we also demonstrate using generalized mixed models to analyze raw EIB scores rather than perform analyses on aggregate scores. Our analysis found that EIB had favorable reliability and internal consistency in comparison to other attentional bias measures, that after 66 trials precision did not significantly increase any further, that of the six EIB indices used in the literature, we could derive 2 factors from an exploratory factor analysis, both valence and arousal of the images predicted performance, but when controlling for each other, only valence predicted performance over and above arousal, and that performance was stable, except for later lags and no-distractor conditions. Implications for future study designs are discussed.
Exploring the basis of confidence in recognition – a psychophysical approach vs. an inferential approach to ecphoric confidence ratings.

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When explaining the basis of metacognitive judgments, two main schools of theory have emerged in the literature: psychophysical models and inferential models. We investigated whether ecphoric confidence ratings – a metacognitive judgement where participants index their recognition by rating their confidence that a test stimulus was viewed at study, in the absence of a binary recognition response – were best accounted for by psychophysical or inferential models of metacognition. 60 participants completed a facial recognition task. Participants saw a mix of full and partial faces at both test and study (partial faces displayed the top half of the face), and provided ratings for each face at test on a coarse-grained verbal (low, moderate, or high) or fine-grained probabilistic (0-100%) confidence scale. Inferential models of metacognition propose that additional information at test, regardless of its diagnosticity, increases confidence. Therefore, we would expect confidence to be higher in trials where participants viewed a partial face at study (PS) followed by the corresponding full face at test (FT), than when they viewed a partial face followed by the corresponding partial face (PT). Psychophysical models, in contrast, propose that confidence indexes stimulus discriminability, and should be unaffected by additional non-diagnostic information, PS/FT = PS/PT. The doubt-scaling model argues that non-diagnostic information should decrease confidence, and therefore PS/PT > PT/FT. Results were consistent with the doubt-scaling account. However, these results must be interpreted with caution given potential limitations. Results were consistent across scale types.
ERP Correlates of Behavioural Inhibition during a Flanker Go/Nogo Task in Chronic Cannabis and MDMA-Cannabis Poly-drug Users

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Regular use of Ecstasy or MDMA (3,4-Methylenedioxyamphetamine) has been associated with a range of cognitive impairments, including alterations in memory and behavioural inhibition. However, poly-drug use is common among MDMA users, leading to ambiguity within the research literature. As such, the current study aimed to examine the effects of regular MDMA use on behavioural inhibition, while controlling for cannabis and other drug use. Forty-six participants (27 male) were divided into a drug naïve control group (DNC) (n = 17), a cannabis only (C) group (n = 16), and a MDMA-cannabis poly drug (PD) group (n = 13). Participants completed a combined flanker/go-nogo task while electroencephalographic (EEG) activity was recorded. Behavioural (accuracy) and neurophysiological (amplitude of the N2 ERP component) measures of behavioural inhibition (nogo trials) were analysed. Both CO and PD groups exhibited more false alarms on nogo trials when compared to DNCs. In addition, N2 amplitude tended to be greater overall for PD users. The results suggest that regular use of both cannabis and MDMA is associated with subtle reductions in behavioural inhibition. In addition, preliminary data suggests that regular use of MDMA may impose additional demands on inhibitory processing mechanisms.
Pitch and syntactic disambiguation in English and German: investigating cross-linguistic differences using eye-tracking

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English and German have similar intonation systems but may use pitch differently to disambiguate syntactic structures. In a visual world, eye-tracking experiment, we investigated whether a cross-language difference in pitch cues produced found for temporarily ambiguous sentences could also affect the perception and time-course of disambiguation. Native German and English speakers listened to temporarily ambiguous verb-phrase (VP) attachment sentences (e.g. The man visited the zoo with his young niece) or noun-phrase (NP) attachment sentences (e.g. The man visited the zoo with the new tigers) while inspecting a scene depicting two objects related to each sentence type. If pitch cues were used to disambiguate between structures, then we expected different patterns of anticipatory eye movements directed to VP objects (e.g. niece) and NP objects (e.g. tigers) in English and German before the point of disambiguation. However, results showed no evidence that speakers used pitch cues to distinguish between NP attachment and VP attachment sentences in English or German. A follow up study involving a more homogeneous German group from Southern Germany also supported the findings of the initial experiment. We conclude that although speakers can use cues such as a pitch to disambiguate, listeners may rely on other cues like context more than prosody when disambiguating, especially in more naturalistic situations.
Illusory contours (ICs) provide compelling data demonstrating the visual system's capacity to synthesize structure that is not present in the input. One theoretical view is that ICs are generated by processes that attempt to provide the best explanation of the input, whereas others explain IC synthesis at an implementation (mechanistic) level of analysis. Here, we report a broad new class of extremely robust IC displays that appear to support implementation level models. We created displays containing thin radial lines ("spokes"). An occluding figure consisting of a 'spiky' circular disk was placed at the center of the display and rotated over the radial spokes. The contrast of the occluding figure relative to the surround, number of spokes, and the number and amplitude of the occluding spikes were parametrically varied. We observed a striking variety of extremely vivid ICs, which appeared to rotate under the physically visible occluding surface. These ICs could take on dramatically different shapes, rigidity, and perceived motion as function of the number of spikes and spokes. We psychophysically measured the strength and shape of the ICs. We show that the shapes and motion of the ICs can be well explained by a model of partial border ownership, and develop a model that can accurately predict the perceived shape and motion of these different ICs. Our results suggest that the ICs formed by the accretion and deletion of thin contours are difficult to reconcile with models that attempt to treat IC formation as rational perceptual inference.
Perceptions of In- and Out-of-Tuneness Before and After Exposure to Different Tuning Systems.

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Various tuning systems have been employed throughout different musical systems, and each can be conceptualized as a form of compromise between the goals of flexibility of transposition on the one hand, and consonance of harmonization on the other. At the one extreme, 12-tone Equal Temperament allows exact transposition of any melody or harmony into any western key. At the other extreme, Just Intonation allows maximum consonance for any given harmony, but lacks the flexibility of transposition present in equal tempered music. While it has generally been shown that listeners prefer the sound of music tuned in Just Intonation, there is evidence that this may differ depending on prior exposure to each system. The present study aimed to explore people’s judgments of in-tuneness when presented with either correctly tuned or detuned chords from both Equal Tempered and Just Intonation systems. Participants (N = 46) were also asked to tune the notes of two chords. To assess whether immediate exposure to music from a given system may moderate the perception of in-tuneness, these tasks were completed before and after exposure to either barbershop quartet (Just Intonation) or Korean popular (Equal Temperament tuning) music. Participants were very sensitive to detuning in equal tempered chords, however the sound of Just Intonation music was perceived as highly robust, with chords in Just Intonation judged as generally in-tune for both correctly tuned and detuned chords. Listening to music did not influence participants’ judgements in either task.
Exploring lower- and higher-order cognitive capacities in premature children using the attentional blink

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Children born before 37 weeks of gestation are described as being born prematurely which is associated with numerous cognitive and educational consequences. We examined lower- and higher-order cognitive capacities in premature children using an attentional blink (AB) task. The AB is considered to reflect a limitation of temporal attention, evidenced by disrupted processing of a second target (T2) when it appears within 500 milliseconds of the first target (T1). T1 accuracy is typically high and when the temporal interval between targets is varied, T2 accuracy follows a U-shaped curve. The AB curve can be summarised by four parameters: lag-1 sparing, width, minimum accuracy, and amplitude. We explored these parameters in relation to lower-order (selective attention, attentional resources, speed of processing) and higher-order (executive) capacities. Relative to their full-term peers, children born prematurely exhibited both lower- and higher-order deficits, but only selective attention demonstrated a pattern similar to the differences noted in fluid abilities (assessed with Cattell Culture Fair test of g). It is suggested that selective attention and fluid abilities reflect novel-task learning and this may be protracted in premature children, likely underpinned by prefrontal brain development.
The Role of Gender in Fat and Muscle Aftereffects: Implications for Body Image Disturbance

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Body size and shape misperception (BSSM) - a significant component of body image disturbance - is experienced by many members of the general population and constitutes a risk factor for the development of eating disorders (such as anorexia nervosa) and muscle dysmorphia. For decades, BSSM has been linked to consumption of media promoting unrealistic body standards, which have tended to be relatively gender specific. While female-directed content primarily encourages pursuit of the thin (i.e. low fat) ideal, male-directed content tends to prioritize muscularity. Recent visual adaptation research has simulated BSSM effects in the laboratory by exposing participants to images of bodies that are high (low) in body fat, causing subsequently seen bodies (including the body of the participant) to appear unrealistically thin (fat). Similar aftereffects are seen for adaptation to extreme levels of muscularity. Here, we investigated gender differences in fat and muscle aftereffects. It was hypothesised that females may exhibit larger fat aftereffects, while male participants may show larger muscle aftereffects. Although these hypotheses were not supported, results showed significantly larger aftereffects for stimuli of the participants' own gender compared to other gender stimuli. The implications of these findings for visual adaptation models of real-world BSSM will be discussed.
Orthographic overlap within a set determines treatment generalisation in acquired dysgraphia?

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Aphasia is a problem with language following stroke, and treatment of impaired word retrieval in aphasia has been used as a method of understanding language processing and representation. Previous treatment of homophones in aphasia has found improvement of even untreated homophones (Biedermann & Nickels 2008a, 2008b): For example, improving picture-naming of cricket [the insect] with treatment also resulted in improved naming of the untreated item cricket [the game]. This has been attributed to homophones sharing a word-form representation (Levelt et al., 1999). However, alternatively generalisation could be caused by feedback from shared phonemes/graphemes to separate word-forms.

To discriminate between these accounts, a treatment study was conducted with a participant with impaired written word retrieval. Homophones and controls were treated, and improved and generalisation to homophone partners, direct neighbours (DN) of the controls, and unrelated controls was investigated: Only DN showed improvement. The most plausible explanation for this pattern is feedback from treated target graphemes to other word-forms. However, this mechanism should have resulted in partners of treated homophones (that share 100% of graphemes and therefore receive the maximum amount of feedback) also showing generalisation (not just DN). However, post-hoc analysis found that the DN had slightly higher degree of graphemic-overlap with the treated item set as a whole than the treated homophones, hence it is possible that treatment improvement is due to similarity to the treated sets as a whole, not individual sets. Indeed, regression showed that graphemic-overlap between the treated set and untreated items, predicted treatment generalisation.
Investigating differences in state and trait empathy between fans and non-fans of violent music

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Exposure to violent video games is linked to negative outcomes such as reduced empathy for the plight of others. No research has investigated whether exposure to violent music has similar effects. The present study investigated whether violent music fans show reduced empathic reactions to aggression compared to non-fans. 108 participants self-identified as fans of violent heavy/death metal, classical or jazz music (n=36). Participants were randomly presented with six vignettes that described a primary character’s reaction (the “aggressor”) to a secondary character’s irritating action (the “instigator”). The aggressor’s reaction was non-aggressive, mildly aggressive or strongly aggressive. Participants rated state empathic concern (other-oriented empathy) and personal distress (self-oriented concern) in response to the aggressor’s reaction. Participants also completed measures of trait empathic concern and personal distress. It was hypothesised that compared to non-fans of violent music, fans would report lower trait empathy and reduced state empathic responses to the aggressive reactions. These effects were also expected for males relative to females. Fans of violent music reported significantly lower trait empathic concern compared to classical and jazz music fans. There were no significant differences in state empathy between the fan groups. In terms of sex differences, male violent music fans exhibited lower state empathic reactions than female violent music fans. Male violent music fans also exhibited lower state empathic responses than male fans of classical and jazz. Results will be discussed in light of cognitive and behavioural consequences of desensitisation to media violence and pre-existing individual differences between fans of different musical genres.
The N170 visually evoked potential, violated expectations and prediction error

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After light strikes the retina, the first 200ms of visual processing is a crucial period as bottom-up gives way to top-down processing. It includes the N170 ERP (approx 170ms poststimulus), a component associated with the brain’s ability to encode facial form. We investigated whether top-down predictive coding mechanisms, by which the brain detects mismatch between its prediction of sensory input and incoming sensory information (prediction error), could enable discrimination of identity (not just form) at this stage, and whether this would apply to stimuli other than faces. It was hypothesised that when contextual expectancy about identity is created, an unexpected (low probability) identity will trigger an increased N170 response, compared to a high probability identity, as the brain detects prediction error, and that this response will not be confined to faces. The study had three parts, each having two ‘identities’ from within a visual category: human faces; buildings; natural landmarks. EEG recorded responses to ambient images presented randomly and rapidly — different images of frequent (high probability) identity and infrequent (low probability) identity. This design manipulated expectation about stimulus identity based on probability, and ensured that response was time-locked to identity change. In the faces experiment no image was repeated; in the landmarks experiments, number of image repetitions was equal across conditions. Results supported the hypothesis, showing increased N170 response to the low probability identity, suggesting the N170 indexes top-down processing of prediction error, not simply stimulus-driven responses to visual form. Moreover, this occurred for faces, buildings and natural landmarks.
Adding types, but not tokens, affects the breadth of property induction

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Property induction involves learning about exemplars that share a novel property and then generalizing that novel property to new instances. The extent to which we generalize depends on the sample used for learning. Across two studies, we presented samples of birds and flowers that differed in the number of types (discrete entities) and/or the number of tokens (copies of the same entity) that shared a novel biological property. For example, types were represented by photographs of different birds, whereas tokens were represented by repeated photographs of the same bird. We then asked participants to generalize the novel property to test items that varied in similarity to the sample. Existing studies permit separate and conditional hypotheses about the effect of adding types and the effect of adding tokens, but no study has examined the effects of both variables on generalization stimuli varying in similarity. We found that adding types broadened generalization to similar stimuli, but tightened generalization to dissimilar stimuli. Adding tokens did not affect generalization, but adding identical exemplars that were framed as types produced some tightening. Implications for models of inductive reasoning are discussed.
Choice over treatment initiation enhances the placebo effect: an experimental model

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Choice is an integral component of modern life. Yet, placebo effects are almost always modelled under passive conditions, where participants have no choice over treatment. The current study tested whether providing choice influences the placebo effect using experimentally-induced pain. Healthy volunteers (n=80) were led to believe they were taking part in a study of Transcutaneous Electrical Nerve Stimulation (TENS) for pain, but this was actually a sham device. In a training phase, participants were randomised to receive either placebo conditioning in which ‘TENS’ was paired with a surreptitious reduction in shock intensity relative to no treatment (placebo groups) or to non-contingent pairings (Natural History group). Critically, the placebo groups were further randomised such that half could choose if and when ‘TENS’ was activated (Choice group) or to no such choice (No Choice group). Exposure to ‘TENS’ was controlled across groups by yoking the No Choice and Natural History groups to the Choice group. In the test phase, shock intensity was equivalent with or without ‘TENS’ with the same choice structure as training. The results indicated a clear placebo effect overall, with both placebo groups rating their pain as significantly lower on ‘TENS’ trials during the test phase compared with the Natural History group. Most interestingly, however, the placebo effect in the Choice group was significantly larger than that in the No Choice group. These findings indicate that choice significantly enhances the placebo effect and, therefore, that placebo effects outside of the laboratory might be much larger than traditional models suggest.
Individual differences in fixation and response times during enumeration and arithmetic reflect the ability to combine dissimilar numbers.

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Dot enumeration speed is a good predictor of arithmetic performance in both children and adults. The correlation between dot enumeration response time and arithmetic speed is greatest when the tasks have similar combinatorial demands. Combinatorial demand can be equated by grouping dots in an enumeration display at four locations (a quad display) and displaying four numerals in a single-digit arithmetic task (add four display). Fixation frequency predicts enumeration and addition response times, so eye movements are likely a good measure of the additive processes during counting tasks. The question arises as to whether individual differences in eye movements reveal variations in how people combine numerical information for enumeration and arithmetic number tasks. We recorded eye position and measured response times while undergraduate psychology students enumerated dots in a quad display or added numerals in an add four display. On each trial the participants enumerated dots or added numerals with total sums from 1 to 16. Response times and fixation frequency increased when the number of dots at the four locations in the quad display were dissimilar, and when the four numerals in the addition task were most different. Individuals varied in how much the addition of dissimilar numbers influenced response times and fixation frequency. Our data provide support for the idea that dot enumeration uses the same combinatorial processes as arithmetic, and that slow arithmetic is associated with greater difficulty in combining dissimilar numerical quantities in dot enumeration displays.
More than words: Instrumental music earworms interfere with phonological working memory

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‘Earworms’—the experience of a catchy melody that repeats endlessly in the mind— are a common occurrence for many. While mostly reported for music with lyrics, anecdotal evidence suggests that the phenomenon can be triggered by instrumental music, particularly for those with music training. Previous research demonstrates that earworms for vocal music engage phonological resources, manifesting as ‘inner singing’. However, it is unclear whether this subvocal activity reflects rehearsal of only lyrics or also musical aspects of the earworm. The present study investigated the role of phonological working memory in instrumental earworms, exploring potential differences among musicians and non-musicians. Five popular instrumental tunes were selected as potential earworm candidates, and five series of random tones generated (auditory stimuli unlikely to elicit earworms). Musicians (n = 20) and non-musicians (n = 20) undertook a serial recall task in silence (baseline), then while listening to either instrumental music or random tones (alternating, within-groups), and again in silence. For non-musicians, there was evidence that certain tunes continued to be subvocally rehearsed during the silent block following presentation, thus producing phonological interference. By contrast, following exposure to random tones, performance was similar to baseline. Musicians performed considerably better at the serial recall task than non-musicians, creating a ceiling effect which reduced the apparent size of the effect. This study is the first to investigate the cognitive processes underlying instrumental earworms, and findings obtained will inform an important area of debate, regarding the extent of overlap between music and language in working memory.
Population Size and Cumulative Cultural Evolution: Fewer Heads Can be Better than Many

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The Sociality Hypothesis predicts that larger populations 1) give rise to a greater diversity of ideas and opportunity for recombination of ideas, 2) generate better quality solutions and 3) are better able to maintain cultural complexity compared to smaller populations. This hypothesis has been primarily supported by mathematical modeling. Recently, archeologists have argued there is no fossil evidence to support the Sociality Hypothesis, and queried the assumptions behind the mathematical models. We ran a large-scale experiment (N=543) to assess the impact of population size on the adaptive evolution of material artefacts. The task was to build a paper airplane that flew as far as possible. Participants were randomly allocated to one of four conditions that simulated different population sizes: Individual-Learning, 1-Model, 2-Model and 4-Model. For example, in the Individual-Learning condition participants learnt via trial-and-error learning, whereas in the 4-model condition participants could learn from the paper airplanes produced by 4 others. A transmission chain design was used to simulate 8 intergenerational transmission episodes. As predicted by the Sociality Hypothesis, greater diversity in plane performance and better adapted planes were observed in larger populations. Contrary to the Sociality Hypothesis, plane performance (i.e., flight distance) improved over generations most strongly in smaller populations. Exploratory analyses indicate that participants’ working memory capacity was overwhelmed in larger populations, and this eliminated the potential benefits of greater variation and accesses to better adapted artefacts in larger populations.
Why Do We Speak When Gesture is Better? Testing the Utility of Vocalisation When Communication Complexity Increases

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When considering speech-first, gesture-first and multimodal accounts of language origin, the multimodal account is broadly supported as a parsimonious explanation for language evolution. However, in referential tasks that require participants to create new communication systems either through gestures, non-linguistic vocalisations (sounds that are not words), or a combination of gestures and vocalisations, those who use only gestures communicate more successfully than those who use only vocalisations. Moreover, participants who use a combination of gestures and vocalisations fare no better than those who use gesture alone. If vocalisations are not necessary or helpful when bootstrapping a novel communication system, how did modern humans arrive at a predominately speech-based language? We present two experiments that test whether increased communication complexity (i.e., the requirement to communicate more meanings per utterance) encourages movement away from a gesture-only system, towards a multimodal system. As referential communication tasks typically examine communication of single-word concepts, it is possible the limited complexity of these tasks has obscured the benefits of vocal communication. The current experiments compared communication across one-word, two-word and three-word phrases, to determine whether vocalisation becomes useful when the demands of a communication system are greater. Contrary to our hypotheses, participants did not vocalise more when communication complexity was greater, and when participants gestured and vocalised, they were no more successful than those participants who communicated using gestures only. Increased communication complexity does not appear to drive communication into the vocal modality.
Using RT distributions and race models to characterize primacy and recency in free recall initiation

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Memory models have characterized retrieval in free recall as multialternative decision making. However, the majority of these applications have only been applied to mean response times (RTs) and not to complete RT distributions, which offer more constraint. We fit RT distributions of free recall initiation with both a racing diffusion model and the linear ballistic accumulator (LBA: Brown & Heathcote, 2008) model in a hierarchical Bayesian framework. We applied models with different psychological assumptions about how drift rates for each serial position are generated. Recency was either a power law or an exponential function. Primacy was treated either as a strength boost to the early list items so that both primacy and recency items jointly compete to be retrieved, or as a mixture model where on some proportion of trials, the start context is reinstated and primacy items race with little competition from recency items. While serial position curves do not distinguish between the two models of primacy, they make distinct predictions about how RT distributions vary with serial position, with the reinstatement model being able to predict longer RTs for primacy items despite a recall advantage. Results from several datasets strongly favor the start context reinstatement model with an exponential recency function. These results also suggest that models of free recall can be more constrained by considering complete RT distributions.
When one item of a stream of very rapidly presented letters (RSVP stream) is cued for report with an outline circle, participants more often than chance report a letter from a few items before or after the cued letter. In other words, sometimes the letter that is reported occurred earlier, and sometimes later. According to “pipeline” accounts, the reason for this variation in time is corresponding variation in the latency of neural events. According to “buffering” accounts (Goodbourn & Holcombe, 2015; Martini, 2013), the variation is largely the result of a noisy binding process. Using an EEG and neural decoding framework, we are correlating the time of letters reported with the time of neural signals and indices of where letters are represented as distinct stimuli.
Vision-impaired people communicate better with gesture than vocalisation when prohibited from using language

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As the majority of the world’s languages are vocal, it is intuitive to think that languages originated in the vocal modality. However, in experimental studies where participants are restricted from using established languages, gestures consistently lend themselves more naturally than non-linguistic vocalisations (i.e., sounds that are not words) to the establishment of novel communication systems. Participants are more successful at communicating with gesture, and a combination of gesture and vocalisation offers no benefit over gesture alone. One criticism of these studies is that participants’ gestures may draw on socially learned conventions, while the majority of vocal conventions (i.e., spoken language) are prohibited. This could unfairly advantage gestural communication over vocal. We addressed this issue by replicating an established communication task using a sample of participants who were vision-impaired since early childhood, and thus had minimal opportunity to learn conventional gestures (N = 10). Additionally, we recruited a sample of age-, gender and education-matched individuals to compare performance. The design involved video recordings of these participants communicating a series of words using gesture or vocalisation, which were presented to another group of participants (N = 90) who attempted to identify the meanings. The gestures produced by vision-impaired participants were harder to identify than those produced by matched participants. However, the vision-impaired participants’ gestures were still identified more accurately than their vocalisations. This demonstrates that the higher communicative success of gesture is not solely due to social conventions unfairly advantaging this modality, and supports a gesture-first account of language origin.
Individual Differences Predict Social Learning Behaviour: Why Some People Copy More Than Others

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An important part of human social learning is knowing when and when not to copy others. Previous research has shown that people are selective about when they copy, and overall levels of copying in experiments tend to be very low. However, this resistance to copying has not received much research attention. In the present study, the aim was to investigate how resistance to copying relates to intelligence and personality. Two hundred participants completed a battery of tasks including intelligence and personality tests, and two novel games we designed to measure participants’ resistance to copying. In both games, participants were presented with a series of problems (combination locks or mazes). For each problem, they were trained on a solution (a combination or a route). After successfully executing this solution three times, participants were presented with a new solution (an alternative combination or route varying in quality), and were able to copy the new solution or stick with the training solution. Overall, participants were resistant to copying, sticking to the training solutions 57% of the time. Resistance to copying was associated with lower intelligence scores. Resistance to copying was also associated with lower openness to experience, but only for trials where the new solution was lower quality than the training solution. (This indicates that participants who copied when copying was maladaptive tended to be higher in openness to experience.) This research provides an important first step in understanding why some individuals are more (or less) resistant to copying than others.
Finding the base-rate: Effects of trial sequencing on the strength of illusory causation

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People are generally accurate at judging the causal relationship between two simple events such as a putatively causal cue and a probabilistic outcome. For instance, causal judgments of the cue usually reflect the extent to which that cue elevates the probability of the outcome above an observed base-rate. However, when the events are statistically unrelated, people display a reliable tendency to falsely regard the cue as causing the outcome, and this tendency towards illusory causation is strongest when both the cue and the outcome occur frequently. While there are many formal explanations of this bias, the types of procedures that most reliably produce these illusory effects have particular properties that limit the individual's ability to calculate and reason appropriately about the base-rate of the outcome. We tested whether one of these properties—the sequencing of trial types, and the length of runs of consecutive cue-absent trials (required to estimate the base-rate) in particular—affected the strength of illusory causation. Using a task with an ineffective treatment cue and a fictitious medical outcome, we found that clustering of trial types had a substantial impact on illusory causation even when the event frequencies were held constant. Implications for theories of contingency learning and false belief will be discussed.
Conventions are ubiquitous. All common everyday activities involve conventionalised behaviour. In language, using conventions improves communication success and understanding, whilst saving time and effort. But where do these conventions come from? The present study investigates a bottom-up account of how language conventions become ubiquitous in large populations, from interactions down at the individual level. It also examines the role of network connectivity in convention formation. Recent research found that connectivity plays a causal role in whether populations can spontaneously produce dominant conventions. The present study addressed issues with this claim. Using a more ecologically valid communication task, the study found a different pattern of results: people did not need to fully coordinate their language use in order to be mutually understood. Differences in population connectivity did not produce population-level differences in whether people could understand each other.
Visual preference for dynamic spatiotemporal variations

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We have previously shown that humans display a consistent preference for a wide range of images with fractal-like scaling characteristics (Spehar et al., 2003; 2016). Moreover observers’ preference for these patterns seems strongly related to their sensitivity for such patterns (Spehar et al., 2015). However, this relationship has been studied almost exclusively in the spatial domain and little is known about sensitivity and visual preference for these scaling properties in the temporal domain. To address this, we measure sensitivity and preference with dynamic synthetic noise patterns across a wide range of 1/f spatial (-2.25, -1.25, -0.25,) and temporal slopes (-2.25, -1.75, -1.25, -0.75 and -0.25). In both tasks, there was a significant effect of temporal slope variations such that observers were less sensitive to and also preferred less the dynamic synthetic noise patterns with steep spatiotemporal slopes. Furthermore we find strong correlation between sensitivity for the dynamic spatiotemporal patterns and the visual preference in individual observers. Like with the static patterns with fractal-like scaling properties, these findings suggest a strong relationship between visual sensitivity and preference, supporting assertions that there is a close relationship between aesthetic experience and the sensory coding of natural stimuli.
Dynamic similitude of cooperative strategies from different perspectives: Uncovering the task-dynamics for the "shepherding" task

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There are many examples of tasks which require the help of other people to obtain the goal. For example, members of a sports team must work together to score a goal against an opposing, dynamically changing, team. Research from our group seeks to investigate the principles that guide what coordinative strategies participants discover and utilize in complex, goal-directed movement tasks. We developed the “shepherding” paradigm where participants must work together to corral and contain autonomous and reactive “sheep” to a pre-defined goal location by moving handheld controllers on a video display. At the onset, participants subdivided the task-space in half and would work individually to contain the sheep. As task difficulty increased, not every dyad was able to solve the task. However, a subset of dyads discovered a coordinated, oscillatory solution where both participants would mirror the movements of their partner. This behavioural mode was robust to perturbations and excelled at completing the task. This oscillatory mode is not unlike what is observed in real sheepdog (Strömbom et al., 2014) and wolf-pack hunting behaviour (Muro et al., 2011). The present work sought to determine whether this behaviour defined a universal mode of shepherding more generally. To investigate this, participants completed a first-person version of the shepherding task, where participants were tasked to locomote through a virtual environment to contain the virtual sheep. Results indicate the same qualitative strategy also emerged in this first-person context, and that task difficulty affected its utilization like in the original work.
Placebo analgesia: The role of symptom variability and choice on treatment selection.

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Patients face difficult decisions when managing pain. Multiple treatments exist, while fluctuating symptoms create background variability, impeding judgements concerning treatment efficacy. An experimental model of placebo analgesia is employed to investigate the extent which treatment efficacy and variability influence treatment selection. Participants (n=62) were informed they would test two novel forms of Transcutaneous Electrical Nerve Stimulation ('Monopolar' vs. 'Bipolar' TENS). Both types of TENS were benign placebos. Two factors were manipulated: treatment efficacy and variability. For treatment efficacy, one sham TENS (e.g. monopolar) was surreptitiously randomised to be paired with a large shock reduction relative to no treatment. The other (e.g. bipolar) was paired with a moderate reduction. Participants therefore had the opportunity to learn one treatment was more effective. With respect to variability, participants were randomised to receive either invariable or variable treatments. The latter modelling natural fluctuations common to pain. At test, placebo analgesia was assessed by comparing both types of sham TENS with no treatment at equivalent pain intensity. Self-report pain and expectancy ratings were collected in conjunction with psychophysiological (EDA) data. Participants learnt about treatment efficacy, selecting the optimal treatment more often than chance (ps<.01). Both invariant and variable groups demonstrated placebo analgesia (ps<.001), with the optimal TENS eliciting a larger placebo effect (p<.001). Treatment variability did not moderate placebo analgesia or alter the extinction-rate. Results indicate that individuals are capable of detecting and exploiting effective treatments for pain. Furthermore, learning about treatment efficacy augmented the magnitude of the placebo analgesic response.
Are some participants more top-down processors than others? Hearing and seeing words that aren’t there.

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In this experiment, we investigated whether participants who were more prone to top-down processing effects in the auditory modality (i.e., hearing a target word that was not presented) were prone to experience such in the visual modality. To test this, we set up a paradigm where participants were asked to report whether a target word was presented or not; and to rate their level of confidence in the decision. Participants were presented with prime and target words, where the prime was clearly presented and the target was masked. To encourage top-down processing, half of the primes and targets had a strong association, e.g., “Doctor - Nurse”, and the other half did not. In the auditory trials, clearly spoken primes were followed by spoken targets that were hard to perceive, or very hard to perceive (presented mixed with white noise either at a moderate or high noise level, -6 dB SNR or -12 dB SNR); the same primes and targets were presented in both conditions. In the visual modality, a parallel setup was created: clearly presented prime words were followed by target words that were hard or very hard to perceive (presented for either 60 ms or 30 ms between forward and backward pattern masks). An additional set of auditory and visual trials were created where targets were not presented at all; responding that a target was present on these trials suggest top-down processing. Results are discussed in terms of a predictive coding account of sensory processing.
jamovi: a Rich, Open Statistical Spreadsheet (and Sexy Alternative to SPSS)

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Having access to a wide range of statistical techniques makes it easier to use the right tool for the job. Unfortunately, for a lot of the more advanced techniques it is necessary to know how to use a programming language such as R, and are therefore not usable for all social scientists. jamovi is a free and open, community driven statistical spreadsheet, that aims to make it easy to publish new analyses with an attractive, compelling user interface, making it accessible to all. This talk introduces jamovi, demonstrates its attractive user experience, and shows how easy new, cutting edge analyses can be developed, packaged, published, and made available to a much broader audience. jamovi is available from www.jamovi.org. (jamovi is also an excellent alternative to SPSS, and complement to R.)
Analysis of muscle activation reveals covert responses during selective and non-selective stopping tasks.

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Inhibitory control, i.e., the ability to cancel or reprogram planned actions in response to changes in sensory stimuli is a critical aspect of human behaviour that degrades with advancing age. Moreover, while we are often required to cancel one component of an action while continuing to execute other components, the mechanisms underlying this behaviour are poorly understood.

Healthy young (19-40 years; n = 25) and older adults (> 60-years n=25) completed a modified stop-signal task requiring simultaneous button presses with the left and right index fingers. Stop Signals were presented on 30% of trials requiring inhibition of either (selective stop) or both (non-selective stop) button presses. Electromyographic (EMG) recordings enabled covert muscle activity (partial responses) to be observed in successful stop trials and allow the latent neural and psychological inhibitory control mechanisms to be investigated.

For young adults, partial responses occurred in a high proportion of correctly inhibited selective and non-selective stop trials. The very presence of such partial responses challenges the assumptions of the traditional horse race model of inhibitory control, suggesting that the going and stopping interact with one another, with stopping remaining viable even following initiation of the go process. Analysis of the older cohort, and Bayesian modelling of all data, has begun to provide greater insights into the underlying processes.

Overall, EMG analysis of partial responses is a sensitive technique that can be used to assess inhibitory control at the individual trial level, elucidate potential (subtle) age-related changes in inhibitory control and inform computational control models.
Looking for Silver Linings, not Wallowing in Misery—Retractions of Negative Misinformation are Effective in Dysphoric Rumination

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People often continue to rely on misinformation in their reasoning after they have acknowledged a retraction. This phenomenon is known as the continued influence effect. Retractions can be particularly ineffective when the retracted misinformation is consistent with a pre-existing attitude. We investigated this effect in the context of dysphoric rumination. Given the prevalence of negative attitudes in dysphoric rumination, we hypothesized that dysphoric rumination may affect the processing of retractions of valenced misinformation; specifically, we predicted that the retraction of negative misinformation might be less effective in dysphoric ruminators. In two experiments, we found evidence against this hypothesis: in dysphoric ruminators, retractions of negative misinformation were at least as effective as they were in control participants, and more effective than retractions of positive misinformation. Findings are interpreted in terms of an attentional bias that may enhance the salience of negative misinformation and may thus facilitate its updating in dysphoric rumination.
Effects of Item Relatedness on Output Interference in Recognition Memory: A Bayesian Hierarchical Analysis

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In recognition memory tasks, output interference (OI) effects manifest as a decrease in performance over the course of a test list. This work investigates the relationship between item relatedness and OI in memory, comparing semantically related (e.g. animal names or emotional words) to unrelated items to better understand memory and decision processes. Because the related items share similar features and are more confusable, it was predicted that there would be a greater amount of OI for related items. Using a single item recognition task, results showed evidence for OI, but no difference in OI between related and unrelated words. The drift diffusion model was implemented to further understand the components of memory and decision processes that either stay constant or change over the course of the test list.
Probiotic+Prebiotic Supplementation Effects on Cognition and Mood

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Probiotics, ingestible and gut-beneficial bacteria, can provide subtle improvements to memory, and relief from stress, anxiety and depression. Prebiotics, indigestible carbohydrate fibres, are important for gut health and promoting gut microbiota growth and survival. Ingestion of a synbiotic (i.e., probiotic+prebiotic) can better enhance the modulation of gut microbiota compared with independent supplementation of probiotics and prebiotics. This improved modulation may benefit brain functioning and stress response. The synbiotic effects on cognitive functioning and mood in healthy non-clinical humans are currently not well understood. Thus, the present study investigated the effects of probiotic+prebiotic supplementation on cognition and well-being in young healthy adult humans (N=30; 17-30 years) using a randomised double-blind, placebo-controlled design. Participants ingested 5 grams of either synbiotic (probiotic+prebiotic) or placebo (maltodextrin) powder daily for 28 days. Before and after supplementation, participants completed a battery of cognitive tests of immediate, delayed and recognition memory (RAVLT); working memory (N-back 2); attention and vigilance (IVACPT); ability to ignore distractions (Stroop); inhibitory control (Stop Signal); and processing speed (Simple Reaction Time), as well as mood measures of depression, anxiety and stress (DASS-21). Probiotic+prebiotic supplementation significantly improved immediate and delayed memory performance. Attention, vigilance and ability to ignore distractions showed a trend towards improvement. There were no improvements for mood. Results have implications for individuals who work in cognitively demanding jobs to maintain optimal performance. Future studies could investigate how longer supplementation duration with synbiotics might further alter gut-brain signalling to potentially yield improvements in other areas of cognition.
Language Distance Drives Adaptive Effects in the Anterior Cingulate Cortex

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We test a new model in which a hallmark of bilingual reading across scripts is a convergence of orthographic processing systems onto a common network of neural structures, regardless of how spoken words are represented orthographically in writing systems (alphabetic vs non-alphabetic). Using functional MRI, highly skilled adult bilingual readers of distinct highly contrasting spoken languages (Dutch, English, Hindi, Chinese), performed an identical oral reading task with written words in their native language. Results showed limited variation at the neural level, confirming a common neural signature of reading proficiency across the wide spectrum of spoken languages. However, if participants performed written word translation, a different neural pattern emerged. Bilinguals who read languages with similar scripts (Dutch-English) activate the ACC differently to bilinguals who read languages with dissimilar scripts (Chinese-English and Hindi-English). Critically, ACC activity was graded according to spoken language families: bilingual speakers of Indo-European languages (Dutch, English, Hindi) showed greater activation if they read similar scripts (Dutch and English) than if they read two different scripts (Hindi and English) whereas bilingual speakers of Chinese who read in two different scripts showed least activation of ACC. This is the first evidence that writing systems interact with conflict monitoring in the bilingual brain and have implications for models of bilingual reading at the behavioural and neural level.
Comparing approach biases towards high- and low-calorie foods when their caloric content is accurately judged

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Food plays an important role in maintaining a healthy weight and in weight disorders. Not surprisingly then, researchers have examined biases towards and away from low and high calorie foods, with research producing mixed results. One possibility is that participants are poor at judging the healthiness of foods. The current study examined how accurately observers could estimate the caloric values of food. In Study 1, 840 participants estimated the caloric value of 178 high and 186 low calorie foods from the "Foodpics" database. Results were used to derive an optimised stimulus set of 20 high- and 20 low-calorie food images that were accurately judged by participants and also matched on valence, arousal and image brightness. Study 2 then used the Stimulus Response Compatibility (SRC) task to investigate approach and avoidance tendencies regarding these images. 104 Participants moved a manikin figure towards or away from a given image type. The starting instruction (e.g. towards high away from low) was randomised across participants and switched at the half way point, to rule out response bias and order effects. Results reveal a modest approach bias towards high-calorie foods but a large approach bias towards low-calorie foods. Results are compared with past findings and associations with eating disorder symptoms are discussed. This study represents a step forward in this field of research by developing high- and low-calorie stimuli that are likely to be accurately perceived within that category by the participant.
Quality versus quantity in end of life choices of cancer patients and support persons: a Discrete Choice Experiment

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We aimed to explore the relative influence of pain, consciousness, and life extension on end-of-life choices. Our data were contributed by a sample of medical oncology outpatients and their nominated support persons (SPs). Instead of more standard methods, such as rating scales or structured interviews, we used a discrete choice experiment (DCE) to investigate these questions, and also the agreement of preferences within patient-carer dyads. Participants chose between hypothetical care scenarios characterised by three attributes: pain, consciousness, and extension of life. Respondents and SPs answered the same questions (SPs answered from the patient’s perspective). A total of 110 patients and 64 SPs responded overall, with 42 matched patient-SP dyads. For patients and SPs, pain was the most influential predictor of choices, by a large margin. Dyad agreement was greater for choices about outcomes that were least favoured than for outcomes that were most favoured - that is, SPs and their patients agreed more about what the patient did not want, than what they did want. Agreement was slightly higher for dyads reporting a previous end-of-life discussion. We conclude that patients and SPs place significant value on avoiding severe pain when making end-of-life choices, over and above level of consciousness or plausible durations of life extension. Discussion of end-of-life care improves agreement, but not to as high a level as could be hoped.
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