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Temporal recalibration involves adaptation at two time scales

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We investigated recovery from adaptation to temporal asynchrony. Subjects adapted to 1min of naturalistic animation with strong audiovisual temporal cues. The soundtrack was asynchronous by either +/- 200 ms. For 2min postadaptation, we sampled synchrony perception every 2 s with a flash/beep stimulus that varied over several ±SOAs. Binning synchrony responses within a short, rolling time window we estimated the PSS during recovery from temporal adaptation. Rolling average PSSs showed significant recalibration initially followed by a recovery function, with PSSs returning to baseline after ~60 s. We also analysed recalibration on a short time scale by testing for inter-trial adaptation effects between successive synchrony probes. Although these probes were brief (60 ms), we found that a given synchrony judgment during postadaptation was strongly influenced by the previous trial, showing adaptation in the direction of the preceding probe’s SOA. Together, these results show temporal recalibration occurs on short and long timescales, with rapid inter-trial effects superimposed on a slower recalibration process. We also tested a non-naturalistic movie (flashes/beeps) and found the same results. In a second experiment, we delayed the synchrony probes for 60 s postadaptation and observed rapid recalibration but no storage of slow recalibration.

The role of resting state and pre-stimulus alpha oscillations in the Attentional Blink

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The Attentional Blink (AB) phenomenon occurs when two targets, embedded within a rapidly-presented sequence of distractors, must be identified. Participants frequently miss the second target when it occurs within around 500 ms of the first. Recently, there has been some focus on the role of alpha (8-14 Hz) oscillations in the brain, their role in temporal attention, and more specifically in the AB. Previous studies show resting-state alpha predicts AB, and that alpha power immediately prior to masked stimulus presentation can predict stimulus perception; however, the role of pre-stimulus alpha in the AB has received relatively little attention. We measured continuous EEG during both resting state and an AB task. There was considerable individual variation in AB magnitude; we replicated MacLean et al.’s (2012) finding that resting-state alpha predicted AB, and also found a strong relationship between pre-stimulus alpha power and AB. Comparing AB to no-AB trials, alpha power was much higher for trials in which an AB was present. This gives further support to the notion that alpha and attention are closely linked, and that alpha oscillations may hold the key to a more complete explanation of the AB phenomenon.
Motion standstill and predictive coding

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Motion standstill can be experienced when movement is equiluminant (defined solely by colour changes, with no brightness difference). Such stimuli pose a paradox, people can see the spatial characteristics of a moving pattern (e.g. a red-green windmill) but have no sense of its movement. Standstill is rare, in part because human sensitivity to colour varies at different retinal locations – colours that seem equally bright at one location can seem to differ in brightness at another. Here we report a simple new method for reliably obtaining standstill - we suppress sensitivity to slight brightness differences by pre-adapting to bi-directional luminance-defined motion, matched in spatial characteristics to coloured tests. We then assess people's ability to detect and anticipate change in standstill displays. People reliably detected change, despite subjective standstill. Unlike luminance-defined motion, detection required a liminal positional change, rather than a liminal period of motion. People, however, could not anticipate when movement would result in a specified state being achieved (when a windmill arm would become aligned with a static marker). Our data suggest that motion-standstill results from a process that remains responsive to change, but which isn’t involved in the predictive calculations that enable people to anticipate the future.

The attentional blink reveals the probabilistic nature of discrete conscious perception

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Attention and awareness are two tightly coupled processes that have been the subject of the same enduring debate: Are they allocated in a discrete or in a graded fashion? Using the attentional blink paradigm and mixture-modeling analysis, we show that awareness arises at central stages of information processing in an all-or-none manner. Manipulating the temporal delay between two targets affected subjects’ likelihood of consciously perceiving the second target, but did not affect the precision of its representation. Furthermore, these results held across stimulus categories and paradigms, and they were dependent on attention having been allocated to the first target. The findings distinguish the fundamental contributions of attention and awareness at central stages of visual cognition: Conscious perception emerges in a quantal manner, with attention serving to modulate the probability that representations reach awareness.
Speech perception in noise: how masking and information interact

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It seems plausible that different regions of the speech signal convey different amounts of information. Understanding which aspects of the signal convey information is important for understanding speech perception, particularly when this occurs in noisy environments. The current study investigated a recently proposed information metric, the so called ‘cochlea-scaled entropy’ (CSE) measure. We examined how well this measure captures a listener’s ability to understand speech in noise. Here, listeners are faced with a situation that distorts what speech information is available, i.e., energetic masking suppresses certain spectro-temporal speech regions. We used a priming paradigm to investigate the interplay between the CSE measure and energetic masking. Primes were constructed that consisted of high CSE regions (high information) or low CSE regions and were presented before a target speech sentence (mixed with stationary speech shaped noise) that participants were asked to identify. Results will be discussed in terms of the interplay between the role of information and energetic masking in speech perception in difficult listening environments.

Evidence for a channel based system of aspect-ratio processing independent of linear dimensions of shape

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Aspect-ratio (height:width ratio) is a fundamental property for shape discrimination. Aspect-ratio could be determined by combining separate estimates of height and width, or by a specialized aspect-ratio detector sensitive to height:width ratios independently from separate linear dimensions. Previous work suggests aspect ratio is the primary cue. This study tested these two hypotheses for aspect-ratio detection by measuring size (2D area) aftereffects and aspect-ratio aftereffects. In a novel psychophysical procedure, size aftereffects were used to predict an aspect-ratio aftereffect consistent with the height-and-width-combination hypothesis, which was opposite in direction to that predicted by the specialized aspect-ratio detector hypothesis. This was possible because a preliminary experiment, using square stimuli, showed size aftereffects exhibit a non-monotonic relationship between adaptor:test size ratios. The resulting direction of the aspect-ratio aftereffect was consistent with the specialized aspect-ratio detector hypothesis. In an extension of this study aspect-ratio aftereffects were then measured, for a large range of adaptor:test ratios, to determine whether this specialized detector represents aspect-ratio using a multi-channel or opponent coding system. The results showed smaller after effects with large adaptor:test ratios than with intermediate ratios. This outcome is consistent with multi-channel coding, i.e. detection by multiple mechanisms sensitive to small, overlapping ranges of aspect-ratio.
Increased trust and the financial implications for older adults

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Two studies compared young and older adults in a series of one-shot economic trust games where investments could result in a profit, but only at the risk of losing everything. Study 1 manipulated trustee age (young, older), while Study 2 manipulated trustee facial appearance (untrustworthy, trustworthy) and history of returns (low, high). In Study 1, regardless of trustee age, older participants were more likely than young to invest money. In Study 2, young and older participants invested more money with trustees who had a history of providing high rather than low returns. Most notably, however, older adults were more likely than young to invest with trustees who had a history of providing low (but not high) returns. Because participants are aware from the start that both they and the trustee will earn cash for a random selection of trials, older adults may have invested more money due to either risk-taking or generosity. However, the finding that older adults invest more money than young only when trustees had a history of providing low returns may favour the explanation that older adults experience an increased propensity to take financial risks as a result of reduced attention to negative information.

Homophone production in Bilingual and Monolingual speakers

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It has been widely established that words with higher frequencies (HF) are named quicker than words with lower frequencies (LF) (e.g. Dell, 1990). Frequency is thought to be located at the phonological form level. Homophones are words that share phonology but not meaning. There is some evidence that homophones share a phonological form in the lexical system of language production (the Shared Representation view; Jescheniak and Levelt, 1994) although there is also conflicting evidence (supporting the Independent Representation view; Caramazza, 1997). It is not known if bilingual speakers have the same representations within language as monolinguals. Monolingual and bilingual speakers named pictures of homophones and control words matched to the summed (HF) and individual frequencies (LF) of presented homophones. It is predicted that, as homophones share a phonological form, they are produced as quickly as the HF control words matched to the summed frequency of homophones. As the bilingual participants are early bilingual speakers we also predict that their language representations will be akin to the monolingual language representations; that
homophones will be produced as quickly as HF control words. This research will provide
evidence toward the homophone representation debate and further our knowledge on
bilingual language representations.

**Functional topography of primary emotion processing in the human cerebellum**

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The cerebellum has an important role in the coordination of movement. It is now clear,
however, that the cerebellum is also involved in neural processes underlying a wide variety of
perceptual and cognitive functions, including the regulation of emotional responses.
Contemporary neurobiological models of emotion assert that a small set of discrete emotions
are mediated through distinct cortical and subcortical areas. Given the connectional
specificity of neural pathways that link the cerebellum with these areas, we hypothesized that
distinct sub-regions of the cerebellum might subserve the processing of different primary
emotions. We used functional magnetic resonance imaging (fMRI) to identify neural activity
patterns within the cerebellum in 30 healthy human volunteers as they categorized images
that elicited each of the five primary emotions: happiness, anger, disgust, fear and sadness. In
support of our hypothesis, all five emotions evoked spatially distinct patterns of activity in
the posterior lobe of the cerebellum. We also detected overlaps between cerebellar activations
for particular emotion categories, implying the existence of shared neural networks. By
providing a detailed map of the functional topography of emotion processing in the
cerebellum, our study provides important clues to the diverse effects of cerebellar pathology
on human affective function.

**Object-scene relationships vary the magnitude of target prevalence effects in visual search**

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Efficiency of target detection in real-world visual search is affected by several factors,
including scene context and target prevalence. Observers are more efficient at detecting target
objects in congruent locations, but less efficient at detecting rare or “low prevalence” targets.
While previous research has investigated context and prevalence effects separately,
concurrent examination is lacking. Two experiments were conducted to explore the
relationship between scene context and prevalence effects. In Experiment 1, we varied target
prevalence (high, low) and context (congruent, incongruent) and, for congruent contexts,
target location (typical, atypical). Experiment 2 focused on the interaction between target
prevalence (high, low) and location (typical, atypical) for congruent contexts, and recorded
observers’ eye movements to examine systematic search behaviour (i.e., scanning patterns). Observers were poorer at detecting low vs. high prevalence targets; however, this “prevalence effect” was significantly reduced for targets in typical, congruent locations compared to atypical or incongruent locations. Overall, our results implicate an interaction between context and prevalence effects, whereby if rare targets do not appear in expected locations observers prematurely terminate search and fail to detect them. Further, while prevalence effects are robust, they may be mitigated through targeted training that teaches observers where to focus their search.

**Mirror blindness: Our failure to recognize the target in search for mirror-reversed shapes**

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Search for mirror-reversed items is especially difficult and takes much longer than finding targets that are flipped horizontally or show other differences in orientation. It has generally been assumed that these difficulties are rooted in the difficulty to find the target. The present study monitored the observer's eye movements during search and found no evidence for this view: Mirror-reversed targets were selected as early as other targets. However, observers frequently failed to notice that they were fixating on the target and continued searching. The failure to recognize the target could be observed even when the target was always kept constant and only the irrelevant distractors varied across trials. Mirror blindness was attenuated only when both the target and the distractors were kept constant across all trials. These findings show that the composition of distractors can strongly affect object identification, and demonstrate that object recognition is to some extent context-dependent.
Pre-movement brain activity encodes attentional shifts

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According to the premotor theory of attention, movement preparation and shifts of attention are intrinsically linked. However, the precise nature of this coupling is unclear. Here, we used multivariate pattern analysis (MVPA) to investigate whether shifts of attention towards an effector are encoded in the pre-movement activity. Twenty-four healthy right-handed adults participated in two separate scanning sessions. In one session, a vibrotactile task was used to identify activation associated with attention directed to the left or right index finger. In a separate session, pre-movement activity was identified from a voluntary movement task in which participants performed left or right index finger movements. MVPA was used to investigate whether pre-movement brain activity for left and right finger movements in the voluntary movement task could accurately classify whether attention was directed to the left or right index finger in the vibrotactile task. MVPA results indicate that attention oriented to left or right index fingers can be decoded from pre-movement activity within the left sensorimotor cortex up to 2 s prior to movement onset. Our results demonstrate that shifts of attention towards an effector are encoded in patterns of pre-movement activity in the sensorimotor cortex. This lends support to the premotor theory of attention.

Transitions of consciousness: when wakefulness modulates cognition

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Understanding levels of consciousness and the transitions between conscious and unconscious states has important theoretical and clinical implications. Yet despite the fact that we typically enter a state of unconsciousness every night, remarkably little is known about how we fall asleep or lose consciousness while getting sedated. In a series of hd-EEG experiments of people falling asleep or getting sedated with propofol, we explored the limits of perceptual and semantic decisions, inhibitory control, top-down and bottom-up target detection and introspection. We found there is a differential modulation of the cognitive control capacities by wakefulness. In the transition to unconsciousness, drowsiness affects inhibitory control and top-down target detection earlier than perceptual and abstract (semantic) decisions. We can take decisions, learn, perceive when losing consciousness and even when unconscious, but these are different. We believe these results may experimentally link the Information Integration Theory of Consciousness and the Global Neuronal Workspace Theory.
The temporal envelope of global shape processing

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To date, research and modelling of shape perception has focused on revealing the spatial cues used to encode shape, a sensible first step in the process. However, this simplification ignores the fundamental dimension of time, the fact that the spatial representations on the retinas change continuously with time. A complete description of visual mechanisms must consider their spatiotemporal properties. In the context of shape perception, we assessed two aspects of this problem: 1) the minimum time required to process global shape, and 2) the maximum timespan across which the parts of a shape are globally integrated. Sensitivity to a Radial Frequency (RF) shape was measured using a temporal 2-AFC in conjunction with MOCS. In Experiment 1 we measured sensitivity to an RF3 shape as a function of presentation duration. A backwards mask was used to avoid visible persistence. Sensitivity was poor, but measurable for 20-40 ms presentations and improved rapidly for longer presentations. Surprisingly, global integration remained optimal at all tested durations. In Experiment 2 the RF shape was cut into three segments, shown in sequence. Global integration occurred when all parts appeared within a 200 ms window and not beyond. Comparisons to higher- and lower-level visual mechanisms are discussed.

Infant-Directed Speech sounds smiled, and infants like that

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Infant-directed speech (IDS) is a special register, with higher pitch and exaggerated melodic contours (Fernald et al., 1989) and exaggerated emotional mouth shapes (Chong et al., 2003). Emotional mouth shapes can be observed visually, but have auditory effect as well: Smiled speech has a higher ('i'-like) spectral quality than frowned speech, and adults can recognize a speaker's mouth shape from the spectral quality (Tartter & Braun, 1992). The two studies presented here test the hypotheses that 1) IDS has the spectral characteristics of smiled speech, and 2) infants prefer listening to speech with a smile-like spectral quality. Study 1 (Benders, 2014) recorded IDS and adult-directed speech (ADS) from Dutch mothers. The spectral quality was more "i"-like in IDS than in ADS, which supports the hypothesis that IDS has the spectral characteristics of smiled speech. Study 2 (in preparation) tested 6-month-olds' listening preferences to speech with artificially heightened ('i'-like) or lowered spectral quality, but constant pitch contours across these conditions. Infants in a head-turn preference procedure listened longest to the speech with "i"-like spectral quality. These results provide the first evidence that infants prefer listening to speech that sounds smiled, even if the pitch does not reveal the speaker's affect.
German plural production in aphasia

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In aphasia, processing of plurals can be impaired (Biedermann et al., 2012; 2013). In German, the most frequent plural inflection is –n (Sonnenstuhl & Huth, 2002). In some grammatical-phonological contexts –n is predictable (Katz-n [cats]), in others not (Gabel-n [forks]). Differences in representation are explored in relation to regularity, frequency and dominance. Five German aphasic speakers participated in spoken picture naming tasks. All showed word finding difficulties and plural errors in background assessments. Using a case series design, single and multiple objects were depicted that either belonged to regular or irregular –n plural nouns. All items were singular-dominant (frequency of singular > plural). Regular plural-dominant (frequency of plural > singular) nouns served as control set. Error rates of plurals were compared to their corresponding singulars within and across plural subsets. Comparing –n plural groups, three patients showed regularity effects (irregular plural errors > regular plural errors). When considering dominance, all participants showed plural dominance effects (accuracy for plural-dominant plurals > singular-dominant plurals). Interestingly, participants, who did not show regularity effects were the ones with the largest plural dominance effects. Effects of regularity and dominance seem dependent on levels of language breakdown in aphasic individuals.

The effect of speech signal reliability on lexical modulation in older listeners

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When faced with speech reductions or noise, young adult listeners flexibly adjust the parameters of lexical activation and competition to account for the unreliability of the speech signal. A mismatch in the input signal is treated with more leniency and does not lead to immediate deactivation of lexical candidates. Following McQueen & Huettig (2012), an eyetracking experiment was conducted to assess whether this lexical modulation also occurs for older listeners. Dutch participants (aged 60+) listened to Dutch sentences containing a critical word while looking at displays of four line drawings. The name of one picture was a phonological competitor for the critical word, sharing either its initial phonemes (onset competitors) or its final phonemes (rhyme competitors). One participant group heard clear, noise-free sentences while the other group heard sentences in which several phonemes had
been replaced by bursts of noise. For both groups, onset competitors are expected to attract more looks than rhyme competitors. Crucially, however, this preference is expected to be smaller in the noise condition. Results will show whether dynamic adjustment of the parameters of spoken-word recognition in response to speech signal reliability is available not only to younger but also to older listeners.

**Head tilt, eye gaze, sexual dimorphism, dominance and attractiveness**

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Burke and Sulikowski (2010) showed that the forward or backward head tilt angle (pitch) of a face influenced both attractiveness and masculinity/femininity ratings. Face pitch has also been shown to impact dominance ratings, as has eye gaze direction. The current study was designed to investigate whether the effect of face pitch on attractiveness and masculinity/femininity was driven by changes in perceived dominance. Twenty male and 29 female participants rated 220 faces that were manipulated for eye gaze (direct vs averted) and 11 different head tilts, for attractiveness, femininity, masculinity, physical dominance and social dominance, to examine the way each of these rating varied as a function of face pitch. For female faces, perceived femininity and perceived attractiveness tracked each other perfectly, across changes in pitch, whereas perceived social and physical dominance monotonically increased as faces tilted further back. For male faces, tilting faces further back produced monotonic increases in perceived social dominance and masculinity, but opposite quadratic functions for perceived physical dominance and attractiveness.

**Subjective, behavioural and theory-based measures of orthographic similarity for English words**

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Evidence from priming indicates that one-letter different words (e.g., *case* and *care*) are similar for the lexical processing system. Importantly for debates about letter-sequence coding schemes in word identification, similarity effects have also been observed for words sharing letters in different positions (e.g., *salt*- *slat*, *music*- *minus*). We asked students to rate word pairs for orthographic similarity. For target words of 5 – 7 letters we chose a similar comparison word with a Levenshtein orthographic distance of 2 (two letter-operations required to convert the target to its comparison). We found that relative to dissimilar controls, words sharing the initial 3 letters had a larger similarity increment than those sharing the last 3 letters. A new sample rated similarity in word pairs covering a large range of Levenshtein distances and word lengths. The end-weighted metric from Davis’ Spatial Coding Model was the best predictor of ratings. In a masked priming study in the same-
different task, primes sharing the beginning letters with targets facilitated yes responses more than did primes sharing the last 3 letters.

**Audio-visual temporal recalibration in cluttered displays scales with relative phase, not latency**

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Audio-visual temporal recalibration (TR) refers to the observation that prior exposure to asynchronous audio-visual events shifts one’s point of subjective simultaneity in the direction of the prior asynchrony. Whilst previous studies use periodic adapting stimuli, they invariably employ single audio-visual events as test stimuli. It is therefore ambiguous as to whether TR results from latency- or phased-based coding. In this study we use periodic adaptor and test stimuli to address this question. On each trial participants were exposed to a 0.72 Hz square-wave amplitude modulating pure tone and luminance-defined disk for 60 s offset by either 0 or 120 ms. Test stimuli consisted of 20 luminance-defined disks concentrically arranged around fixation (14° radius). The tone and luminance of each disk modulated periodically at either 0.36 or 0.72 Hz. Each disk in the visual test array was presented at a unique temporal phase with respect to the tone with each temporally adjacent pair of disks separated by 40 or 80 ms for high and low temporal frequency modulations respectively. On each trial, the phase of one disk matched that of the tone modulation. Critically, the temporal phase associated with each disk location varied randomly from trial-to-trial and it was the subjects’ task to identify the synchronized disk. We measured the proportion of trials for which a given disk was chosen as perceptually synchronous. PSS shifts of ~120 ms and 240 ms were observed for test modulations of 0.72 and 0.36 Hz respectively in the asynchronous adaptor condition. Not only are these the largest recalibration effects ever reported (latency shifts of 100% and 200% respectively), they demonstrate that TR preserves the relative temporal phase, rather than the latency of the adapting asynchrony.
Variations within a “subtype”: Developmental phonological dyslexia

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Developmental phonological dyslexia is characterised by poor reading of nonwords in the presence of unimpaired irregular word reading, and is typically attributed to a selective difficulty in acquiring the nonlexical route within a dual route model. However, the nonlexical route consists of more than one processing component, so it would be expected that different subtypes of phonological dyslexia should be able to be identified based on the locus of the impairment within this route. We explored this hypothesis in 19 children with selectively poor nonword reading for their age, separately assessing: (1) their knowledge of grapheme-phoneme correspondences (GPCs), (2) their ability to blend spoken phonemes, and (3) their phonological output processes. Different profiles were evident within the sample, with more than half of the cases displaying a selective difficulty in just one of the processing components. The results provide evidence for substantial heterogeneity within developmental phonological dyslexia and are discussed in the context of theories of reading and reading development.

Experimental and computational studies using the picture-nonword interference task: implications for models of reading and speech production

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The picture word (or nonword) interference paradigm refers to the task in which participants are required to name a picture while disregarding a written word (or nonword) distractor superimposed upon the line drawing (Glaser & Dungelhoff, 1984). We investigated via five experiments how written pronounceable nonword distractors affect picture naming latencies, investigating in particular the effects of picture-nonword phonological relatedness and nonword distractor length. Our aim is to improve the current knowledge on the Phoneme System of the human reading system when two different sources of physical stimulation compete to be named, the picture and the nonword. We ran five simulations with a Semantic version of the DRC model (Coltheart, Rastle, Perry, Langdon & Ziegler, 2001), corresponding to the first four analysis of the human data. We highlight 1) a different phoneme position coding system from that implemented in DRC model and 2) the importance of the number of syllables in picture naming (Exp. 5).
Physiological orienting during passive picture viewing: The role of stimulus valence and arousal

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Despite robust findings that affectively valenced stimuli prompt preferential processing, it remains unclear whether such biases are reflective of a threat-detection mechanism or motivational systems that are responsive to arousing stimuli which are both threatening and appetitive. To disentangle the effects of valence and arousal on the orienting response (OR), a precursory mechanism to attentional processing, skin conductance responses (SCRs) and heart rate were measured while participants \(N = 43\) passively viewed threatening, appetitive and neutral pictures that varied in arousal. Verbal ratings of valence, arousal and interest were obtained following the viewing task. Irrespective of valence, SCRs and cardiac deceleration were greatest for high arousing pictures (blood injuries and heterosexual erotica) relative to low arousing pictures (human aggression and nurturance of offspring), suggesting that orienting is augmented on the basis of stimulus arousal. The physiological indices were found to share a strong association with verbal ratings of arousal, even after controlling for subjective interest. Arguing against threat-superiority theories, orienting responses did not vary as a function of valence. Rather, our data indicate that the magnitude of the OR is determined on the basis of motivational significance, as indexed by arousal.

The effects of stimulus valence and arousal on early attentional processes

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In two studies, the separate and interactive effects of valence and arousal on early attentional processes were investigated using a spatial cueing paradigm. Pictures of mutilations and physical attacks represented high and low arousing threat cues, respectively, whereas pictures of erotica and parental nurturance operationalised the high and low arousing appetitive categories. The exposure duration of the cues also varied (24 ms vs. 59 ms vs. 100 ms). Probes appeared in either cued (valid trials) or non-cued locations (invalid trails). In Study 1, response latencies to the probe location served as the index of attentional prioritisation. Reaction times were slower on valid trials, indicating inhibition of return, which was potentiated for high arousing threat and low arousing appetitive cues. In Study 2, we tested the robustness of these findings by employing a probe categorisation task. This procedure yielded a complex interaction between valence, arousal, and exposure duration. Engagement biases favoured high arousing appetitive stimuli at 59 ms, and low arousing threat pictures at 100 ms. Delayed disengagement was potentiated for the high arousing stimuli at 24 and 59 ms post-stimulus onset. Results are discussed with respect theoretical frameworks and procedural issues, including the nature of the task.
The effects of expression clarity and visual information on the perception of vocal emotion expressions

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Research suggests that a person tends to be more accurate when judging vocal emotional expressions presented in his/her native language compared to a non-native one. The current study investigated whether this effect occurs regardless of the clarity of the expressions or whether it occurs only with ambiguous depictions. We also examined whether visual information about the emotion would attenuate differences. English and Cantonese native listeners were presented spoken English sentences produced by an actor who had very clear emotional expressions or by one whose expressions were not as clear (levels of clarity were established in another study). Angry, happy, sad, surprise or disgust expressions were tested in auditory only (AO), visual only (VO) and audio-visual (AV) conditions. Overall, the results showed the expected difference as a function of the clarity of the emotion expression and across emotion types; these effects were similar across the language groups. In the AO condition, Cantonese speaker’s performance was significantly less accurate than the English ones. This was not the case in the VO or AV conditions where performance levels did not differ. This suggests that for AV speech, visual cues helped the Cantonese listeners compensate for poorer AO recognition. The differences across emotion types will be discussed.

A test of conventions: An empirical study to determine whether ERP researchers should start plotting all waveforms with negative downward

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In event-related potential research it is traditional to plot amplitudes upsidedown. That is, with negative values upward. Interestingly, the N170 component, is sensitive to the orientation of stimuli for which people are experts with the peak found to be larger and later when images are inverted. We studied whether reversing the waveform of the N170 affected the processing of the image in two N170 experts and seven controls. Participants were shown pictures of faces and N170 waveforms while electroencephalography was recorded. Faces were presented upright and inverted. The N170 was presented with negative plotted up and negative plotted down. All participants produced an increase in amplitude and latency of the N170 for faces when they were inverted. However, for the N170 waveforms, only the experts showed an increase in both the amplitude and latency of the N170 component. The results show that the perception of a familiar ERP waveform is mediated by the same structures in the inferior temporal cortex and occipital cortex that are used for the processing of other
objects of expertise such as faces. These also suggest that the conventions of plotting in ERP research serve an important purpose by allowing experts to readily interpret waveforms.

Towards a unified account of dynamic visual feature binding

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Displays alternating rapidly between orthogonally oriented gratings give rise to the perception of persistent transparent surfaces. If the gratings are differently coloured, observers can report accurately which colour is associated with which orientation at alternation rates in excess of 15Hz (Holcombe & Cavanagh, 2001). Here, we examined such colour-orientation binding while manipulating the angular difference between the gratings. For differences below 20° we observed a non-monotonic effect: performance remained high at 8-10Hz and below 3Hz but dipped close to chance levels at 5Hz, where the percept was of a single grating changing in orientation and colour over time. The decline in performance as alternation rate decreases from 10Hz to 5Hz indicates that binding of colour and orientation is not occurring at the temporal resolution of single cycles of the stimulus. Instead, we propose that accurate colour-orientation judgments at rates in excess of 5Hz depend upon the rapid formation of persistent surface representations which can then be accessed by binding mechanisms, circumventing the latter’s relatively low temporal resolution. Such an account can also be applied to the binding of colour and direction-of-motion, which shows a similar non-monotonic effect of alternation rate on performance (Moradi & Shimojo, 2004).

Biomechanical constraints on production also influence predictions of observed actions

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Recent theory suggests that people use a model of their own body’s kinematics to generate predictions about merely observed actions (Colling et al 2013). Consistent with this, it has been shown that people are better able to generate predictions about observed actions when the actions are performed in a manner similar to how they would themselves produce those actions (Colling et al 2010, 2014). Furthermore, it has also been shown that biomechanical constraints that influence action production also influence prediction of observed action with prediction accuracy being reduced when the observed actions violate known biomechanical laws (for example, the two-thirds power law) (Kandel et al 2000; Colling et al 2014). The present study extends this earlier work to a previously uninvestigated biomechanical constraint. Work on ipsilateral and contralateral reaching and pointing movements has shown that ipsilateral movements are performed with greater ease and precision, and this has been linked to biomechanical constraints. The aim of the present study was to determine whether prediction of observed actions would similarly be more accurate for ipsilateral movements.
The results of the study confirmed that this was indeed the case suggesting the constraints that influence action production also influence the prediction of merely observed actions.

**Visual sensitivity for action relevant stimulus properties is improved in perihand space when covert attention can be shifted to the target**

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Recent evidence suggests that close proximity of hands to a stimulus, improves elements of visual sensitivity. This improvement is thought to indicate a bias towards actable space / action-relevant stimuli. We investigated whether the proximity of hands and the ability to shift attention to the target modulates the horizontal-vertical illusion. Participants completed an aspect ratio task in which they indicated whether the target object (a rectangle presented to either the left or right of fixation) was largest in the height or width dimension. In blocked trials, participants completed the task with their hands either adjacent to or distant from the monitor. Across two experiments, we modulated the duration of target presentation either 43 ms (Experiment 1) or 250 ms (Experiment 2) to vary the participants ability to shift attention. In Experiment 1, there were no significant differences between the hands near and hands far conditions. In Experiment 2, participants were more accurate at identifying whether the target was taller or wider when their hands were adjacent to the screen. These findings suggest that proximity of the hands may facilitate processing of action relevant stimulus properties when attention may be shifted to the target.
Can emotion explain the Happiness Superiority Effect for schematic faces in heterogeneous backgrounds?

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Recently, D.V. Becker, Anderson, Mortensen, Neufeld, and Neel (2011) proposed recommendations to avoid methodological confounds in visual search studies using emotional photographic faces. These confounds were argued to cause the frequently observed Anger Superiority Effect (ASE), the faster detection of angry than happy expressions, and conceal a true Happiness Superiority Effect (HSE). In Experiment 1, we applied these recommendations for the first time to visual search among schematic faces which had previously yielded a robust ASE. Contrary to the prevailing literature, but consistent with D.V. Becker et al. (2011), we observed a HSE with schematic faces. In an additional experiment, background heterogeneity was isolated as the key determinant leading to the HSE. Finally, we manipulated mood to determine the extent to which the HSE observed in Experiment 1 could be explained by the emotional meaning transmitted by the faces.

Individual differences in duration perception

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The ability of subjects to identify and reproduce brief temporal intervals is influenced by many factors, both stimulus and task or subject-based. The current study used a modified temporal-bisection paradigm to examine the role the personality has upon duration perception, an upon the individual’s ability to reflect upon their performance in the task. 120 subjects completed the OLIFE personality questionnaire prior to performing the temporal-bisection task. Subjects responded to two identical presentations of a sinusoidal grating presented 4 deg above fixation, presented for 1.5secs. They initiated presentation with a button-press, and released the button when they considered the stimulus to be half-way through. The stimuli were either static or drifted in blocked trials. Subjects were asked to indicate their ‘most accurate estimate’ of the two and given feedback half the time. Counter to expectations and existing literature, there was found to be little correlation between performance in the task and the dimensions of schizotypy, despite there being significant individual difference in performance. There was also no effect of drift on accuracy or precision in the task. Placed in context, these results place interesting constraints on the underlying theory of time perception over short periods.
Searching for synchrony with AV speech and non-speech stimuli

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We used an auditory-visual (AV) synchrony search task to examine how accurately an observer could detect AV synchrony with speech and non-speech stimuli. In this task on each trial a participant viewed four videos (positioned at the cardinal points of a circle) that showed either the lower face of a talker (Expt 1) or a black flood-filled equivalent shape in which mouth opening was white flood-filled (Expt 2) and heard a spoken /ba/ syllable. One of the four videos had the original AV timing and in the others the visual speech was shifted 100 ms, 200 ms or 300 ms earlier. Participants were required to conduct a speeded visual search for the synchronized face/voice token (the position of which was randomized). The results showed that with the AV speech stimuli the synchrony detection window was narrower than that reported with other methods but was broader than the non-speech stimuli. These results are discussed with respect to the salience of the onset of the visual signal.

Do current face "emotion" stimuli really display emotion?  
Differences between posed and genuinely-felt face expressions

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Studies of facial expression processing have used mostly posed expressions, which show acted, unfelt emotions (e.g., smiling for a license photo). Yet in real life expressions often reflect genuinely-felt emotions (e.g., smiling when winning), which convey different meanings and invite different responses. We show that angry, disgusted, fearful and sad stimuli from two widely-used sets of posed faces (Pictures of Facial Affect [Ekman & Friesen, 1975] and the RaFD [Langner et al., 2010]) are often perceived as being faked rather than genuinely-felt emotions. This casts doubt on their use in many settings, particularly where the research question concerns perception of, or responses to, other people's felt emotions. We then demonstrate that, to produce images that are perceived as showing genuine emotion, lab-elicitation of emotions can be effective for some expressions (e.g., happy) but that for others (e.g., anger) more intense genuinely-felt expressions need to be obtained from natural settings (news photographs). Finally, we present a case in which genuinely-felt and posed expression stimuli lead to different theoretical conclusions, demonstrating that the genuineness of facial expression stimuli is an important issue for research.
Response priming and the lateralized-readiness potential

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The current study investigated the influence of prime novelty on reaction times and motor-response preparation EEG activity in the form of the Lateralized Readiness-Potential (LRP). Participants were presented with digits as targets, and asked to categorise with left/right button responses whether they were greater or less than 5. The target digits were preceded by subliminally presented (50 ms in duration) digits, which were either congruent (the same category) to the target digits or incongruent. In addition, the digit primes also differed in whether they had been presented consciously as target digits or not, manipulating the novelty of the primes. The LRP results show an effect of prime congruency, arising earlier in response to primes that had also been used as targets. Further analysis suggests that this congruency effect was driven by an earlier LRP onset in response to congruent primes that had also been used as targets compared to congruent primes that were never consciously viewed. Interestingly, this pattern was not observed in the overt button responses.

Relatedness proportion effects in lexical decision and semantic categorization: RT distribution analysis reveals different mechanisms.

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The magnitude of the semantic priming effect has been found to increase as the proportion of related trials in an experiment increases. This relatedness proportion (RP) effect was examined using a short SOA of 240 ms, which is widely assumed to be too short to make strategic prospective use of the prime and therefore not produce RP effects. On the contrary, robust RP effects were found in both a lexical decision and semantic categorization task. RT distribution analysis revealed that RP modulated the semantic priming effect differently in the two tasks. In semantic categorization, RP modulated the amount of distributional shift. In contrast, in lexical decision, RP affected the size of the semantic priming effect in the slow tail of the RT distribution. These patterns are interpreted in terms of source confusion of semantic features used in making semantic categorization decisions, and the retrospective semantic matching strategy in lexical decision.
The quantified self: Harnessing smartphone technology to understand episodic memory

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People naturally divide their everyday experience into a sequence of contexts. Episodic memory refers to the ability to bind item representations to these context representations and subsequently retrieve those bindings. Although context is definitional for the study of episodic memory at this point there is no theory of context. Contexts are typically operationally defined by referring to a study list, aspects of the experimental task or the physical attributes of the laboratory environment. However, these contexts may not resemble those that people typically employ outside the laboratory. In this talk, we will outline our attempts to use smartphone technology to sample people's everyday experience and to use this data to characterize context and to test episodic memory.

Neuroplasticity in the primary motor cortex is reduced in elderly adults

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The adult human brain is capable of ongoing adaptation in response to the demands of its environment, a characteristic termed ‘neuroplasticity’. Emerging evidence suggests that plasticity may manifest over a more distributed neural network in elderly relative to young individuals. We investigated how advancing age modulates plasticity in the motor system. Plasticity was induced within the hand area of the primary motor cortex using paired associative stimulation (PAS). In this technique, peripheral stimulation of the median nerve in the wrist is paired repeatedly with single pulse transcranial magnetic stimulation over the contralateral motor cortex to induce a short-term increase in cortical excitability. The plasticity effects were quantified by measuring the amplitude of motor evoked potentials before and after PAS in young (18-35 years) and older (65+ years) adults. It was predicted that older adults would show less PAS-induced plasticity in the hemisphere targeted by the PAS procedure, but greater effects in the non-targeted hemisphere. Interestingly, PAS-induced effects did not differ across hemispheres for either age group, but the overall effects were reduced in the elderly. The results suggest that, even in a healthy and active group of individuals, advancing age is associated with a reduction in the capacity for brain plasticity.
Resistance to instructed reversal of the learned predictiveness effect

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The learned predictiveness effect is a widely observed bias towards previously predictive cues in novel situations. Although the effect is generally attributed to an automatic attentional shift, it has recently been explained as the product of controlled inferences about the predictive value of cues. This view is supported by evidence that the learned predictiveness effect can be completely reversed through explicit instructions about the predictive value of cues. However, subsequent research has shown conflicting results. In order to investigate the parameters of the instructed reversal effect, three experiments manipulated length of initial training, causal scenarios and instruction difficulty, respectively. While causal scenarios and instruction difficulty had some influence on learning about instructed cues, substantial resistance to reversal as a result of prior experience was still observed in every experiment. Taken together, the results are inconsistent with a purely controlled account of learned predictiveness, and provide support for dual-process theories of learning and attention.

Verbal labeling, gradual decay, and sudden death in visual short-term memory

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Zhang and Luck (2009) found that perceptual memories are lost over time via sudden death rather than gradual decay. However, they acknowledged that participants may have instead lost memory for the locations of objects. We required observers to recall only a single object. Although the paradigm eliminated the need to maintain object-location bindings, the possibility that observers would use verbal labels increased. To measure the precision of verbal labelling we included explicit verbal-labelling and label-matching trials. We applied a model that measured the contributions of sudden death, gradual decay, and verbal labelling to recall. Our model-based evidence pointed to sudden death as the primary vehicle by which perceptual memories were lost. Crucially, however, the sudden-death hypothesis was favoured only when the verbal-labelling component was included as part of the modelling. The results underscore the importance of taking into account the potential role of verbal-labelling processes in investigations of perceptual memory.
Man or monkey? Empathy predicts species category boundary judgments

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Empathic capacity – the extent to which an individual responds vicariously to the emotional status of non-self agents – relates to perceived similarity. Specifically, stronger empathic responses are associated with higher levels of perceived similarity (Gallese 2001). In line with this, we tested whether empathy and performance on a vision-based category boundary task are related. Participants judged species membership (or not) of individual images taken from a human/monkey continuum (Sigala et al 2011). They then completed an empathy scale. Data show that for female participants, empathic capacity predicted performance on the perceptual task. In particular, high empathy women accepted images with low levels of target signal as belonging to the species of interest. Implications of this first demonstration of a systematic relationship between empathic capacity and vision-based category boundary judgments are discussed.

Goal-directed pointing enhances target identification in object substitution masking

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Object recognition is traditionally viewed as an exclusively perceptual function, but recent evidence suggests that planned actions can modify how objects are represented by the visual system. It remains unclear, however, how and when in the processing hierarchy the motor system exerts its influence on visual processing. To investigate this issue, we had participants point toward visual arrays in which the target was masked using object substitution masking (OSM). Participants judged the gap orientation in a Landolt C that could appear in one of 6 different locations. In separate trial blocks, participants either performed the visual task in isolation (perception condition), as in conventional OSM paradigms, or they made a speeded pointing movement to the target’s location before their visual judgement (action condition). Results showed that action influenced the magnitude of the masking effect compared with the perception condition. Pointing movements initiated rapidly after target onset strongly reduced OSM, whereas those initiated more slowly tended to increase OSM. Our findings suggest that action-related processes can enhance visual perception by affecting relatively early visual processing. Since target locations were unpredictable, our results also suggest that the influence of action on visual perception may not be mediated by top-down orienting of attention.
Effects of trait anxiety and situational stress on backward word span efficiency are buffered by mental effort

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We investigated the relationship between trait anxiety, situational stress and mental effort on forward and backward word span. Trait anxiety was operationalised using questionnaire scores, situational stress was manipulated through ego threat instructions, and perceived level of invested mental effort was measured using a visual analogue scale. Dependent variables were performance effectiveness (accuracy) and processing efficiency (accuracy divided by response time). For the forward word span task the predictors were not associated with performance effectiveness or efficiency. For the backward word span task there was a main effect of effort on performance effectiveness such that greater effort was associated with greater effectiveness. We observed a significant 3-way interaction on processing efficiency. At higher mental effort, trait anxiety was not associated with processing efficiency at high or low situational stress. However at lower effort, higher trait anxiety was associated with lower efficiency but only for those under ego threat; there was no relationship between trait anxiety and efficiency in the control condition. Results are interpreted with respect to attentional control theory and directions for future research are discussed.

Perception at isoluminance: Role of spatial resolution and background colour

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Isoluminant stimuli, in which chromatically defined stimuli are matched for luminance, were developed to investigate the role of colour information in aspects of visual processing. Performance is typically impaired, leading to the conclusion that particular processes, e.g. motion, are substantially colour blind. However, other techniques that don’t use isoluminance have shown that these processes are strongly sensitive to colour. Why are some visual tasks impaired at isoluminance? We tested two possibilities, impairment is specific to when: 1) fine spatial-resolution is required; 2) a red background is used, consistent with red-light suppressing some red magnocellular cells. Motion and form processing were assessed using global-dot-motion and Glass patterns, respectively. Dot/dipole densities varied from 1 to 2 dots/deg². The background was either achromatic (grey) or chromatic (red or green). When the grey background was used, performance for the isoluminant dots was unimpaired by increasing dot density. Thresholds were at least equal to the chromatic noise-in-luminance condition. Use of a red background impaired performance, particularly with the motion stimuli. High dot density does not impair processing the processing of all isoluminant stimuli, but when isoluminant stimuli are presented on a red background, performance is impaired.
Bilingual children's perception of lexical tones: The role of age and language background

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This study investigates the role of training mode, language background and level of literacy in bilingual children's ability to perceive foreign lexical tones. Two groups of primary school students, 6- to 7- and 8- to 9-years-old from tonal (English-Thai) and non-tonal (English-Arabic) language backgrounds were tested. Over six sessions, children were trained on auditory-only (AO) or auditory-visual (AV) computer-based tasks to identify the four Mandarin tones and tested on both AO and AV tone identification before (pre-), during (mid-) and after (post-test). Generally, the English-Thai 8- to 9-year-old group showed better performance than their younger counterparts and the English-Arabic groups suggesting that tone language experience and age contributes to perception of non-native tones. Training improved reaction time for both AV and AO training groups, over test phases. However only the AO training resulted in improved accuracy, there was a linear improvement over the test phases; AV training did not generate improvement over the three test phases, and in fact there was even a decline. Thus, the AO training was the most effective; it resulted in improvement on both AO and AV tests.

Exploring the repetition paradox: The effects of learning context and massed repetition on memory

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Although repetition is generally assumed to enhance the accessibility of memory for rehearsed material, recent research has suggested that prolonged repetition might actually be detrimental under some conditions. In the present work, we manipulated repetition duration and learning condition (intentional vs. incidental) in an effort to clarify the relationship between repetition and memory. Replicating previous findings, memory for repeated items declined with increased repetition under incidental-learning conditions. However, increased repetition had the opposite effect under intentional-learning conditions. Taken together, these results provide evidence for distinctive mechanisms of memory acquisition during repetition that vary depending on learning context.
Exploring the effect of procedural differences in humans vs. non-human primate decision making experimentation

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Evidence accumulation models have successfully been fit to human decision data for decades, modelling decisions from simple perceptual choice to consumer choice. Traditionally, these models have assumed that decision thresholds remain constant during each decision (fixed thresholds). However, recent primate studies have suggested collapsing thresholds, which decrease as decision time unfolds. One feature of these results is that collapsing bounds have mostly been supported by data from non-human primates, while fixed bounds are supported by human data. We investigated whether this apparent difference between species might instead be caused by different procedures used for humans vs. non-human primates, by putting human participants through an experimental procedure usually used for non-human primates. Fifteen participants each practised for 4,320 trials of a random dot motion task, over a two-week period. The data became more consistent with the predictions of the collapsing bounds model as practice went on. This effect was magnified by the inclusion of an unusual delayed-reward procedure that is sometimes used for non-human studies. We conclude that the extended practice given to non-human primates, and the reward structure used, may have contributed to the apparent difference in decision-making strategies between the species.

We can be happy upside down: Inversion effects for static and dynamic facial expressions

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While it is well documented that inversion impairs recognition of face identity, surprisingly few studies have investigated inversion effects on facial expressions. Expression and identity recognition share some common early processes; however, there is also evidence that they are processed by somewhat independent functional and neurological systems. Also, there is only a limited set of basic facial expressions and many of these have characteristic and featural cues (e.g., upturned mouth for happy). While inversion and motion effects have been shown for subtle expressions, the effects in normal intensity expressions are less clear. Here, we examine inversion for static basic expressions (anger, disgust, fear, joy, sadness, and surprise). For the first time, we also examine whether faces with complete dynamic expressions display an inversion effect. Dynamic expressions were recognised more accurately than static, but both show an overall inversion effect. However, inversion effects were not found for each expression tested. Inversion significantly impaired recognition of
static expressions of disgust and dynamic expressions of sadness. It seems the relative
collection of holistic and analytic processing to facial expression recognition depends on
the expression and motion. These findings highlight the differences and complexities of the
processes involved in recognising individual expressions.

**Electrical stimulation of human prefrontal cortex improves multitasking**

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Making two decisions simultaneously typically leads to performance impairments that are
thought to reflect a response selection (RS) bottleneck. Imaging studies have implicated
the left posterior lateral prefrontal cortex (pLPFC) in single- and dual-task RS. In a recent
study, we used transcranial direct current stimulation (tDCS) to provide causal evidence
for left pLPFC involvement in single-task RS (Filmer et al., 2013). To date, however,
there is no causal evidence implicating the left pLPFC in multitasking. We used tDCS to
test the involvement of left pLPFC in performing two temporally overlapping tasks.
Participants completed three sessions, each involving anodal, cathodal, or sham
stimulation. The behavioural paradigm consisted of a mixture of single- and dual-task
trials in which a sound, an image, or both were presented. Responses to relevant stimuli
were made as quickly and accurately as possible before, immediately after, and 20
minutes after stimulation. For single-task trials, both anodal and cathodal stimulation
disrupted reaction times, complementing the findings of Filmer et al. (2013). For dual-
task trials, cathodal stimulation reduced reaction times. The results confirm that the left
pLPFC is causally involved in the central bottleneck that limits multitasking, and suggest
that RS may vary for single- and dual-task responses.
**Visual attention adult illiterate and dyslexic readers provides fresh insights into the magnocellular theory of dyslexia**

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A complex visual scene, involving aligned stimuli, has been shown to involve the magnocellular pathway in order to guide attention to identify target objects. Individuals with reading impairments perform demonstrably worse on visual attention tasks compared to normal readers. This has been attributed to a deficit in dorsal processing on the part of readers with dyslexia. However, this premise is yet to be tested when comparing adults with reading impairments to adults with no reading experience. The current study compared the performance of illiterate, semi-literate and normal readers to dyslexic readers when performing a visual search task. The visual search task presented the target item randomly at one of five possible locations on a horizontally aligned array of geometrically regular figures which could be presented either right or left of fixation. The dyslexic readers performed worse on the conjunction search task compared with all other groups, however they performed comparably on the pop-out search task. The illiterate adults demonstrated poorer performance than the normal and semi-literate readers, but not the dyslexic readers. The implications of these findings in relation to the magnocellular theory of dyslexia are discussed.

**Response times for addition and subtraction depend on the magnitude of the answer for both symbolic and non-symbolic stimuli**

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Performance on basic number tasks is correlated with mathematical aptitude. Differences in response times between number tasks are used to infer the time taken to access and manipulate the symbols required to complete the number task. The magnitude of the answer is assumed not to contribute to the response time differences between tasks. Here we compare response times for addition and subtraction using symbolic and non-symbolic stimuli. Each trial showed a central fixation marker with a random dot array on each side (non-symbolic stimulus) or an Arabic numeral on each side (symbolic stimulus). Forty first year students completed the tasks using verbal responses. We found that response times for subtraction were faster than addition for the same numerical inputs. This was most evident for symbolic stimuli but was also evident for non-symbolic stimuli (albeit with greater variability). When response times were recoded according to response magnitude, response times for addition and subtraction using non-symbolic stimuli were similar. After recoding for response magnitude, response times for symbolic stimuli were marginally faster for subtraction than addition. Our findings show that the magnitude of the numerical answer contributes to response time as well as access and manipulation processes.
A role for visual awareness in the recalibration of temporal order

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The relative timing of physical events is not faithfully represented in perceptual awareness. Sensory signals (visual and auditory, for example) are processed in relatively independent brain areas and are processed with different speeds. A physically synchronous multi-sensory signal may thus reach perceptual awareness at varying times. Prolonged exposure to temporally offset audio and visual signals results in a distortion of perceived timing; events presented in the same order and near the same offset as the adapted stimuli are more likely to be judged as synchronous. This is known as temporal recalibration (TR). There is debate concerning the role of attention in the recalibration process, with some suggesting the determination of audio-visual timing takes place pre-attentively, and other evidence suggesting that the relative timing of the two signal streams must be attended. We therefore decided to investigate the role of awareness -- the assumption being that TR should be degraded for subliminal adaptation if conscious attention of timing is required for audio-visual temporal judgments. As a control condition, we measured the tilt aftereffect (TAE), which is known to be robust for subliminal adaptation. We used dichoptic presentations to mask awareness of the dynamics and orientation of visual adaptors and tests. Consistent with previous findings, we found that the TAE could be elicited by either supra- or sub-liminal adaptation. In contrast, we found that only supra-liminal adaptation resulted in a robust TR. These results suggest conscious awareness of the adapting visual dynamics is important for recalibrating temporal relationships, an effect we attribute to the need to consciously attend the adapted audio-visual temporal offset.
Event related potential evidence for dissociable training benefits for perception and decision-making

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Humans show striking processing costs when perceiving and acting upon multiple stimuli concurrently. Fortunately, these costs can be attenuated with training. Recently we observed that training benefits for perceptual-encoding transfer to new stimulus response mappings whereas benefits for decision-making remain specific to trained mappings. Here, we used electroencephalography (EEG) to reveal the neural correlates of this dissociation. In a pre-training session, participants completed two 4-alternative choice (4ac) response time (RT) tasks, as a single-task and along with a different task (dual-task). Subsequently, the training group completed 3000 training trials upon one of the 4ac tasks. Hence one task became trained; the other remained untrained. At test, event-related potentials (ERPs) associated with perceptual-encoding (N1 and N2) showed increased amplitudes for trained and untrained mappings relative to a control group. Timing of the N2 component was reduced for trained and untrained mappings, relative to controls. In contrast, the onset of the stimulus-locked lateralized readiness potential, a component that reflects activation of motor plans, was reduced only for tasks that employed trained S-R mappings, relative to untrained mappings and to controls. These results show that training does not affect all neural events equally, which has clear implications for the design of cognitive training regimens.

The importance of edges in stereoscopic surface perception

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It is now known that absolute disparity provides a poor basis for the stereo depth of discrete objects, which is a response to their relative disparity. We earlier extended this finding to stereo slant. We showed that gradients of absolute disparity across a surface elicit weak slant compared to gradients of relative disparity, which can be created by adding frontal plane surfaces flanking the slanted surface in the direction of the slant axis or seen transparently through it. Here we compare this effect with the effect on slant enhancement of discrete relative depth at surface edges produced by binocular or monocular background regions at the side of the slanted surface. All showed significant slant enhancement with full relative disparity gradients having the greatest effect followed by binocular then monocular background regions. We attribute these results to variation in constraints on relative slant. We also demonstrate that single narrow stereoscopically slanted ellipses show greater perceived slant than wider ellipses, which we attribute to the greater proximity of relative edge disparity in the narrower ellipses. We relate our finding to recent physiological data showing coding of surface edges and to other findings and models of depth extrapolation and monocular regions.
Can retrieval practise support the application of an abstract principle to new cases across a delay?

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Retrieval practice (aka "the testing effect") has been generating a lot of interest in cognitive psychology and education because it greatly boosts recall over lengthy delays. Further, there is evidence that retrieval practice supports some forms of knowledge transfer (e.g., from one paired associate to the other). However, there is less evidence that retrieval practice supports other forms of transfer, particularly the spontaneous application of abstract principles to new examples. Unfortunately, this latter form may be the most important for students to achieve. On the other hand, analogical learning paradigms are quite successful in promoting such transfer, but often this evidence comes from tests very soon after training. Here using a variety of methods, we attempt to integrate retrieval practice with analogical learning to foster the transfer of principles across a delay.

The importance of visual features in rapid scene categorization: Evidence from repetition blindness

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Observers can determine a great deal of information about a visual scene from only a brief glimpse. In this study, we examined what aspects of a scene contribute to this rapid understanding of scene gist, using a Repetition Blindness (RB) paradigm. RB is the failure to report the second instance of an item in an RSVP sequence and is thought to occur when two items tap a common underlying representation (or ‘type’) but are not individuated as two distinct instances of this ‘type’. Participants viewed RSVP sequences containing two or three scene images sandwiched by masks. We manipulated the similarity between the first and last scenes, such that they were: 1) identical repeated images, 2) mirror-reversed versions of the same image, 3) different members of the same category (e.g., two different beaches), or 4) scenes from different categories (non-repeats). Across different experiments, we measured participants’ accuracy in categorising scenes or their sensitivity to detect repetitions. Rather than RB, we generally found a repetition advantage for identical and mirror-image repeated scenes, whereas category repeats were no different to non-repeats. The results suggest that early stages of scene categorization rely on visual features present in the image, rather than higher-level categorical information.
A magnocellular contribution to conscious object perception via temporal object segmentation

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The human visual system is continuously confronted with dynamic input. One problem that the system must solve, therefore, is recognising when two distinct objects, as opposed to a single object, have appeared at a given location despite their brief presentation and rapid succession (temporal object segmentation). Given the superior temporal sensitivity and faster conduction speeds of magnocellular relative to parvocellular neurons, here we examined the role of magnocellular neurons in temporal object segmentation. We measured temporal object segmentation via object substitution masking (OSM), which reflects the failure to distinguish the target and mask as distinct objects through time. We isolated the selective role of magnocellular neurons by comparing target identification performance under conditions of pulsed versus steady luminance pedestals. A pulsed pedestal saturates the magnocellular response with a rapid pulse of luminance concurrent with the target array, whereas a steady-pedestal condition leaves both the magnocellular and parvocellular channels response-sensitive. We found that OSM magnitude was selectively enhanced under pulsed pedestal conditions, despite the fact that the pulsed pedestal did not alter overall target identification accuracy. This indicates that magnocellular neurons underlie our ability to resolve and consciously perceive two distinct objects presented in close spatiotemporal proximity.

Differentiation of integral dimensions: The effect of training a unidimensional boundary on perceptual representation

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Building on long-standing convergent operations, recent analyses of response times in multidimensional categorization has shown that separable dimensioned stimuli are processed independently (either in serial or parallel), whereas integral dimensioned stimuli are processed holistically in a coactive fashion. The current experiment extends this research by examining how processing changes with experience either with the multidimensional categorization task only, or with a unidimensional boundary training task interspersed throughout completion of the categorization task. Fourteen participants completed an initial (four sessions) categorization task using a purportedly integral dimensioned stimuli allowing initial diagnosis of processing strategy. Nine of those participants then learned a unidimensional boundary on one of two possible stimulus dimension; the other five continued the initial categorization task. Finally, all subjects completed the categorization task again to diagnose changes in processing. Initial results indicated that, consistent with increased selective attention to the trained dimension, training on a single dimension resulted in
decreased RTs for decisions made using that dimension. This presentation builds on these findings by examining changes in the perceptual spacing (using Multidimensional Scaling methods) over the course of training, specifically focusing on the effect of training type on the perceptual representation of these stimuli.

No evidence for a sensory component in the stream/bounce effect: signal detection analysis and post-coincidence trajectory duration manipulation

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Grove, Ashton, Kawachi and Sakurai (2012) investigated the sensory and decisional factors underlying the audiovisual “stream/bounce” illusion using signal detection theory. Observers distinguished between objective streaming and bouncing events when a transient sound was presented at coincidence or not. Sensitivity (d’) measures were the same between sound and no sound conditions but criterion (c) changed significantly across these conditions, suggesting that decisional processes underlie the illusion. However, Grassi and Casco (2012) reported evidence for both a sensory and decisional processes in the illusion. One important difference between these studies is that Grassi and Casco required participants to make judgments about the perceived overlap of the targets near the point of overlap, while Grove et al had observers report which sequences depicted streaming or bouncing. Importantly, Grassi and Casco’s task restricted judgments to epochs close to the time of coincidence. Grove et al had participants respond after viewing the entire motion sequence. To investigate this discrepancy, I repeated Grove et al’s measurements, manipulating the duration the targets were visible after coinciding. Sensitivity measures were the same between sound and no sound conditions across duration conditions but criterion changed significantly between sound conditions. These data are further evidence for decisional processes but not sensory processes in our version of the stream bounce illusion.

Easy on the eyes: Gaze and pupil response patterns for fractal images

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Fractal and natural images are known for their considerable aesthetic appeal and past behavioural investigation have a strong preference for such patterns with intermediate levels of complexity. We investigate the visual preference by measuring gaze and pupillary response patterns in response to abstract images varying in fractal dimension and/or their amplitude spectrum slope. Observers viewed images in one of two conditions, one in which visual preference ratings were collected, and the other in which they performed an unrelated shape identification task. Pupillary responses and eye movement indices were recorded for both conditions. We found a pattern of reliable and robust variations in pupil size as a function of fractal dimension and a high correlation between the pupil size and explicit
reports of visual preference. While the pupil size also varied as a function of fractal dimension in the shape-discrimination-task, there was no significant correlation with the shape recognition ratings. The images with intermediate fractal dimensions and amplitude spectrum slopes also elicited the higher number of fixations compared to other images. These results suggest a strong relationship between the abstract spatial structure and both behavioural and physiological measures of visual preference, further contributing to our understanding of aesthetic responses.

Estimating ensemble statistics impairs statistical learning

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Our visual world is consistent and predictable; knowledge of environmental regularities can be acquired incidentally, automatically, and implicitly to influence behaviour. Zhao, Ngo, McKendrick, and Turk-Browne (2011) reported that statistical learning of pairs of line segments that appeared in predictable configurations within larger sets was impaired when participants estimated ensemble statistics, such as mean orientation, over these sets. We investigated whether this effect reflects differences in the spatial scale of attention required for these two operations. Participants viewed arrays of oriented lines, and either estimated the mean orientation of each set (ensemble group), or indicated whether an orientation had been repeated (control group). The stimuli were presented sequentially, to encourage participants to attend individually to each. Participants were not informed that pairs of orientations would appear in predictable sequences. In a subsequent recognition test, the control group was able to distinguish previously seen pairs from foil pairs that had not appeared together reliably. In contrast, the ensemble group performed at chance on the recognition test. The results demonstrate that estimating ensemble statistics impairs statistical learning, even when controlling for attention. Importantly, they also hint that common resources may be involved in statistical processing across a range of different paradigms.
Semantic neighbourhood density effects in aphasic speech production

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In the course of spoken word production, it is assumed that not only the intended lexical representation, but also other semantically related entries are activated. The nature of these related representations and the influence they exert during word production remain unclear. Alternative views of “semantic neighbourhood” (words that are semantically related to a given target) include (i) words that share many semantic features with the target word (i.e. Mirman, 2011), (ii) words that frequently co-occur with the target word in discourse (Kittredge, Dell, and Schwartz, 2007), and (iii) words that are associates from the same semantic category (i.e. Bormann, 2011). Importantly, these distinct views regarding semantic neighbourhood have been associated with different effects in picture naming performance in aphasic speakers (i.e. Mirman, 2011; Kittredge et al, 2007; Bormann, 2011). In light of these different views, we are looking at semantic neighbourhood density effects on aphasic naming performance, using an existing picture naming database of aphasic speakers (Mirman et al, 2010). Results of these analyses will contribute to a better understanding of the representation of semantically related words in the lexicon, and how their influence can be explained by models of word production.

fMRI evidence for monitoring and inhibition of inappropriate words during speech production

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How do speakers prevent themselves uttering inappropriate words? To investigate, we employed taboo distractors in the picture word interference (PWI) paradigm. According to one account, taboo distractors capture attention involuntarily due to their arousal levels, slowing target picture naming until they are inhibited. Alternatively, speakers might use their comprehension system to monitor the content of an articulatory output buffer, and then inhibit inappropriate words from production. We tested neuroanatomically-informed hypotheses from these two accounts in a functional magnetic resonance imaging (fMRI) experiment. Participants named pictures (e.g. CRAB) with superimposed distractors that were either neutral (e.g. tower), taboo (e.g. damn) or phonologically-related taboo (e.g. crap) words. Significant interference was observed for taboo and phonologically-related taboo conditions, consistent with a monitoring account. Arousal ratings of the taboo words correlated with the magnitude of the interference effect while offensiveness ratings did not, consistent with an attention capture account. For the taboo > non-taboo contrast, increased BOLD signal was identified in bilateral inferior prefrontal and premotor cortices, anterior cingulate, and posterior middle and superior temporal gyri. Similar regions were observed for
the phonologically-related taboo > non-taboo contrast. Overall, the fMRI results are consistent with both monitoring and attention capture accounts.

**Eye fixation patterns support improved guidance as the source of reduced search times in contextual cueing**

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Participants report the identity of visual search targets faster for search displays that are intermittently repeated than for those that are novel. This ‘contextual cueing’ benefit has been attributed to the implicit coding of the location of the target in relation to a constant distractor context, which guides attention to the target more efficiently on repeated displays. This guidance account has been challenged by evidence that contextual cueing still occurs when attentional guidance is optimal, suggesting instead a facilitation of response selection. To further examine the mechanisms underlying contextual cueing we tracked participants’ eye-movements while they performed a spatially cued contextual cueing task. Repeated and novel search displays were preceded by a spatial cue at either the target location (valid trials) or at the location of a distractor item (invalid trials). Results demonstrated that participants were faster to report the target in repeated than in novel displays only when invalidly cued. Eye tracking showed that the benefit of repetition was due primarily to fewer fixations on invalidly cued repeated compared to novel displays. Taken together with the absence of a contextual cueing benefit on validly cued trials, our results support the role of attentional guidance in contextual cueing.
Orientation anisotropy in human visual cortex revealed using TMS

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Many cells within visual cortex show orientation tuning, responding preferentially to stimuli with a specific orientation. Brain imaging studies using fMRI have revealed anisotropies in the orientation tuning of human visual cortex. When participants view gratings at low contrast, the BOLD response is stronger for vertical and horizontal gratings than for oblique gratings, suggesting that more neurons are tuned to the cardinal orientations. This is consistent with long-standing psychophysical evidence that observers are better at discriminating gratings in the cardinal orientations. Here we have used TMS to investigate this anisotropy. We delivered weak pulses of TMS, below the threshold for eliciting phosphenes, to occipital cortex while measuring contrast thresholds for subjects to detect gratings presented within the receptive field of the stimulated cortex. We have shown previously that such weak excitation of cortical neurons can serve as a pedestal, lowering contrast detection thresholds for a plaid. Here we tested this effect for sinusoidal gratings oriented either horizontally, vertically, or obliquely. We found a clear pedestal effect for horizontal gratings, but no effect at other orientations. We conclude that the TMS pulses predominantly targeted neurons tuned to horizontal orientations, consistent with a greater prevalence of such neurons in the visual cortex.

Reducing base rate neglect with informative samples

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Two studies examined when sampling information reduces base rate neglect in probabilistic judgments using a Bayesian model-based analysis. Experience with samples from the posterior distribution in the form of sequential sampling or a descriptive summary tally both markedly reduced base rate neglect relative to baseline, and the summary tally improved performance over sequential sampling. The relevance of sample information to the target judgment was examined with participants sequentially sampling or observing a summary format of samples from the prior distribution, which highlights the rarity of the target outcome but does not approximate the 'correct' answer, as the posterior distribution does. Samples from the prior distribution reduced base rate neglect when conveyed as a descriptive summary, but not when sequentially sampled over time. We conclude that presenting a summary of sample information might be more beneficial to judgments than sequentially sampling the same information. Further, sampling experience is more likely to improve judgment performance when it provides information perceived as relevant to the target problem.
How many types of reasoning are there? Part 1: Evidence from functional dissociations and reversed associations

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Descriptively it appears that people engage in at least two different forms of reasoning; deductive and inductive inference. However it remains unclear whether these distinctions reflect the operation of more than one underlying cognitive process. Experiment 1 examined this issue by presenting arguments that varied in their logical validity and the typicality of their premises. Participants evaluated the strength of these arguments according to either deductive or inductive criteria. Functional dissociations were found such that argument validity had a greater impact on deductive than inductive judgments, while the opposite pattern was found for manipulations of typicality. Experiment 2 found a reversed association between induction and deduction; the rank order of strength evaluations of arguments was reversed depending on whether the arguments were evaluated deductively or inductively. Although these results may be seen as consistent with the operation of two distinct reasoning processes, we point out the limitations in this logic. The need for more clearly specified single- and dual-process models of reasoning is highlighted and novel methods that may differentiate between these accounts are discussed.

Reduce temptation or resist it? The effect of implicit food and goal evaluations on experienced temptation and intake of unhealthy snacks

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Positive implicit evaluations of food stimuli predict higher intake of those foods. Likewise, positive implicit evaluations of goal concepts (e.g., ‘weight management’) predict goal-consistent behaviour (e.g., lower intake of unhealthy foods). However, the relationship between those evaluations and the experience of temptation to indulge in goal-inconsistent behaviour when exposed to unhealthy food, remains unclear. A sample of 145 women (18-25 years) who tried to manage their weight through healthy eating completed two implicit association tasks assessing implicit evaluations of unhealthy food and the weight management goal, respectively. Intake of four energy-dense snack foods was measured in a task disguised as a taste-test, and participants reported the strength of experienced temptation to indulge in the snacks offered. Positive implicit food evaluation was associated with higher levels of experienced temptation and snack intake. Temptation mediated the relationship between implicit food evaluation and intake, suggesting that the valence of implicit food evaluations influenced intake through increasing (in the case of positive evaluations) and
decreasing (in the case of negative evaluations) the strength of temptation experienced. Implicit goal evaluation moderated the relationship between temptation and intake. When tempted by an unhealthy snack, a more positive implicit evaluation of a weight-related goal limited subsequent intake.

Efficient selection of information during hypothesis testing

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Our ability to test and update beliefs about hypotheses is fundamental to the process of learning. Doing so efficiently requires selecting test instances that decrease our uncertainty about the target hypothesis as quickly as possible. Previous theoretical work predicts that the proportion of queries that are true for a hypothesis influences how useful different information sources are (Navarro & Perfors, 2011). Here we present two experiments in which we test this prediction by comparing the types of information sources people select, depending on the proportion of queries that are true under the potential hypothesis. The results indicate people are sensitive to changes in composition of potential hypotheses and, overall, the relative utility of information sources.

The modularity of speech production during speeded word naming

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The speeded word naming task is used to explore important reading sub-skills, such as word recognition. A common assumption is that reaction time to begin vocalization should be the main dependent variable because once speech has started all prior processes of interest (e.g., word recognition) are resolved and bear no further influence. The present research extends previous findings undermining this assumption. In a simple speeded naming task, where adult participants were instructed to name all words and pictures as quickly and accurately as possible, production durations lengthened when naming low frequency words relative to naming corresponding pictures. This is consistent with the onset of speech before orthographic to phonological translation is complete. To see whether production durations were also sensitive to cognitive load during orthographic to phonological translation, responding in a second task was made conditional on whether each word was a noun (requiring a naming response) or a verb (requiring a manual response). Results showed effects on production duration differed between the two tasks, suggesting the execution of naming is influenced by complexity of response choice. The results highlight the dynamic and interacting relationship between the word reading and speech production systems during speeded naming tasks.
Validating perceptual face space

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A ‘perceptual face-space’ was derived for 60 faces using a sorting task. This space is distinct from a physical face-space based on principal components analysis of a superset of 224 faces, concordance $R_V = .84, p<.001$. Key differences include i) changes in shape associated with the directions of principal variation, ii) nearest neighbour and other groupings, iii) ‘distinctiveness’ of individual faces (their distance from the centre of space) and predicted memorability. Methods developed to visualise perceptual dimensions physically were used to generate stimuli for two experiments aimed at testing the validity of the perceptual face-space. In Experiment 1 we show generally higher sensitivity (dL) and smaller criterion (P50) for faces varying from the average along principal directions of perceptual variation as compared to faces varying along principal directions of physical variation. In Experiment 2 we show that, when equated for physical distance, the nearest neighbour in perceptual space was more likely, .61 (95%CI [.59, .63]), to be chosen as a match than the nearest neighbour in physical space. The results are used to argue in favour of including perceptual face-space based measures and visualisations for face processing tasks involving humans.

The identity-location binding problem

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The effortlessness of vision belies the challenges faced by the visual system. Different attributes of an object, such as its colour, shape, size and location, are often processed independently, sometimes in different cortical areas. The results of these separate analyses have to be combined before an object can be seen as a single coherent entity and not just a collection of unrelated attributes. Without visual binding you can be aware of the individual object attributes but binding is required for you to be able to perceive whether or not a given object has a particular combination of these attributes. Visual bindings are typically initiated and updated in a serial fashion, one object at a time. In contrast to this, here we show that one type of binding, location-identity binding, can be updated in parallel. The location-identity binding problem is the problem of knowing which objects are where in the visual scene. Using complementary techniques, the simultaneous-sequential paradigm and systems factorial technology, we examine the computational processing that underlies the updating of these bindings. Our findings are surprising, strongly constrain several theories of visual perception and help resolve an apparent conflict in the field.
Perceived warmth and competence of younger and older adults: How perspective and presentation mode can change stereotype content

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The Stereotype Content Model (Fiske, Cuddy, Glick, & Xu, 2002) is a popular model to describe how the social groups are perceived in society. For the development of this model, participants were asked (among other things) to judge social groups regarding warmth and competence “As viewed by society”. However, personal impression of social groups might differ from the society perspective. Thus, attitudes and behaviour towards the social groups could also differ.

The aim of the following research was therefore to examine whether perceived warmth and competence differed, depending on the perspective that the participants were asked to judge. Particularly, 194 participants in Germany and the US rated perceived warmth and competence of younger and older adults regarding three perspectives: a) as viewed by society, b) as viewed by their peer group and c) as viewed by themselves. Additionally, we varied the presentation mode of the two social groups with by using either word labels or neutral faces. Results revealed that judgments differed regarding perspective as well as presentation mode.

Improving recognition of low-resolution faces with caricaturing: The bionic eye

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The “bionic eye” can restore limited vision to individuals with complete or partial blindness. Electrodes implanted in the retina, optic nerve or cortex produce visual arrays of discrete “phosphenes”. Resolution with current bionic eye devices remains low, making fine-discrimination tasks such as face recognition difficult. Here we explore a new approach for improving face recognition in the bionic eye – by enhancing the higher-order shape information in the face using caricaturing. To create caricatures, a target
(veridical) face was morphed away from a matched average face (same sex, race, viewpoint as target), to exaggerate all aspects of the face's individual appearance. Face images were then "phosphenised" to simulate how they would appear when seen with a bionic eye. We tested four phosphene resolutions: 16x16, 32x32 and 40x40 all with 30% dropout (e.g. due to electrode failure), and 40x40 without dropout. Results showed caricaturing improved both perceptual individuation and recognition memory. In the perceptual task, participants compared images of two different people and rated how different they looked. Caricaturing improved perceptual differentiation (i.e., dissimilarity ratings increased) compared to veridical faces, at all resolutions except 16x16. In the old-new recognition task, caricaturing improved face memory, at least at the 40x40 (without dropout) resolution.

The BOLD and the Beautiful: Neural responses to natural scene statistics in early visual cortex

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A key property of natural scenes is that they share a specific distribution of spatial frequencies and associated luminance intensity variations known as the 1/f amplitude spectrum. This is characterised by a linear fall off which typically has a slope between -1.2 and -1.4. Images sharing these characteristics have been reported as more aesthetically pleasing and less aversive compared to images with shallower or steeper slopes. We sought to investigate the response profile of areas in early visual cortex to random noise images with varying 1/f slopes (-0.25, -0.75, -1.25, -1.75 and -2.25) across two contrast levels (10% and 30%) and two viewing conditions (aesthetic rating and a central visual search task). Both tasks were directly compared in order to characterise both bottom-up activation of brain areas and those involved in the aesthetic judgment. Participants (n = 12) underwent fMRI scanning whilst viewing these images, where maximal BOLD responses were observed with natural 1/f slopes at both contrast levels. These results suggest that early visual areas are optimally tuned toward processing images with a natural slope (-1.25), which can potentially explain why we find these scenes calming and aesthetically pleasing.
Interactive effects of task set and working memory on attentional capture

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When we search for objects with particular features, attention becomes biased toward any object possessing those features. Maintaining such biases may involve similar neural resources to working memory (WM). If so, taxing WM should reduce top-down influences on attentional capture. We recorded electroencephalogram (EEG) data while observers monitored dynamic stimulus streams for targets defined by a particular feature value (e.g., red), and ignored lateralised distractors. First, we replicated previous evidence for top-down modulation of attentional capture by demonstrating an enhanced N2pc component and slowed target responses when distractors possessed the target feature. We then investigated whether taxing WM reduces the effect of task set on attentional capture. A concurrent n-back task, which involves the updating component of WM, compromised the influence of task set by reducing the N2pc associated with task-relevant distractors. By contrast, a concurrent digit rehearsal task, which only involves information storage, did not change the effect on task set on the N2pc. Neither WM load manipulation affected the extent to which distractors slowed target responses. These results indicate that some – but not all – WM load manipulations compromise top-down influences on visual processing, and support the notion that WM and selective attention compete for common neural resources.

Modelling the reminiscence bump in the temporal distribution of autobiographical memory: Support for the cognitive abilities and the cultural life script account

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People tend to recall more personal events from adolescence and early adulthood than from other lifetime periods. This effect is called the reminiscence bump and it is often examined with the Galton-Crovitz cueing technique, in which participants retrieve personal events with the help of cue words. By presenting the cueing technique on the Internet, nearly 140,000 autobiographical memories were collected with 64 different cue words, which allowed plotting of detailed lifetime distributions for each cue word. Although many cue words, such as chair, flower or sugar, mostly triggered memories from childhood (6 to 10 years), other cue words, such as wine, baby or army, tended to trigger memories from a later age (11 to 30 years). The 64 lifetime distributions yielded good fits with a model that consisted of two functions: a gamma function that was the same for all cue words and a normal distribution
that was different for each cue word. Whereas the gamma function corresponded well with the cognitive abilities account for the reminiscence bump, the normal distribution corresponded well with cultural life scripts account, which suggests that people try to restrict their memory search while retrieving personal events, but that this may not always be possible.

**Does building face composites influence line-up identification performance?**

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Constructing a facial composite reduces the likelihood that a witness will subsequently identify a suspect in a line-up task (Wells, Charman & Olson, 2005). Existing research has employed somewhat artificial manipulations of this task that do not incorporate realistic exposure to faces or plausible intervals between composite production and the line-up task. The current experiment recruited 88 participants to investigate whether the adverse face composite effect still arises when the witness task is made more realistic. It also incorporated different time intervals between the composite stage and the line-up task. Participants viewed a clip of a moving face and returned to complete a cognitive interview 48 hours after viewing the target. Half the participants also took part in a facial composite building exercise using EvoFit. After an interval of 24 hours or 6 weeks participants returned to attempt the line-up identification. A negative impact of composite building was present for participants returning after both intervals. The long term disadvantage for witnesses who constructed a composite is used to provide an explanation of its mechanism.
Visual voice activity detection using spatiotemporal Gabor filters

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Visual Voice Activity Detection (VVAD) refers to the detection of speech from a video sequence by means of visual cues. VVAD provides a useful addition to auditory voice activity detection, in particular in cases involving multiple speakers or background noise. In our research we focussed explicitly on the measurement of facial movements at different speeds to determine which rates of movement contribute to VVAD. Facial movements in video sequences of talking faces are measured using a spatiotemporal Gabor transform. VVAD performances based on these measurements are determined for different speeds and compared to simple frame differencing and regular Gabor filters. In addition, performances are assessed for the entire frame, the head region, and the mouth region. By creating speaker dependent and speaker independent models we tried to determine the generalizability of our method. The results obtained reveal an elevated VVAD performance for low speeds as compared to large speeds. In addition, our Spatiotemporal Gabor filter based VVADs in general outperform the two baselines.

Impulsivity moderates the relationship between cognitive bias and unhealthy eating

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Cognitive biases for food cues have been linked to unhealthy eating behaviour. Furthermore, studies show that higher impulsivity is related to increased food intake. Recent research suggests that cognitive biases and impulsivity may interact to explain unhealthy eating behaviour. The aim of this study was to explore the potential moderating role of impulsivity in the relationship between approach bias for food and snack consumption. Participants were undergraduate women aged 18-25 years. An approach-avoidance task was used to assess automatic processing of food pictures relative to control (i.e., animal) pictures. Impulsivity was assessed via self-report, and snack consumption was measured during a so-called taste test. Preliminary analyses showed a positive relationship between approach bias and consumption, and a moderating effect of impulsivity on this relationship, such that the association between approach bias and consumption was stronger for individuals higher in impulsivity than for those lower in impulsivity. The results support dual-process models, which propose that food cues elicit automatic approach tendencies, and that higher impulsivity is related to less control over consumption (Strack & Deutsch, 2004). At a practical level, they offer potential scope for an intervention that focuses on modifying approach biases and/or impulsivity in order to discourage unhealthy eating.
**OZI: The vocabulary development inventory for Australian English**

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The MacArthur-Bates Communicative Development Inventory checklist is used worldwide as a reliable and cost-effective method for research and diagnostic assessment of early vocabulary development. Given its utility, there are many CDI adaptations, but it should be noted that direct translations of the CDI to other languages or the use of the original US English version for other varieties of English have not successfully captured rates of vocabulary development. Accordingly, the CDI has been adapted for multiple languages and for British and New Zealand English, but to date no official version for Australian English has been released. The OZI was adapted and designed with these constraints in mind, and the present research introduces the first normed data for the OZI Vocabulary Development Inventory for Australian English. The OZI productive vocabulary checklist was administered to infants aged 12 to 30 months (\(N = 1350\)). Itemised analyses yielded normative scores for productive vocabulary development for infants acquiring Australian English, as well as norms for age of acquisition for the 546 items in the inventory. These results will be compared to other CDI versions, and applications of these normative data for future research on language acquisition involving Australian infants will be discussed.

**Lombard tone: An acoustic analysis of Thai tones**

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It is well-known that speakers modify their speech in different communicative intent as well as different environmental conditions. Speakers often have to handle noise in the auditory environments every day. One way to achieve this is by modifying speech production in noise, a phenomenon called Lombard speech. Previous studies showed that the main characteristics of Lombard speech, when compared to quiet environment speech include increases of loudness, vowel duration, and in fundamental frequency (F0). Since modifying F0 is one of the key features of Lombard speech, it is of interest to investigate the acoustic characteristics of tones produced in noisy environments, that is Lombard tones. Here the acoustic characteristics, such as F0, vowel and tone duration, of Thai tones produced by 6 native Thai speakers in quiet and noisy environments were investigated. The results suggested that speakers hyperarticulated their tones in Lombard speech by raising F0 level of the whole contour as well as lengthening tone and vowel duration.
i no how 2 spell, ok! Undergraduates’ grammatical errors in
text-messaging and in standard English

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As electronic communication becomes an increasingly important part of most
Australians’ lives, so does the casual writing style that omits capitals and apostrophes (*im
coming*) and ignores grammatical conventions (*there coming 2!!*). There is widespread
concern that exposure to such spellings will reduce young people’s ability to write
conventionally correctly. In two studies, we examined the relationships between the
production of grammatical violations in naturalistic text messages, and performance on
tasks of conventional grammar. In Study 1, we found that 70 British undergraduates
showed a weak relationship between the proportion of grammatical violations they made
in their text messages, and their ability to correct those types of grammatical violations in
messages written by others. In Study 2, we found no significant relationship between 50
Australian undergraduates’ production of grammatical violations in their text messages,
and their ability to write grammatically determined words in a conventional dictation
task. It seems that although undergraduates certainly make errors in conventional
grammar, their errors are not consistently related to their unconventional use of grammar
in electronic communication. Using unconventional grammar in electronic
communication instead seems to reflect a sense of linguistic fun, or simply the saving of
typing time.

Stability of attentional bias modification effects on
consumption over time

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Accumulating evidence shows that cognitive bias modification produces immediate changes
in attentional bias for, and consumption of, craved substances, including food. This study
examined the stability of these attentional bias modification effects over time. Specifically,
we used a modified dot probe paradigm to determine whether alterations in biased attentional
processing of craved food cues, and subsequent effects on consumption, were maintained at
24-hour and 1-week follow-up. A sample of undergraduate women (N = 149) were trained to
direct their attention toward (‘attend’) or away from (‘avoid’) food cues (i.e., pictures of
chocolate). Within each group, half received a single training session, the other half
completed 5 weekly training sessions. Consistent with previous findings, attentional bias for
chocolate cues increased in the ‘attend’ group, and decreased in the ‘avoid’ group
immediately post training. Importantly, these effects were maintained 24 hours later and also
1 week later, but only following multiple training sessions. Participants in the ‘avoid’ group
also ate less of a chocolate food product in a subsequent taste test than did those in the
‘attend’ group. The results support a causal role for attentional biases in consumption
behaviour, and offer potential scope for tackling unwanted (over)eating.
Task-relevant or not, emotional distractors impair awareness for subsequent items

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Emotional distractors can disrupt awareness for subsequent items, an effect known as “emotion-induced blindness” (EIB). Participants typically search for a single target in a rapid stream of images and are instructed to ignore the attention-grabbing distractors. We recently found that an ERP waveform indicative of attentional disengagement from the distractor predicted EIB, raising the possibility that emotion-induced blindness might dissipate when participants are instructed not to ignore the distractor. In the present experiment, each rapid stream of images included two images surrounded by coloured borders, and we manipulated the task-relevance of the first bordered image (T1). T1 could be emotionally negative or neutral, and all other images (including that in the second border, T2) were of everyday objects. For half of the experiment, participants identified both bordered items (T1-relevant condition), but in the other half they only identified T2 (T1-irrelevant condition). We found that participants were better at identifying T2 when T1 was irrelevant, but that the emotional (relative to neutral) T1 images disrupted T2 identification regardless of their relevance. Intriguingly, EIB emerged despite worse identification of emotional than of neutral images. Thus, emotional distractors impair target detection regardless of their task-relevance, and independent of their access to visual memory.

Investigating the cause of anagram errors in developmental Letter Position Dyslexia

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Children with selective Letter Position Dyslexia (LPD) make an extreme number of anagram errors (such as reading form as ‘from’) in the absence of any other obvious reading or spoken language problems. Previous research has suggested that letter position dyslexia is caused by a selective letter position coding deficit at the prelexical stage of reading. However, direct evidence for a prelexical deficit account of English LPD is currently lacking. We aimed to both replicate and extend previous findings by investigating the locus of impairment in three English-speaking children with developmental LPD. To do this, we administered various experimental tasks including reading aloud words and nonwords, visual lexical decision and same-different matching. The results indicate that LPD is most likely caused by a letter position coding deficit at
the prelexical stage of reading. Furthermore, the results suggest that variations in the manifestation of this deficit may be, in part, due to individual differences in strategy use. These findings provide further evidence for the heterogeneity of dyslexia and its underlying causes, and will be discussed in the context of current cognitive models of reading aloud.

**The integration and discrimination of global speed without visual awareness**

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We investigated whether visual awareness is required for the integration of local motion in the perception and discrimination of global speed. It has been reported (see Verghese and Stone 1996, *Nature*) that global speed discrimination thresholds are superior when the stimulus consists of many local elements. This is because integrating many local estimates reduces uncertainty when estimating the global speed. In Experiment 1 we quantified speed discrimination thresholds (N=7) using a ring of 8 ‘moving’ Gabor elements configured to convey rotational motion. Using Continuous Flash Suppression (CFS) we selectively suppress from awareness the number of Gabors (2, 4 and 6 elements) forming the stimulus. This was compared to a baseline condition in which the elements were actually removed from the stimulus. Consistent with Verghese and Stone, when elements were removed from the stimulus, speed discrimination thresholds (expressed as Weber fractions: $\Delta S/S$) significantly decreased with the number of elements. However, when local elements were suppressed from awareness using CFS, speed discrimination thresholds did not change with the number of suppressed elements, and were comparable to performance when all 8 elements were visible. This result suggests that the motion integration process largely operates without visual awareness.

**Spontaneous and explicit speech imitation: How different?**

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It has been claimed that the speech imitation that occurs in the single word speech shadowing task (where participants simply repeat what a model talker says) is different from that which would occur from explicit imitation. We tested this claim by examining whether the speech of participants who shadowed or explicitly imitated a model talker would converge on similar or different properties of the model’s speech. The model talker produced speech in two styles (normal and clear speech) that differed in VOT, word duration, intensity and F0. Participants produced immediate and delayed naming responses. The results suggested that spontaneous and explicit imitation tap different processes. That is, a different pattern was found for spontaneous and explicit imitation in relation to which speech properties converged with the speech model and patterns of convergence differed between immediate and delayed imitation and between normal and clear speech.
Better spellers are more disrupted readers. Is there a prime lexicality effect?

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Previous studies of masked priming have reported an inhibitory effect of word neighbour primes and facilitatory effect of nonword neighbour primes in lexical decision (Davis & Lupker, 2006). Following Andrews & Hersch (2010), we tested where the prime lexicality effect is modulated by vocabulary and spelling ability. Experiment 1 using the lexical decision task showed that spelling ability is associated not with the prime lexicality effect but the sensitivity to the wrong letter (e.g. fiure – CURE or pure-CURE). In Experiment 2 the same stimuli were used in a same-different task to test if the difference was prelexical. No individual difference was found in this task. Better spellers are more sensitive to the presence of a wrong letter only when lexical access is required.

Visual similarity effects on masked priming

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We investigated the role of the visual similarity of masked primes to targets in a lexical decision experiment. In the primes, some letters in the target (e.g., A in ABANDON) had either visually similar letters (e.g., H), dissimilar letters (D), visually similar digits (4), or dissimilar digits (6) substituted for them. The similarities of the digits and letters to the base letter were equated and verified in a two-alternative forced choice (2AFC) perceptual identification task. Using targets presented in lowercase (e.g., abandon) and primes presented in uppercase, visually similar digit primes (e.g., 484NDON) produced more priming than did visually dissimilar digit primes (676NDON), but little difference was found between the visually similar and dissimilar letter primes (HRHNDON vs. DWDNDON). These results were explained in terms of task-driven competition between the target letter and the visually similar letter.
On the other side of the fence: Effects of social categorisation and spatial grouping on memory and attention for own-race and other-race faces

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Humans typically have better memory for own-race than other-race faces (“own-race bias”). Recently, Hehman et al. (2010) reported improved recognition for other-race faces categorised as belonging to participants’ social in-group (i.e., same university). Faces were studied in groups, containing both own-race and other-race faces, half of each labeled as in-group and out-group, respectively. When study faces were spatially grouped by race, participants showed a clear own-race bias. When faces were grouped by university affiliation, in-group other-race face recognition was indistinguishable from own-race face recognition. Our study aimed at extending this unique finding to other races of faces and participants. Forty Asian and 40 Caucasian participants studied Asian and Caucasian faces. Faces were presented in groups, containing equal numbers of own-university and other-university Asian and European faces. Between participants, faces were grouped either according to race or university affiliation. Eye-tracking was used to study the distribution of spatial attention to individual faces in the display. Participants demonstrated a clear own-race bias, but their memory was unaffected by the faces’ university affiliation and the criterion for their spatial grouping. Eye-tracking revealed looking biases towards both own-race and own-university faces. Results are discussed in light of theoretical accounts of the own-race bias.

Variations within a “subtype”: Developmental surface dyslexia

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Developmental dyslexia is a heterogeneous disorder. There have been different approaches to map this heterogeneity (e.g., Castles & Coltheart, 1993; Peterson et al., 2013). However, much of the work relies on broad labels such as “surface dyslexia” or “phonological dyslexia”. In this study, we endeavoured to move beyond these categories. Based on dual route architecture we predicted three different proximal causes for developmental impairments of irregular word reading (Coltheart & Funnell, 1987; Friedmann & Lukov, 2008). Our participants were 12 children (aged 7 to 11) with surface dyslexia. We tested these children on four tests to tap into the different component-skills involved in lexical processing: Visual lexical decision, written homophone
comprehension, reading aloud irregular words, spoken picture naming. Results indicate that children indeed show a variety of underlying impairments. The profiles evident in the sample were in line with the model’s predictions. While there is support for these different deficits in Hebrew-reading children (Friedmann & Lukov, 2008), this is the first study to carefully profile the heterogeneity of poor irregular word reading in English reading children.

**Visual search is not a strictly categorical process: Evidence from genetic algorithms**

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In the present study we examine how observers search among complex displays. Participants were asked to search for a big horizontal red line among 120 distractor lines of various sizes, orientations and colours, leading to 36 different distractor combinations. To understand human behaviour, we evolved the search display by using a genetic algorithm. That is, the best displays (i.e. displays corresponding to the fastest RTs) were selected and combined to create new evolved displays. Search times declined over generations. Results show that items that shared the same colour and orientation as the target interfered (as they disappeared over generations), but items that shared the same colour and were 10° different in orientation only interfered if they were also the same size. A second experiment confirms the results of the genetic algorithm, but also finds that whether or not distractors that were the same colour and 10° different in orientation interfered with search times depended on the size disparity between the target and distractor. The distractor interfered when the size disparity was small, but not when the size disparity was great. We concluded that visual search could not be a strictly categorical process, as proposed by some models of visual search.
A mental rotation task increases thresholds to perceived motion

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There has been a great deal of debate concerning whether visual imagery employs the same or similar brain regions to those used for visual processing, and more recently, whether mental rotation involves the same mental resources as those required for perceiving visual motion. In this experiment, thresholds for minimum motion displacement were measured for six male and five female visually normal, young participants on a set of motion measures (minimum displacement for a drifting Gabor patch, $D_{min}$ for a random dot-kinematogram, and second-order motion defined by a drifting sinusoidal modulation of contrast on a noise background). Participants undertook the tests once as a baseline, and then again while mentally rotating the image of a stick-man holding an object in each hand and reporting which object was held in the left hand. In a third condition participants also stated the number of hours on the clock it would be necessary to rotate the stick-man to arrive at 12 o’clock. For the Gabor and Dmin tasks, participants showed higher thresholds in both of the mental rotation conditions relative to baseline. For the second-order motion stimulus, the double rotation task produced higher thresholds than either of the other two conditions, but only for female participants.

The value of $p$: ‘Just’ significant results are increasing

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Null hypothesis significance testing uses the probability of .05 as a cut-off for objectively determining if a tested effect is reliable. Recent research has found an over-representation of $p$ values around .05 within psychological articles. The present study examined whether this over-representation has remained constant throughout the years, or whether it is more pronounced due to increasing pressure to publish. Articles published in 1965 and 2005 from two prominent psychology journals were examined. Similar to previous research, the frequency of $p$ values at and just below .05 was greater than expected compared to $p$ frequencies in other ranges. This over-representation was found for both 1965 and 2005 but was much greater in 2005. Additionally, in 2005 compared to 1965, $p$ values close to but over .05 were more likely to be rounded down to, or incorrectly reported as, significant. This pattern might be explained by modern statistical software as well as an increased pressure to publish. The problem may be alleviated by reduced reliance on $p$ values and increased reporting of confidence intervals and effect sizes.
Attuned to unfamiliar music: Non-musicians learn novel music systems through exposure

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The project aimed to understand the development of mental representations of a music system through exposure to the music environment. It proceeded with examining the initial learning process of a novel music (microtonal) system from attentive listening. We instructed 28 non-musicians to perform goodness-of-fit judgments before (pretest) and after (post-test) two melodic memory tests that generate exposure. The fitness judgments involved listening to a microtonal melody from the novel system followed by a test tone (probe), and participants had to indicate if the probe ‘fits’ the melody. They then attended to the melodies repeatedly in the memory tests, indicating if the test tone was present in the melody with feedback provided. Participants were found to respond significantly faster and were more likely to indicate probes from the same system as ‘fit’ in the post-test. Error rates in recalling the absent micro-probe as present in the melody also decreased in the second memory test, implying the development of knowledge of the novel system. We then conduct ongoing experiments to investigate the learning of several novel systems that vary in musical structures and familiarity. We suggest that these results may have implications for music development and the adaptation to new music.

Effect of Automatic Phonological Activation on Episodic Recognition

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Visual lexical processing involves going from a written word (input orthography) to the activation of the appropriate meaning (semantic output). Doing so also automatically activates representations related to the original input (e.g., orthographically similar representations, the same input in the phonological modality). The present research investigated the effect of this automatic activation on episodic memory of word and nonword stimuli by comparing nonwords pronounced the same as existing words (“pseudohomophones”) to control nonwords on a recognition memory task. Pseudohomophone targets had higher hit rates relative to control nonword targets with Pseudohomophone foils also having an increased false alarm rate relative to controls. However, the effect for pseudohomophone targets was greater than that for the foils. Furthermore, there was no concurrently inflated false alarm rate for foils that shared a pronunciation with pseudohomophone targets. This effect was explored in the context of intentional and incidental memory, revealing that it is potentially sensitive to awareness during encoding. Overall, the outcome provides evidence for the claim that phonological representations activated during processing can enhance memory in terms of hit rates but not at the cost of increased false alarms.
The effect of stimulus set size on the sex-emotion interaction in face categorisation

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Previous research has shown that invariant facial features, e.g., sex, and variant facial features, e.g., emotional expressions, interact during face categorisation. The nature of this interaction is unclear, however, and has been reported as either asymmetrical, invariant features affect emotion perception whereas emotion does not affect perception of invariant features, or symmetrical, invariant features affect perception of variant features and vice versa. The current research investigated the source of these inconsistent results and identified the number of different posers used as the critical variable. Using faces drawn from two different databases, Experiments 1 and 2 replicated the finding of a symmetrical interaction between face sex and emotional expression when 32 different posers were used. Using subsets of four posers in the same task setup, however, did not provide evidence for a symmetrical interaction also consistent with prior research. The same pattern of results emerged using the Garner paradigm (Experiments 3 and 4), which, with small stimulus sets, previously had yielded only evidence for an asymmetrical interaction. This pattern of results seems to suggest that faces are processed to a lower level of detail if they are encountered repeatedly preventing interference from features that are not task relevant.

Familiarity breeds neglect: latent inhibition-like effects in rapid serial visual presentation

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Exposure to visual stimuli results in well-documented facilitatory and inhibitory effects when those stimuli are subsequently used in learning or perceptual tasks. In visual attention research, stimulus familiarity is associated with faster and more accurate identification in some tasks and retarded performance in others. Here we examined the effects of familiarizing stimuli in a simple cognitive task on later performance in rapid serial search task where two coloured targets appeared amongst distractors, with the sequence of stimuli comprising a mix of familiarized and novel stimuli. Familiarization of target stimuli was associated with poorer performance in rapid serial visual presentation, while familiarization of neighbouring distractor stimuli was associated with enhanced target report. These effects were not specific to the level of attentional control at test (manipulated using the attentional blink), were insensitive to manipulations of memory load during exposure, and survived a delay between exposure and testing of at least 24 hours. As will be discussed, the results have implications for models of controlled stimulus selection.
Transformations gone wrong: Using Generalized Linear Mixed Models to avoid transforming skewed distributions in psycholinguistic research

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Psycholinguists have increasingly adopted linear mixed model (LMM) analyses to assess the extent to which their experimental effects generalise over two random populations – subjects and items. However, the raw reaction time (RT) data typically recorded in psycholinguistic experiments produce residuals that are neither normally distributed nor homoscedastic, so they are typically inverse transformed (-1000/RT) in order to meet the assumptions of LMM. Unfortunately, many models of word recognition depend on inferences drawn from raw rather than inverse RT. Researchers are therefore caught between a rock and a hard place: analyses based on raw RT may be statistically illegitimate, while those based on transformed data may yield misleading conclusions. Generalized Linear Mixed Models (GLMM) provides a solution to this dilemma because it allows statistical assessment to be based on raw RT, while at the same time producing normally distributed residuals by accommodating the shape of the RT distribution. We outline the major theoretical decisions involved in specifying a GLMM and illustrate them by reanalysing a dataset (Yap & Balota, 2007) for which analyses of raw and transformed RT yield conflicting conclusions about the relationship between effects of word frequency and stimulus degradation.

Instructed extinction affects physiological but not verbal indices of human fear learning

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Conditioned fear, as indicated by physiological responses, is significantly reduced after receiving instruction that the unconditioned stimulus (US) will no longer be presented. However, instruction does not affect verbal ratings of conditioned stimulus (CS) pleasantness collected after extinction. The current study investigated the influence of an instructed extinction manipulation on physiological responses and CS evaluations measured simultaneously. Electrodermal responses (Experiment 1) and fear potentiated startle (Experiment 2) were measured as physiological indices of fear learning, and trial-by-trial CS pleasantness evaluations were measured as a verbal index. Instructed extinction resulted in the immediate decline of differential physiological responding, but did not affect CS pleasantness ratings, revealing a dissociation between physiological and verbal indices of fear learning. In Experiment 3, a separate sample of participants read the experimental scenario and was asked to predict the results. As the opposite pattern of results was predicted demand characteristics seem an unlikely explanation for the findings. The dissociation between physiological and verbal indices of fear learning seems to indicate that not all aspects of fear learning respond to cognitive interventions in the same manner, a finding which has both theoretical and clinical implications.
Trading off risk and delay: Using utility based models to predict choice between risky and delayed rewards

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While there are a variety of theories of risky choice and inter-temporal choice, there is relatively little research on how people make decisions which involve both. In the current experiment, we test whether past decisions involving risks or delays alone can predict how people then choose between the two. Participants were given sets of inter-temporal choices and sets of risky choices to calculate their delayed and risky indifference points (IP) for several monetary amounts. They were then required to choose between risky outcomes and delayed outcomes of the same amount (trade-off choices) to calculate fresh IPs. Overall, participants’ trade-off IPs appeared to shift in the direction of preferring to wait longer or take less of a gamble than when faced with risky or inter-temporal choices alone. In order to examine whether utility based models of choice can account for this behaviour, we then fitted variations of Cumulative Prospect Theory and Hyperbolic Discounting models to the risky and inter-temporal choice data. The utilities generated from these models were then used to predict decisions in the trade-off choices. Finally, we discuss whether variations in probability weights, discount rates, or other parameters better account for the observed data.

How does sensorimotor control change with age?

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Age-related changes in goal-directed movements may be due to sensory-related or motor-related decline or may also be affected by more generalised slowing of neural processing. The goal of these experiments was to quantify differences in performance on visual and sensorimotor tasks between older and younger observers. Older (age range 60-70) and younger (age range: 20-30) observers were screened for visual and motor deficits before testing. We measured visual localisation performance and compared it to pointing performance for targets presented for 100 ms or on until touch. We also used a two step online correction task to further quantify changes in rapid online integration. Although visual localisation was comparable between groups, pointing precision for both target durations was decreased for older people. Movement times for older observers were longer, consistent with previous work. In the two step task, older observers showed a reduced ability to update and longer movement times. When forced to reach under time pressure, older observers showed lower accuracy and decreased precision compared to younger observers. Altogether, results suggest that declines in pointing performance with age reflect changes in sensorimotor integration, particularly online integration of visual information.
The integration and discrimination of global speed without visual awareness

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We investigated whether visual awareness is required for the integration of local motion in the perception and discrimination of global speed. It has been reported (see Verghese and Stone 1996, Nature) that global speed discrimination thresholds are superior when the stimulus consists of many local elements. This is because integrating many local estimates reduces uncertainty when estimating the global speed. In Experiment 1 we quantified speed discrimination thresholds (N=7) using a ring of 8 ‘moving’ Gabor elements configured to convey rotational motion. Using Continuous Flash Suppression (CFS) we selectively suppress from awareness the number of Gabor elements (2, 4 and 6 elements) forming the stimulus. This was compared to a baseline condition in which the elements were actually removed from the stimulus. Consistent with Verghese and Stone, when elements were removed from the stimulus, speed discrimination thresholds (expressed as Weber fractions: ΔS/S) significantly decreased with the number of elements. However, when local elements were suppressed from awareness using CFS, speed discrimination thresholds did not change with the number of suppressed elements, and were comparable to performance when all 8 elements were visible. This result suggests that the motion integration process largely operates without visual awareness.

How does sensorimotor control change with age?

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Age-related changes in goal-directed movements may be due to sensory-related or motor-related decline or may also be affected by more generalised slowing of neural processing. The goal of these experiments was to quantify differences in performance on visual and sensorimotor tasks between older and younger observers. Older (age range 60-70) and younger (age range: 20-30) observers were screened for visual and motor deficits before testing. We measured visual localisation performance and compared it to pointing performance for targets presented for 100 ms or on until touch. We also used a two step online correction task to further quantify changes in rapid online integration. Although visual localisation was comparable between groups, pointing precision for both target durations was decreased for older people. Movement times for older observers were longer, consistent with previous work. In the two step task, older observers showed a reduced ability to update and longer movement times. When forced to reach under time pressure, older observers showed lower accuracy and decreased precision compared to younger observers. Altogether, results suggest that declines in pointing performance with age reflect changes to sensorimotor integration, particularly online integration of visual information.
Elderly speech recognition in noise: Contribution of temporal, spectral and visual cues

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Previous research with young adults has shown that temporal cues (amplitude modulated, AM) provide sufficient information to recognize speech in quiet but do not do so for speech in background noise. Speech perception can be more robust to noise when spectral cues (frequency modulated, FM) are provided along with AM ones and visual cues (AV) provide an additional benefit. The current study tested the effectiveness of these different types of speech cues for elderly compared to young participants. It is predicted that the benefit from these cues may not be additive for elderly participants due to their inability to effectively use frequency cues. We measured the relative contribution of AM and FM cues in young adults and elderly across auditory (AO) and AV conditions through speech identification of sentences, vowels and consonants in noise. The results will be discussed in terms of how the effectiveness of speech cues is altered as a function of age due to changes in central auditory functioning and cognitive abilities.

Clarifying the abilities that underpin mutual exclusivity

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The skills that underpin mutual exclusivity (ME) have been hotly contested, with some arguing that ME is simply a linguistic skill while others believe it relates to social-pragmatics. Marchena et al. (2011) explored this issue in a sample of children with autism spectrum disorder (ASD), and revealed that the underpinning skills are context specific. In order to further tease apart these underlying skills, this current study utilises two conditions: ‘labels’ in which objects were assigned novel nouns, and ‘facts’ whereby they were given novel facts. A sample of 177 children (71 typically developing, 49 with moderate learning disabilities and 57 with ASD) demonstrated that all children were able to utilise ME in the ‘labels’ condition, with this skill relating to language and general cognitive abilities. Contrastively, only typically developing children selected the target object in the ‘fact’ condition, with neither language nor social skills relating to performance. We conclude that mutual exclusivity is not simply a linguistic skill, rather it relates to general cognitive ability and can be adhered to using logical inference instead of social pragmatics.
Scene consistency increases the human V1 response to local natural image fragments

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Neurons in primary visual cortex (V1) each encode a spatially local portion of the visual image. However, the activity of such neurons can be indirectly affected by visual stimulation positioned outside their receptive fields. Although this contextual modulation is intensely studied, we have little notion of how it manifests with natural stimulation. Here, we investigated how the V1 response to a natural image fragment is affected by spatial context that is consistent or inconsistent with the scene from which it was extracted. Using fMRI at 7T, we measured the BOLD signal in human V1 (n=8) while participants viewed an array of apertures. The majority of apertures showed fragments from a single natural scene, yielding a dominant perceptual interpretation which participants were asked to categorise, and the remaining apertures each showed fragments randomly selected from a set of 20 natural scenes. We find that the V1 response was significantly increased for fragments from the dominant scene relative to those that were from randomly-selected scenes. This suggests that knowledge of typical spatial relationships is embedded in the functional circuitry of contextual modulation, serving to increase the local V1 activity under conditions of contextual consistency.

Apparent 3D shape influences material perception

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The visual system has the remarkable capacity to sort luminance gradients into shading from matte materials and specular reflections from shiny materials. Previous work has argued that visual processes perform this sorting task using characteristics of the luminance gradient’s profile (e.g., sharpness) that commonly differ between matte and specular surfaces. Here, we show that the same luminance profile can appear as either a matte or specular surface just by changing the perceived 3D shape of the profile. Perceived 3D shape was manipulated by changing the 2D shape of the bounding contour that cropped 1D luminance gratings. The contours were either sinusoidal (Exp. 1) or projected from 3D surfaces (Exp. 2). Observers performed specular rating judgments and paired comparisons for both experiments. The different percepts of 3D shape induced compelling differences in the perceived specularity of identical luminance gratings, particularly those containing sharp luminance maxima (potential specular highlights). The results were well modelled by the luminance maxima’s sharpness and the apparent range of surface normals generating the luminance maxima. Our results demonstrate that the visual system relies on 3D shape cues to estimate the reflectance properties of matte and specular surfaces from otherwise identical luminance gradients.
Fast and slow effects in the emotional Stroop task for individuals with non-clinical anxiety

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The Emotional Stroop Task (EST) demonstrates how emotional material disrupts performance on a simple task through the biasing of attention. Participants generally take longer to colour-name emotional material relative to neutral material which is known as the emotional Stroop effect (ESE). The ESE was thought to occur relatively fast on a single trial. Recent research however suggests that emotional material, primarily negative, may have the ability to disrupt colour-naming performance beyond that of its presentation. The present study (N = 200) investigated the duration of both fast (occurring on a single trial) and slow (occurring on subsequent trials) effects within the EST for individuals with varying levels of non-clinical anxiety. Two experiments with differing methodologies were conducted, which utilised positive, negative and neutral words. Contrary to predictions, no evidence of fast effects emerged. Additionally, mixed findings were reported in relation to slow effects. Disruptions in colour-naming were noted on neutral words that followed emotion words however not for the expected word type. Implications of the findings are discussed in relation to a recently proposed Neural Network Model of attentional bias within the EST.

Inference in the wild: Bayesian modelling of fighter pilot situation assessment

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Situation assessment (SA) is recognised as a crucial ability for operators in complex work environments. SA comprises the extraction of information from the environment, the integration of new information with existing knowledge, the use of knowledge to guide further exploration of the environment, and the prediction of the future state of the environment, with and without intervention. Bayesian Belief Networks (BBNs) are attractive for normative modelling of all of these tasks within a single, unified framework. We elicited a BBN from RAAF fighter pilots in regard to the inferences made while identifying airborne threats. This model was then validated using performance data collected from fighter pilots in a semi-realistic simulation of their work environment. The elicited BBN required re-parameterisation in order to fit the average performance data well. Inspection of the data also revealed cases of systematic departures from Bayesian reasoning (cognitive biases). We generated causal models from the collected data using machine learning in order to better
understand how pilots made their inferences and to identify the information which was most important in their identification of threats.

The effects of phonological and semantic information on orthographic learning in adults of differing abilities

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Word recognition is a crucial bottom-up reading process that can be automated when lexical representations amalgamate orthographic, phonological and semantic information. High quality lexical representations facilitate speedy, accurate word recognition, allowing readers to attend to other reading processes. Although adult readers continue to acquire words, research investigating the importance of phonological and semantic information in orthographic learning traditionally focuses on developing readers. Adult studies often neglect to consider the impact of individual differences upon orthographic learning. Spelling is arguably the best index of lexical representation quality (Perfetti, 1992), and may mediate the formation of future representations (new words) in adults. This study investigated orthographic learning in adults of varying spelling, reading and vocabulary ability. Participants completed an orthographic learning task in which obsolete English words were presented visually and aurally with differing levels of phonological and semantic information, followed by an orthographic choice task. Spelling ability was the strongest predictor of accuracy in the orthographic choice task. Reading and vocabulary ability also predicted accuracy under certain semantic and phonological conditions. These results offer strong support for integrating individual differences into tests of adult orthographic learning. Individual differences in orthographic learning may have marked implications for future research and language instruction.

Battenberg summation reveals larger psychophysical receptive fields for motion signals

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Results of classic summation studies can be obfuscated by summation of additional internal noise as stimulus size increases. This study re-evaluated summation extent for motion using Battenberg stimuli (Meese, 2010) which circumvents internal noise changes by holding display size constant. In this checkerboard stimulus, the size of checks containing signal (luminance-modulated drifting gratings) are varied to measure dependence on signal area. Experiment 1 used either, signal checks alternating with uniform, mean luminance, checks (single-motion condition), or alternate checks containing gratings moving in opposite directions (opposing-motion condition). The latter tests whether summation extent changes when segregating regions based on motion direction. Results show summation over an area of at least 3.2° and this was found for both motion combinations, providing no evidence
summation extent differs when segregating patterns based on direction, at detection threshold. Experiment 2 was conducted at suprathreshold contrast levels to determine whether differences in summation extent arise under high-contrast conditions. There was no dependence on check size for either condition, across the range of sizes tested. This supports findings that spatial summation of motion plays a minor role in contrast discrimination at high-contrast, but provides no evidence that spatial summation depends on motion combination, at these suprathreshold levels.

A new theoretical approach to improving recognition of low-resolution faces: Blur in simulated age-related macular degeneration

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Age-related macular degeneration (AMD) is a common cause of damage to central vision, leaving patients with only blurred peripheral vision. Previous approaches to improving face recognition in AMD, and other low-resolution situations, have employed image manipulations designed to enhance early-stage visual processing (improving visibility of image detail, e.g., by magnification, or increased HSF contrast). Here, we demonstrate that further improvement is possible by targeting known properties of face processing in mid- and/or high-level vision. We enhance individual identity information in the face by caricaturing each person away from an average face (matched to the target for sex, race, viewpoint). We simulate the blur in early- through late-stage AMD by filtering higher spatial frequencies to mimic appearance at approximately 10° through 30° into the periphery (assuming a face seen premagnified on a tablet computer). Results show caricaturing improves face perception and face memory, relative to the original, uncaricatured face, for all blur levels, and for face viewpoints from front view to semiprofile. Results provide a proof of concept that caricaturing may assist in improving face recognition in AMD and other disorders of central vision. Implications are discussed for improving face recognition in other low-resolution formats (e.g., CCTV; distant eyewitness testimony).
Learning that faces vary: Experience of within-face variation causes asymmetric criterion shifts

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Unfamiliar face matching is error-prone, partly because dissimilar images of one person are incorrectly interpreted as different people. Thus, participants are overly-conservative, and fail to accept that considerable variation may occur between images of a single face. In two experiments, we examined how past experience of “within-face” variation affected subsequent matching performance. Participants decided if two photos were of the same person. In match trials, the two images were of the same person, and were either similar or dissimilar in appearance. In mismatch trials the images were of different people. Match trials were blocked by similarity, and feedback was provided (Experiment 1), or withheld (Experiment 2). Across both experiments, we found that mismatch accuracy was higher in the similar-match block, indicating a more conservative criterion (i.e. more likely to respond ‘different person’). This demonstrates that face-matching decisions are not made independently, but are influenced by similarity of face pairs in preceding trials. Importantly, this effect was asymmetric with respect to block order: in both experiments, this effect was greater when the similar-match block was presented before the dissimilar-match block, suggesting that people are more willing to adjust criteria to include variance than to exclude it.

Malleable temporal integration of positional information for moving objects

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Temporal integration refers to an accrual of information over time. It is a common computational process evident in diverse settings, like electrical engineering and neural coding. In the later context it is often assumed that integration dynamics are immobile, and consequently that they can be diagnostic of a common or discrepant sensory systems. Here we challenge this view. We examine a motion-induced illusion (of perceived position) that has been linked to temporal integration – the Fröhlich effect, and use prolonged exposure to motion of different speeds (sensory adaptation) to modulate the dynamics of neural activity. Our data indicate that perceived position encapsulates a weighted average of positional estimates from multiple channels with distinct integration times. Post-adaptation the contribution of different channels is re-weighted, optimizing coding to the prevailing dynamics of the environment.
The role of social context on interpersonal rhythmic coordination

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Interpersonal coordination during joint action (e.g. musical ensemble performance) requires individuals to both anticipate and adapt to each other’s action timing. Temporal anticipation and adaptation have traditionally been studied using sensorimotor synchronisation tasks that require participants to tap in time with an auditory pacing sequence. However, many of these studies have been conducted in an individual context which neglects the social nature of interpersonal synchronisation. The present study addressed this by using a simulated social context during a series of sensorimotor synchronisation tasks to manipulate whether participants believed that they were synchronising with a person or with a computer driven pacing sequence. Differences in anticipatory skill, adaptive processes, and synchronisation performance were measured. Adaptive ability was estimated by the degree of temporal error correction that participants engaged in when synchronising with an adaptive pacing signal. Anticipation was measured by calculating a prediction/tracking index that reflected the degree to which participant’s inter-tap intervals led or lagged behind inter-onset intervals in tempo-changing sequences. It is hypothesized that synchronisation performance will be different when participants believe that they are synchronising with a human as opposed to a computer driven pacing sequence. Results will be discussed.

Emotion regulation and dietary self-control

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To investigate the effect of emotion regulation strategies on behavioural and cognitive self-control, 98 undergraduate psychology students (78% female and 44% dieters) were randomly allocated to one of three experimental groups: suppression (n = 32), acceptance (n = 33), and control (n = 33). While utilising the emotion regulation instructions provided, participants watched a pre-validated sadness-eliciting film. After watching the film, two primary outcome variables were measured; behavioural self-control was assessed using a measurement of food intake during a taste test, and cognitive self-control was assessed using the Iowa Gambling Task (IGT). Consistent with expectations, food intake significantly differed across the emotion regulation experimental conditions. Contrasts revealed that participants in the suppression experimental group ate significantly more food in the taste test than participants in both the acceptance and control groups. Intake did not significantly differ between the acceptance and control conditions. No significant difference in IGT scores across the emotion regulation conditions was observed. Overall the results suggest that food intake when feeling negative emotion (i.e., sadness) can be exacerbated with the use of ego-depleting emotion regulation strategies, namely suppression. Future interventions aimed at decreasing emotional eating and improving dietary self-control could incorporate less effortful methods of emotion regulation.
The role of light fields and reflectance functions in shape perception

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An extensive body of research has shown that image gradients exhibited by diffuse shading are important cues in shape perception. Specular reflections modify these image gradients, yet previous studies have produced inconsistent results regarding the effects of added specular reflectance on perceived shape (Norman, Todd, & Orban, 2004; Nefs, Koenderink, & Kappers, 2006). However, no previous studies utilised realistic light fields or parametrically manipulated the amount of blur applied to the specular component of reflection. Both of these parameters have a strong effect on the image structure generated by specular reflections and could produce distinct shape cues. We investigated deformed planes with varying surface curvature, rendered in a complex natural light field. We compared the perceived shape of surfaces with purely diffuse reflectance and surfaces with both diffuse and specular reflectance components. We found that surface curvature and the blur of the specular lobe interacted strongly in modulating perceived shape. Our results show that complex light fields, the width of the specular reflectance lobe, and the extent of surface curvature are critical in determining when and how specular reflections affect the perception of 3D shape.

Repetition blindness for faces: A comparison of face, expression and gender decisions

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Repetition Blindness (RB) refers to the impairment in reporting two identical targets within a rapid serial visual presentation stream compared to when the two targets are different. This experiment compared the magnitude of RB for faces when the repeated stimuli were of the same expression and identity (complete repeat), the same identity (same individual, different expression), and the same expression (different individual, same expression). Complete repeats compared to the no repeat condition, produced more RB for the Expression and Gender decision tasks than for the Face decision task. For the Expression decision task, RB was larger for the Complete Repeat than the Expression Repeat condition, which produced more RB than the Identity Repeat condition. In the Gender decision task, RB was greater in the Complete Repeat than the Expression Repeat and Identity Repeat conditions. For the Face decision task, RB was greater in the Complete Repeat than the Identity Repeat condition and there was no RB for the Expression Repetition. These results indicate that for faces, the type of repeated information and the task instructions affect RB.
Measuring attention via the internet

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Attention tasks in psychology experiments are usually performed in a laboratory where sensory stimulation is minimized. Recruitment of participants can be resource intensive, especially where laboratories are not co-located with a participant pool. Online testing has become more commonplace, though as yet, we are unsure whether a home-based setting could approximate results found in a laboratory. The aim of the present study was to compare participants’ performances in a cueing task in a laboratory setting and through an internet connection within the participant’s home. The Inquisit software package was used to present the task to participants (a) within a laboratory in two different conditions (computer-based and web-based), and b) in participant’s home (web-based). The results showed that there was no significant difference in performance between the computer-based and web-based laboratory setting. Neither was there a difference between the web-based laboratory and web-based home setting. The computer-based condition in the laboratory was more sensitive to experimental condition (i.e. a bigger cueing effect), although there was no significant difference in performance between the computer-based laboratory setting and web-based home setting. Our results show that testing within a home environment may approximate results to that found in the laboratory.

Distributed and overlapping neural bases for object individuation and identification

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To gain a sense of what, where and when visual information appears in our environment, we rely on two processes known as object individuation and identification. In object individuation, spatial and temporal cues are used to register an object as a distinct perceptual event relative to other objects. In object identification, featural and related conceptual properties of a stimulus are extracted. It is currently unclear how these two processes are represented in the brain. We explored whether individuation and identification are underpinned by distinct neural substrates, and the extent to which brain regions involved in these two operations are consistent across encoding, maintenance and retrieval stages of visual short-term memory (VSTM). Using functional magnetic resonance imaging, we identified brain regions that were sensitive to the number of physical objects (individuation) or the number of distinct object identities (identification) presented in a display. We found a large degree of overlap between these two processes in the brain, and the brain regions recruited for each process varied across each stage of VSTM. Our findings challenge models of multiple object encoding in VSTM which argue that individuation and identification are underpinned by a limited set of non-overlapping brain regions.
Information versus reward in a changing world

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How do people solve the explore-exploit trade-off in a changing environment? In this paper we present experimental evidence in an “observe or bet” task, comparing human behaviour in a changing environment to their behaviour in an unchanging one. We present a Bayesian analysis of the observe or bet task and show that human judgments are consistent with that analysis. However, we find that people’s behaviour is most consistent with a Bayesian model that assumes a rate of change that is higher than the true rate in the task. We argue that this tendency is the result of asymmetric consequences: assuming that the world changes more often than it really does is not very costly, whereas assuming a too-low rate of change can carry much more severe consequences.

Ensemble representations for face identity

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We extract important cues, such identity, when we view a single face. When confronted with multiple faces, we also extract an ensemble representation or average from the set of faces. We conducted two experiments to investigate the mechanisms involved in forming ensemble representations of facial identity. We systematically varied two parameters - presentation duration and size of the face group - that affect the ability to encode the identity of each individual face when presented as part of a group. Participants viewed sets of faces and then judged whether probe faces, which were either individual faces or an average blend of the set of faces, were in the previous sets. Extraction of an ensemble representation was measured by incorrect “present” responses given to averages of a face set. Ensemble representations were not extracted when participants were unable to recognize the identity of the individual faces, e.g., at short presentation durations or with large set sizes, suggesting that encoding the mean identity of sets of faces may not be an early process. Instead, ensemble representations for facial identity might be formed during a later stage of face processing, which initially requires accurate individual representations of each face in a group.
Managing the budget: Reframing the CO₂ accumulation problem

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The failure to understand the relationship between the ‘stock’ of CO₂ in the atmosphere, the ‘in-flow’ via anthropogenic CO₂ emissions, and the ‘out-flow’ via natural CO₂ absorption has been cited as a reason for inaction on climate change. Failure to appreciate this relationship might impair people’s acceptance of the need to manage the “budget” of carbon that is available to “spend” if we are to limit future temperatures rises to “safe” levels (e.g., 2°C). We report two experiments – one with a student sample and one with a large online sample - in which a simple re-framing of the CO₂ accumulation problem as managing an analogous financial (rather than CO₂) budget leads to significant improvements in performance and understanding. The results of the online experiment also suggest that exposure to the CO₂ accumulation problem increases endorsement of regulatory actions (e.g., increased fuel taxes) and makes people less willing to endorse “wait and see” or “go slow” approaches to climate change.

Pseudoextinction and visual frames of reference

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In visuospatial judgments such as line bisection, healthy subjects demonstrate a leftward attentional bias known as pseudoneglect. Like its clinical counterpart hemispatial neglect, pseudoneglect operates in both egocentric (viewer-centred) and allocentric (object-centred) reference frames. We have recently described the related phenomenon of pseudoextinction: When two rapid serial visual presentation (RSVP) streams of letters with simultaneously cued targets are concurrently presented to the left and right of fixation, observers accurately report left targets more often than right targets. Here, we present two preliminary experiments exploring the influence of allocentric and egocentric reference frames on pseudoextinction. First, we reversed the object-centred frame of reference by mirror-reversing the letters of the display. This eliminated the leftward bias. Second, we altered the egocentric frame of reference using adaptation to prisms that shift the visual scene to the left or to the right. Adaptation to left-shifting prisms reduced pseudoextinction, selectively boosting right-stream performance with no accompanying decrement in the left stream. In contrast, there was no effect of right-shifting or control prisms. Our results indicate that, like hemispatial neglect and pseudoneglect, pseudoextinction operates in both egocentric and allocentric frames of reference.
All participants are not created equal: Motivation and performance are affected by time of semester

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Experiments conducted across different times of semester may be confounded by differences between participants in their level of motivation. Research indicates that course-credit participants who engage in research early have different personality and performance characteristics compared to those tested later. We examined whether the semester effect is caused by internal (inherent motivation of the participant) or external (looming exams, essays) factors. To do this, sustained attention and intrinsic/extrinsic motivation was measured in groups of course-credit (n=40) and paid (n=40) participants early and late in semester. While there was no difference in sustained attention between the groups early in semester, the course-credit group performed significantly worse late in semester. The course-credit group also showed a significant decrease in intrinsic motivation with time whereas the paid participants showed no change. Because changes were not seen for both groups, the semester difference cannot be due to external factors. Instead, the data demonstrate that course-credit participants who engage early have high sustained attention and intrinsic motivation compared to their late counterparts, who leave their participation to the last minute. Researchers who use multi-experimental designs across semester need to control for these effects – perhaps by using paid participants who do not vary across semester.

Automatic motor inhibition of imitative behavior: An alternative solution to the correspondence problem

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Under certain experimental conditions, subliminally presented arrows produce a negative compatibility effect (NCE) in which responses are slower when primes and targets call for the same response than a different response (Eimer & Schlaghecken, 2003). This phenomenon has been attributed to self-inhibitory mechanisms of response processes. Recent studies have demonstrated that the NCE is not restricted to subliminally presented arrow stimuli. For example, when the image of a left or a right hand is presented only briefly, responses to subsequent targets are faster when performed with the non-corresponding hand (Vainio et al., 2013). These findings suggest that motor self-inhibition is a general and basic functional principle in the control of manual actions. Here, we examined whether motor activation triggered by an observed hand action is similarly inhibited when the action is presented briefly. Participants completed an automatic imitation task in which they performed one of two hand actions (“thumbs-up” or “peace”) in response to a go-stimulus (the number “1” or “4”). Crucially, the image of a compatible/incompatible hand action was displayed prior to the go-signal, for 50 ms, 200 ms or 500 ms in a blocked design. Findings will be discussed in relation to visuo-motor priming and automatically activated inhibitory mechanisms.
### Attentional bias modification of sweet food cues

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Sweet foods with high levels of fat and sugar are frequently craved in western society. Their consumption can pose health risks including binge eating and obesity. This study investigated the use of attentional bias modification to manipulate attention away from sweet food cues and reduce subsequent consumption of sweet foods. Using a modified dot probe task, 88 women were randomly allocated to an ‘avoid sweet’ or ‘avoid savoury’ condition. Participants in the ‘avoid sweet’ condition were trained to direct attention away from sweet food cues and towards savoury ones, and vice-versa in the ‘avoid savoury’ condition. Training attention away from sweet food cues resulted in a significant decrease in attentional bias for these cues. In contrast, training attention away from savoury food cues did not change the existing bias for these cues. During a taste test, participants in the ‘avoid sweet’ condition consumed a smaller amount of sweet relative to savoury snacks than those in the ‘avoid savoury’ condition. The results are consistent with incentive sensitisation theory (Robinson & Berridge, 1993), which attributes a causal role to attentional bias in consumption behaviour. Furthermore, they suggest potential practical benefits of attentional bias modification as an intervention strategy for problematic food cravings.

### Continuous versus global measures of loudness change: Disentangling mechanism from response bias

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Investigations of continuous increases (up-ramps) and decreases (down-ramps) of acoustic intensity report greater perceived loudness change in response to pure-tone and vowel up-ramps (but not white noise) when retrospective global ratings are measured. However, the mechanisms underlying perceptual differences from global ratings of loudness change are shrouded by response biases based on ramp-offset level and stimulus duration. It is hypothesized here that calculating perceived loudness change using a real-time continuous measure minimizes response bias and thus sheds greater light on perceptual differences and mechanisms underlying dynamic intensity perception. Two experiments investigated global (Exp 1, N=34) and continuous (Exp 2, N=33) loudness change with variables timbre (vowel, white-noise), duration (1.8, 3.6, 7.2 s), and intensity region (45-65dB, 65-85dB) manipulated within-subjects. In Experiment 1, global loudness change was significantly influenced by offset intensity and stimulus duration for vowel and white-noise up-ramps only. With these biases controlled in the analysis, down-ramps were perceived to change significantly more in loudness than up-ramps. In Experiment 2, greater perceived loudness change in response to down-ramps was recovered from the continuous loudness measure with negligible response bias. Results support the hypothesis and suggest down-ramp recruitment and sensory adaptation underpin perceived differences in loudness change.
Distributional Learning of Lexical Tones

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Perceptual attunement refers to the process by which humans become less sensitive to non-native speech sounds, as indexed by their difficulty discriminating between non-native speech contrasts. A proposed mechanism for this phenomenon is distributional learning (DL), in which learners keep track of speech sounds in their linguistic environment and form mental categories based on the global statistics. Previous research has shown that phonetic (consonant and vowel) categories can be acquired using DL. Here we extend this to examine acquisition of lexical tone categories, which are used in tone languages and are acoustically different to phones. There were three phases in this study. In the pre-test and post-test, participants were tested for discrimination of lexical tone contrasts (e.g. /kha33/-/kha241/). In the training phase, half the participants were trained on a bimodal distribution of a lexical tone contrast, which would promote the formation of two separate categories that leads to increased discrimination of that contrast, while the other half was trained on a unimodal distribution, which would induce a single category for the contrast. Results are discussed in light of the role of DL in perceptual attunement of lexical tonetic categories and the linguistic status of lexical tones compared to phones.

Temporal recalibration occurs rapidly for audiovisual but not visuotactile or audiotactile stimuli

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Sensory temporal recalibration, the shift in perceived synchrony following exposure to asynchronous inputs, has been demonstrated for audiovisual, visuotactile and audiotactile pairings (Fujisaki et al., 2004; Hanson et al., 2008; Vroomen et al., 2004), leading to the suggestion of a supramodal recalibration mechanism. A common feature of these studies is the use of a prolonged exposure period and ‘top-ups’ of the adapting stimulus prior to each test trial. This approach suggests recalibration is sluggish. Recently, a ‘rapid recalibration’ paradigm was used to investigate audiovisual temporal recalibration (Van der Burg, Alais, & Cass, 2013). In this approach the participant’s response in each trial was analysed as a function of the modality order in the previous trial. In this manner, each trial was treated as the adapting stimulus for the subsequent trial. This analysis revealed audiovisual temporal recalibration occurs rapidly, with significant shifts present after a single trial. In this study we applied the same approach to audiovisual, visuotactile and audiotactile pairings. Interestingly, the rapidly induced shift observed for audiovisual timing was not seen for visuotactile and audiotactile pairings. This suggests rapid recalibration is unique to audiovisual inputs. These findings are discussed in relation to the proposed mechanisms underlying temporal recalibration.
Gaze Constancy in Upright and Inverted Faces

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Constancy in the perception of gaze direction across lateral head rotation depends on the integration of information from the eye region and information about head rotation (Otsuka, Mareschal, Calder, & Clifford, in press). The purpose of the current study is to examine whether such an integration process is affected by facial inversion, which is known to disrupt integration of information across features in face processing. Participants performed categorical judgements of perceived gaze direction for faces seen in 3 lateral rotation poses (-20°, 0°, 20°) in two image orientations: upright and inverted. There were three image conditions: normal face condition, eyes-only condition, Wollaston condition (images consisting of eyes from the 0° pose placed in the angled face). Integration of eye and head information was inferred by comparing the effect of pose between the eyes-only condition and the normal face condition, and by examining the effect of pose in the Wollaston condition. Facial inversion increased the range of eye deviations categorized as “direct”. However, the results provided little evidence that facial inversion impairs the integration of information from the eye region and information about head rotation in gaze processing. Instead, upright and inverted faces yielded similar levels of gaze constancy.

What do we see when driving? Using inattentive blindness to explore attentional capture in driving

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The driving situation is typically replete with external distractions, such as billboards, other cars, people, animals, and other objects. Safe driving requires the ability to filter out unnecessary distractions and focus on the primary task of driving, but conversely, it also requires that attention is captured by a potential hazard. How and why some objects capture attention, while others do not when driving, is of particular interest to both road safety research and models of attention. We have been conducting a series of experiments in which we use a static, real-word, IB task. The primary task involves making safety decisions about briefly-presented driving scenarios. After a given number of trials, an unexpected object – such as a person, animal or object, is placed on the side of the road. Using this methodology we have demonstrated that participants are increasingly more likely to detect objects that reflect an increasing level of threat to the driving situation. This is a happy outcome for road safety, however it also suggests that pre-attentive coding of all scene elements occurs at the level of the semantic qualities of the objects. Once this is complete, attentional selection mechanism filters out relevant and non-relevant objects.
Scan-speed as an index of imputed velocity in the tau effect

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The notion of time and space sharing a common representation is explored using the kappa/tau effect paradigm. Kappa describe the common finding that spatially longer stimuli lead to the production of longer times. Tau effects describe the common finding that temporally longer stimuli lead to the production of larger spaces. In four experiments a relationship between perception of time and space, indexed through scan-speed, is seen in the tau effect. By varying the size and duration of the stimuli used, the relationship between time, scan-speed, and space is manipulated. The ability to manipulate this relationship is taken as evidence of a resonance point specific to a given stimulus set. The results of these experiments support theories linking perceptions of time and space, and help account for contradictory findings common in the literature. These findings overturn and simplify accounts that have stood since 1977 by providing a common equation describing the relationship between the tau effect and scan-speed in this paradigm. The failure to produce similar findings with the kappa effect highlights the difference between these effects and provides a key area for future research.

The influence of morphophonological and prosodic alternations on native speech perception

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Second language (L2) speech perception is challenging, especially for adults. Many L2 learners find themselves struggling with listening to native speakers despite years of studying or living in the L2 environment. So far, difficulties in L2 acquisition have been addressed mutually exclusively from either a phonological (Lardiere, 2003; Goad, White & Steele, 2003) or a morphological perspective (Hawkins & Chan, 1997; Hawkins & Liszka, 2003; Jiang et al., 2011). Possible prosodic influences have barely been addressed, nor have phonological-morphological interactions. Therefore, we examined morphological and prosodic influences on Australian English monolinguals’ perception of phonological elements in connected speech. Participants completed a phoneme monitoring task (Foss, 1969) where sentence position, morphological, and phonological properties of target open/closed class words ending in –en were manipulated. The results show that native listening is influenced by these alternations, with accuracy affected by the word type and reaction time being consistently slower in sentence-medial as compared to sentence-final position across word types. These findings provide a baseline for interpreting the performance of non-native Chinese participant groups and probe for interactive effects among these factors in native listeners.
The bad, the good, and the neutral: The effect of emotional violations in affectively negative sentences: An MEG study

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We examined the effect of emotional violations in a sentence task using Magnetoencephalography (MEG). Sentence stems were used that had negative affect and could be completed using either a congruent negative or incongruent positive or neutral adjective (e.g., My mother got killed and I felt bad/good/normal). Four main MEG components were examined: Early-Posterior Negativity, the P300, the N400, and the Late Positive Complex (LPC). Sensor-space results showed that there were effects of emotion on only the P300 and the LPC, and that there was no significant Early-Posterior Negativity or N400. Source-space results showed early main effects of emotion in the parahippocampal gyri (200 ms), and the right (200 ms) and left amygdala (270 ms), with the differences being relatively transient in the parahippocampal gyri compared to the amygdalae. These results suggest that the semantics of words are processed differently in emotionally negative compared to neutral sentences, and subcortical areas including the amygdala and parahippocampal gyrus are activated very early in the processing of words.

Moving biological stimuli (not just faces) amplify inversion effect sizes

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Turning an object upside-down disrupts our ability to accurately perceive changes in spacing and feature shape information. For static stimuli, this inversion effect is disproportionately larger for faces and bodies than most other objects, making it a useful indicator of configural/holistic processing. The aim of the current experiment was to test whether differences in the size of the inversion effect are similar for moving and static unfamiliar faces and two comparable classes of biological stimuli - human bodies and dogs. It was hypothesised that the added disruption of spacing and feature shape change due to motion would increase inversion effect sizes for moving (compared to static) faces and bodies, but not dogs. Results from a long-term memory recognition task revealed that even though significantly larger inversion effects were found in inverse efficiency for all moving (compared to static) stimulus types, differences in the size of the inversion effect between stimulus types were similar for static and moving groups. Overall the findings suggest that face perception remains quantitatively similar to whole-body perception and quantitatively dissimilar to dog perception regardless of whether the stimuli are static or moving. This implies holistic processing for still (and moving) faces and bodies, but not dogs.
Both sensory and cognitive declines contribute to the reduced UFOV in older adults.

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Reduced Useful Field of View (UFOV) performance (involving the simultaneous identification of a central target and localisation of a peripheral target) has been associated with increased falls and motor vehicle accidents in older adults. Little research has been directed to identifying the specific perceptual processes that decline with age and result in a reduced UFOV. We used the Steady and Pulsed Pedestal paradigm developed by Pokorny and Smith to assess reductions in sensory input from the M and P pathway, and varied the contrast of the UFOV elements to assess the contributions of top-down (cognitively driven) and bottom-up (sensory driven) allocation of attention to UFOV performance in 42 younger and 42 healthy older adults. Results support the hypothesis that older adults have greater difficulty disengaging from a central target, indicating reduced cognitive control of attention. Sensitivity in the magnocellular pathway was found to be a better predictor of UFOV performance than sensitivity in the parvocellular pathway. These results further our understanding of the changes which have functional implications for older adults and add to our understanding of the role of the magnocellular and parvocellular pathways in the deployment of visual attention.

Accounting for the list composition effect in lexical decision

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Asymmetric effects of list composition are typically observed in lexical decision tasks (LDT), whereby there is a slow-down in reaction times (RTs) for easy items (e.g., high-frequency words) and a small speed-up for hard items (e.g., low-frequency words) when items are presented in mixed compared to pure blocks. The present study manipulated item difficulty simultaneously for words (high vs. low frequency) and nonwords (zero vs. high neighbourhood size). Analysis of mean RTs revealed list composition selectively influenced word items, where the list-composition effect was entirely driven by high-frequency words. To further examine the locus of this effect, the data were fit by the linear ballistic accumulator (LBA) model. Within this framework, model variants examined whether list-composition effects arise due to differences in processing stimulus related factors (which should be captured by drift rate parameters) or due to the strategic changing of response criterion based on different list environments (which should manifest in threshold/start-point parameters). Results are consistent with this latter view, with list composition selectively affecting the quantity of evidence required for responding. Implications for current models of lexical access will be discussed as will the potential contribution of sequential dependencies in accounting for list-composition effects in lexical decision.
Speed vs. accuracy emphasis in recognition memory

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Evidence accumulation models, which account for both response choice and response time (RT), are being increasingly used to understand recognition memory (e.g., Starns & Ratcliff, 2014; Starns, Ratcliff & McKoon, 2012). Here we examine the effect on recognition memory of a speed-accuracy tradeoff as induced by instructions emphasising either the speed or accuracy of responding. Starns et al. reported an atypical finding with very fast responding under speed emphasis; in diffusion model fits not only was the amount of evidence required for a decision decreased under speed emphasis (a standard and widely replicated finding) but also the rate of evidence accumulation was decreased, which had not been reported before in any task. Rae, Heathcote, Donkin, Averell and Brown (in press) replicated this finding in recognition memory, but with less severe speed emphasis, and extended it to lexical and perceptual tasks, and to analogous parameters in the Linear Ballistic Accumulator (LBA) model (Brown & Heathcote, 2008). Here we report the results of a manipulation of the severity of speed emphasis on recognition memory. Consistent with Starns et al.'s findings, for the diffusion model rate effects occurred only under strong emphasis, but this was not the case for the LBA.

Using virtual week to investigate prospective memory in children and older adults

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Prospective memory (PM) refers to memory for future intentions. Many studies have shown age-related deficits with older adults on most PM tasks but few studies have focused on strategies to improve PM and relatively few have investigated PM in children. Two studies are reported using the computerized measure of PM, Virtual Week. This has a board game format, with each circuit of the board simulating a day of activities and includes PM tasks closely resembling PM tasks from everyday life. Study 1 compared 100 young and 100 older adults and investigated the strategy Implementation-intentions that involves repeating the task in specific format “when X, I will perform Y”. This strategy with or without imagining task eliminated the substantial age-related deficits on event-based tasks but did not reduce age differences on time-based tasks. Study 2 involved 30 children aged between 8 and 12 who were diagnosed with ASD were compared to typically 30 developing children on a child appropriate version of Virtual Week. The ASD group showed significant PM impairment on measures of time- (but not event-) based prospective remembering. In both groups, time- (but not event-) based PM difficulties were associated with functional outcomes in daily life.
Time compressions for dynamic tests following 1\textsuperscript{st} and 2\textsuperscript{nd} order motion adaptation

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Adaptation to high temporal frequencies can induce a localised reduction in the apparent duration of dynamic tests (Johnston et al., 2006). This effect is dissociable from apparent speed changes (Ayhan et al., 2009), and the specificity of the effect for high temporal frequency adaptation, coupled with its insensitivity to stimulus orientation, suggests a causal locus at an early (pre-cortical) magnocellular stage of analysis (Johnston et al., 2006). The absence of adaptation-induced time compression for isoluminant tests supports this claim (Ayhan et al., 2009). Here we further examined the determinants of adaptation-induced time compression by investigating interactions between 1\textsuperscript{st}-order luminance defined and 2\textsuperscript{nd}-order luminance-contrast defined motion signals. We found that adaptation to an 8Hz first order stimulus markedly reduced the apparent durations of 1\textsuperscript{st} and 2\textsuperscript{nd} order 4Hz tests, whereas adaptation to 2Hz 1\textsuperscript{st} order signal had little impact on either test type. In contrast, adaptation to 8Hz 2\textsuperscript{nd} order motion shortened the perceived duration of 4Hz 1\textsuperscript{st} and 2\textsuperscript{nd} order tests, whereas adaptation to a 2Hz 2\textsuperscript{nd} order signals shortened the perceived duration of 4Hz 2\textsuperscript{nd} order tests, but had little impact on 4Hz 1\textsuperscript{st} order tests. We believe the efficacy of both 1\textsuperscript{st}order luminance and 2\textsuperscript{nd} order luminance-contrast adaptation further implicates an early magnocellular locus as the critical site for time-compression adaptation.

Bottom-up saliency driven element selection during simultaneous motion processing

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When confronted with multiple moving objects the visual system can process them in two stages: an initial stage in which a limited number of signals are processed in parallel (i.e. simultaneously) followed by a sequential stage. We previously demonstrated that during the simultaneous stage, observers are capable of simultaneously extracting direction information, which is bound to its corresponding element, from up to 3 signals (Rideaux & Edwards, 2014). When the number of elements presented exceeds this capacity, a subset of 3 can be automatically selected and processed. Here we investigate which element characteristics influence bottom-up saliency, driving this automatic selection process. The results show that when presented with a heterogeneous population of motion signals exceeding the limit of simultaneous processing, observers consistently demonstrated significant selection bias. Elements presented at greater eccentricity, moving in cardinal directions, moving relatively faster, and of higher contrast are more likely to be selected than their counterparts, i.e. low eccentricity, oblique directions, slower, and low contrast. This indicates that during simultaneous motion processing, the automatic selection of signals is driven by variations in bottom-up saliency resulting from relative differences in both motion-specific characteristics, i.e. direction and speed, and other characteristics, i.e. spatial location and contrast.
Dual-route models of reading aloud and pronunciation data: A clustering approach

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DRC and CDP++ are two of the most successful models of reading aloud. These models differ in how their sublexical systems convert letter strings into phonological codes. DRC adopts a set of grapheme-to-phoneme conversion rules while CDP++ uses a trained network that has been exposed to a combination of rules and known words. Thus far the debate between these approaches has emphasized reaction time experiments, error rates in dyslexias, and item-level variance from large-scale databases. Recently, Pritchard et al. (2012) examined the models’ nonword reading by comparing model responses to those produced by 45 skilled readers. Their item-by-item analysis is informative, but leaves open some questions that can be addressed with a different technique. Using hierarchical clustering, we first looked for classes of subjects that are similar to each other in their overall response profiles. We found two groups of subject that differ in their pronunciations for certain consonant clusters. We also tested whether CDP++ is modeling one set of subjects well, while DRC is modeling difference subjects. We found that CDP++ does not fit any human reader’s response pattern very well, while DRC fits the human readers as well as or better than any other reader.

Odours enhance perception of matching images during object substitution masking

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Recent evidence suggests that olfactory stimuli can influence early stages of visual processing but few studies have focused on whether such olfactory-visual interactions convey an advantage in object identification. Here we asked whether familiar odours can enhance the detection of matching visual objects that are rendered invisible due to object substitution masking (OSM). We had participants (N = 36 females, 36 males) look for masked visual images of odour-related objects (orange, rose and mint) amongst non-odour related distractors (e.g., box, watch). In each trial, participants inhaled a single odour that either matched the odour-related target (congruent trials; e.g., mint odour with image of mint leaves) or did not match the odour-related target (incongruent trials; e.g., mint odour with rose image). Target detection performance was analysed using signal detection (d’) to rule out response biases. In females, but not males, congruent odours significantly enhanced detection of masked targets compared with incongruent odours, suggesting that odours can influence an early stage of visual perception, possibly even prior to re-entrant processing. We conclude that multisensory interactions between olfaction and vision serve to enhance object
identification processes, and offer some potential explanations for why this effect is evident in females but not males.

**Distinguishing between initiating and maintaining response generation in Motor Neurone Disease: Implications for executive control processes**

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There are several approaches to understanding ‘executive’ functions associated with the frontal regions of the brain. One position is that specific frontal regions control discrete domain general processes, including energization, monitoring and task setting (e.g., Stuss, 2011). This study focused on the process of energization by investigating response initiation and sustaining of response generation (or maintenance) on a range of verbal and non-verbal fluency tasks in Motor Neuron Disease (MND). Although MND has typically been viewed as a motor disorder, cognitive symptoms are reported in approximately 50% of patients. In particular, reduced word fluency is arguably the most consistent cognitive sign and has been interpreted as suggestive of frontal ‘executive’ difficulties. In this study 17 MND patients and 19 matched healthy controls were given word, design, gesture and ideational fluency tasks, in addition to baseline cognitive tests. The MND group were found to be impaired on select fluency tasks, rather than impaired across all tasks. Response initiation of the MND patients was comparable to controls, whereas sustaining response generation was impaired. This is consistent with an energization deficit. The findings are discussed in relation to other component processes involved in the range of verbal and non-verbal fluency tasks and current approaches to frontal executive functions.

**A one-handed motor task differentially affects naming of objects with aligned and unaligned handles**

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Stimulus-response studies suggest that when we attend to an object we perceive the action it affords us and relevant motor programs are activated. However, it is unclear how concurrent motor activity during a general object recognition task might interact with these processes. The current study used a dual task paradigm to investigate how a motor task affects object identification. Participants named pictures of objects while maintaining a gentle squeeze on a small, foam ball one hand at a time. Objects’ handles faced either the left or right such that they best afforded a left- or right-handed grasp. Vocal response times were faster when objects’ handles faced the squeezing hand rather than the unoccupied, relaxed hand. These results highlight the role of action-relevant object properties in object recognition and are consistent with sensorimotor or embodied theories of cognition.
Visual search for emotional expressions: Effect of poser identity on angry and happiness superiority

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Prior inconsistent results from studies of visual search for emotional expressions have been attributed to low level perceptual confounds like the display of teeth. However, similar findings have been reported for face stimuli that avoid these confounds. Using closed mouth faces from the same face database, Horstmann, Lipp, and Becker (2012) reported a happiness superiority effect whereas Savage, Craig, Lipp, Becker, & Horstmann (2013) reported anger superiority effects. Experiment 1 eliminated minor procedural differences as a potential explanation, yielding a happiness superiority effect with the stimuli used by Horstmann et al. in the procedure of Savage et al. Experiments 2a and 2b confirmed that differences in image color and poser gender did not account for the inconsistent findings. Experiments 3a and 3b confirmed poser identity as the critical variable, revealing happiness or anger superiority effects for two partially overlapping subsets of target faces. These findings suggest that apparently small differences in poser identities across experiments can lead to opposing outcomes in visual search for emotional expressions.

Development of lexical and sublexical processing in German and English

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It is well established that it is harder to learn to read in English than in other alphabetic languages. Cross-linguistic theories of reading have related this finding to differences in reliability of letter-sound correspondences between languages. It is still unclear how these differences exactly impact on lexical and sublexical processing. We tested 55 German and 32 Australian children in Grades 2-4. We examined overall reading ability and the efficiency of lexical and sublexical processing. We also present an optimisation procedure based on participants' nonword pronunciations, which can be used to quantify the degree to which they relied on sublexical units of different sizes, i.e., the nature of sublexical processing. We found that the lexical route in English children develops faster than in German children, and discuss changes in reading strategies across language and age. Our results are in line with Share's (1995) self-teaching hypothesis: English children have difficulty in using sublexical decoding.
due to the unreliability of the orthography, and as a result are slower in establishing the orthographic lexicon.

How does the brain represent surface lightness for simple versus complex centre-surface displays?

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We conducted a series of experiments to assess how the complexity of surface mesostructure and reflectance properties influence perceived surface lightness (how light or dark an object’s pigment is), and how these judgments provide insight into the computations and representations responsible for the perception of lightness in different classes of centre-surface displays. Flat, matte test patches embedded in homogeneous and 3D rocky surrounds (matte or glossy) were rendered in a natural illumination field. Experiment 1 evaluated the role of surface relief and gloss on perceived lightness. Experiments 2 and 3 compared this to two control displays that contained matched pixel histogram or an equated (phase-scrambled) power spectrum, respectively. For the rocky surrounds in Experiment 1, lightness constancy was better for glossy compared to matte surfaces. However, Experiments 2 and 3 revealed that this effect was indistinguishable from the displays with equated power spectrums. The homogeneous results were qualitatively different to (and more complex than) the rocky conditions. For complex displays, the effects of surface mesostructure and optics are well explained by “low level” distributions of contrasts across space and scale. Conversely, the putatively “simple” homogenous displays are perceptually complex, appearing to involve the segmentation of surfaces into layered image representations.

Self-control training reduces awareness of distracting stimuli and off-task thoughts

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Self-control has robust effects on behavior, but less is known about the attentional effects of self-control. In these experiments self-control was experimentally bolstered via a 2 week training procedure. The subsequent effect of this training on attention to distracters was examined. It was hypothesized that self-control training would attenuate the processing of unexpected distracting stimuli. Across a number of experiments, participants given self-control training were less likely to notice the unexpected distracter in an inattentional blindness task. However, the effects of self-control on distracter filtering were not confined to external attentive processes. Training also altered the frequency with which participants would catch their mind wandering, accounting for the actual incidence of mind wandering. The attentional profile of self-controlled individuals appears highly resilient to attention grabbing distracters, with these distracters being less likely to reach conscious awareness. The implications of these attentional effects as a route to maintaining self-controlled behavior will be discussed.
Modifying approach biases for chocolate

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Recent evidence has demonstrated successful approach bias modification for alcohol using an Approach-Avoidance Task (AAT). The current study was the first to use this task in the food domain. Specifically, we tested the effects of cognitive bias modification on approach bias for chocolate, chocolate craving and consumption. Participants pulled (approach) or pushed (avoid) a joystick in response to pictures of chocolate and non-chocolate food items. Eighty-four women (18-26 years) were randomly assigned to an approach-chocolate or an avoid-chocolate condition. Participants in the approach-chocolate condition pulled the joystick for most of the chocolate pictures and pushed it for most of the non-chocolate pictures. These contingencies were reversed for participants in the avoid-chocolate condition. Training had the predicted effect on approach bias, particularly for participants in the avoid-chocolate condition, who developed an avoidance bias for chocolate. Training did not affect chocolate craving. However, participants in the avoid-chocolate group ate less of a chocolate muffin than a non-chocolate alternative in a subsequent taste test. The results lend support to cognitive-motivational models of food craving, and have potential scope for the AAT as an intervention for reducing approach biases for craved foods and curbing their consumption.

Mapping the development of identification expertise: A prospective longitudinal approach

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Existing studies of expertise have typically deployed cross-sectional designs to plot the development of expertise, focusing primarily on expert-novice differences. Moreover, the few studies of expertise that have deployed a longitudinal design have typically been retrospective in nature (e.g., surveying diary records or reviewing interviews of elite performers for common characteristics); there have been surprisingly few prospective studies mapping the development of expertise in natural work settings. I am working closely with police agencies across Australia on a longitudinal project aimed at mapping the development of expertise in fingerprint identification from when people begin their training, to when they qualify as an expert able to testify in court. I will discuss the results from initial experiments aimed at validating the measures we use to track trainee fingerprint examiners. By tracking a cohort of trainees on a variety of expertise-based measures as they progress through their training we have the opportunity to establish a robust benchmark for comparing laboratory-based learning strategies and training programs. We may also uncover predictors of expertise, and glean a richer, more fine-grained understanding of how people develop expertise across time.
The alleviation of visual discomfort in migraine with colour

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For over thirty years, coloured lenses or coloured overlays have been used to alleviate visual discomfort and improve reading fluency when susceptible people (especially those who also experience migraine) view striped patterns like text on a page. This therapy has been controversial and its efficacy beyond a placebo effect has been doubted. Striped patterns of 0.5, 3 or 12 cpd of the same luminance contrast (0.9 Michelson) were created using cardinal colours in a cone excitation space selectively stimulating the early visual pathways: achromatic, tritan (purple/yellow), protan/deutan (red/green). 14 migraine participants with aura, 14 migraine without aura and 14 control participants rated the discomfort and described the distortions seen in these patterns. They were also assessed for visual migraine/headache triggers, contrast sensitivity, colour vision, acuity, stereopsis, visual discomfort from reading, and dyslexia. For the migraine groups, the greatest number of illusions was seen in the 3 and 12 cpd stripes and all four colours reduced, to some extent, the visual discomfort. Contrast sensitivity was reduced in the migraine groups and achromatic visual discomfort correlated with migraine triggers. Colour, independent of luminance or specific colour contrasts, can have therapeutic effects for people with visually triggered migraine in reducing visual discomfort.

Temporal orienting of attention and predictive timing in anticipatory auditory processing

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Previous investigations into the perceptual effects of directing attention to points in time have shown increased early sensory responses, while others have found no effect, or reduced responses. Commonly used probabilistic cueing paradigms may induce temporal orienting of attention while increasing predictions about event timing are believed to have opposing effects on early sensory responses. We factorially manipulated task-relevance based on event onset and the probability of event timing to investigate how early auditory processing is facilitated by attention and prediction. We recorded EEG from seventeen participants instructed to attend to either early (1000 ms) or late (2000 ms) tones occurring after a visual cue. Participants responded by speeded button press to deviant high tones occurring at the task-relevant time. Across two sessions early tones occurred in 75% or 25% of all trials. Preparatory contingent negative variation (CNV) amplitude immediately prior to tone onset was greater for task-relevant than task-irrelevant tones, \( p = .009 \). Auditory N1 responses were greater for tones with lower probability onsets, \( p = .016 \). Our findings are in line with the idea...
that top-down attention evokes greater preparatory activity and suggest that early sensory processing is attenuated by greater predictability of event timing.

It’s like learning Chinese: The effects of implicit vs. explicit instruction on semantic radical learning in novice learners

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A distinctive feature of Chinese orthography is the semantic radical - a sub-lexical orthographic component that sometimes indicates the semantic category of the character. Semantically transparent Chinese characters are characters whose meaning is predicted by the semantic radical, whereas semantically opaque Chinese characters are not meaningfully related to their semantic radicals. The current study investigates whether novice Chinese learners can pick up on the functional role of semantic radicals during character learning and whether they will further benefit from explicit instruction regarding the semantic radical. Undergraduate students with no previous knowledge of Chinese were asked to learn the meanings of 30 Chinese characters, half of which were semantically transparent and half were semantically opaque. Participants were randomly assigned to the Implicit group (N=43), where they were simply asked to learn the characters, or the Explicit group (N=35), where they were given information about the semantic radical. In a recall test taken immediately after learning, performance was significantly higher for transparent compared to opaque characters. This transparency effect was maintained in a recognition test administered one week later, where the Implicit group performed significantly better than the Explicit group. Implications for learning Chinese are discussed.

Detecting no causal association is difficult: Exploring the role of working memory in causal reasoning

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Recent neurological studies have demonstrated the close connections between working memory (WM) and causal reasoning (Satpute, 2005). Lower WM capacity may also be positively associated with illusory correlation bias in detecting a cause-effect contingency (Mutter, 1996). The current study explores the relationship between working memory and causal reasoning, controlling for the effects of prior knowledge. A within-subject design experiment with an abstract causal reasoning scenario was conducted. There were two memory load conditions (High vs. Low), in each of which participants were presented cause-effect contingency stimuli with three different directions of contingency (positive, zero and negative). Results revealed that increased memory load significantly decreased participants’ confidence in judging contingencies. Higher memory load was associated with more positive and higher variability of causal ratings in the zero contingency condition. In addition, WM capacity measured by the n-back task, but not by OSPAN, was significantly and negatively associated with the variability of participants’ contingency ratings. Participants with higher n-back score provided more homogenous causal ratings especially for the zero contingency
condition. These findings suggest that causal reasoning may be associated with specific facets of WM.

Subliminal processing of emotional faces depends on attention

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The present study examined whether processing of face emotion can occur without awareness and/or without attention. Visual masking was used to render a prime stimulus (a happy or angry face, matched on low-level image properties) unavailable for conscious report. Prime and target emotion matched (primed) for half the stimuli, and mismatched (control) for the other half. Participants classified target faces as ‘happy’ or ‘angry’ and response times and error rates were measured. In Experiment 1 (n = 23), targets were displayed centrally with primes displayed on the left or right and an exogenous cue used to direct attention towards and away from them. No significant priming effect was found for either attended or unattended primes, suggesting that either cueing of the primes was not effective or that subliminal emotion processing did not occur. Experiment 2 (n = 22) was conducted using a different manipulation of attention (by showing 80% of targets in one location). Here, a significant masked priming effect was found but only when faces were attended; suggesting that subliminal processing of face emotion occurs but it depends on attention.

A sequential sampling analysis of interpretation biases in social anxiety

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Some studies have shown that socially anxious individuals are more likely than non socially anxious individuals to perceive emotional facial expressions (EFEs) as threatening, but other work has failed to demonstrate this effect. Studies of EFE processing in social anxiety have often failed to distinguish between the effects of *bias*, tendency to favor one response over another, and *sensitivity*, the ability to successfully discriminate between emotional states, in participants’ responses. *Sequential sampling models* decompose the decision-making process into separate and theoretically-meaningful components, including *starting point* (z) and *drift rate* (v), and offer a more sensitive analysis compared to other approaches. Starting point reflects bias, whereas drift rate indexes the quality of evidence from the stimuli. High socially anxious individuals were expected to have starting points closer to negative responses, and lower mean absolute drift rates compared to low socially anxious individuals. Fifty-nine adults participated in a visual interpretation task during which participants judged whether crowds comprising all happy, angry, or neutral EFEs were ‘friendly’ or ‘unfriendly’. Correlations between anxiety scores and model parameters show no evidence of biased interpretation in high socially anxious subjects.
The flash-lag illusion, the magnocellular visual pathway, trajectories, and the effect of speed

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Chappell and Mullen (2010) showed that reducing Magnocellular (M) visual pathway processing of a moving stimulus eliminated the flash-lag illusion with a continuous trajectory, whilst Chappell, Potter, Hine, Mullen and Shand (2013) found that this manipulation increased the flash-lag illusion with onset and reversal trajectories. Here we again manipulated the support for M processing by reducing the contrast of the moving stimulus to be equiluminant with its background, and immersing it in luminance noise. For two contrast levels (luminance-defined vs. equiluminant in luminance noise), and two trajectories (continuous vs. onset), we traced out the dependence of the illusion on speed (0° to 24°). Some models, e.g. temporal integration and differential latency, predict a linear relationship with speed. We replicated the interaction between contrast and trajectory found by Chappell et al. (2013), which argues for different processes underlying localization with these trajectories. For all except the continuous trajectory in low contrast condition we found the illusion to increase linearly with speed. More work is suggested to characterize the functional form with this particular condition, but the difference across trajectories again supports there being different underlying processes for continuous and onset trajectories (cf. Chappell et al., 2013).

Priming with social and non-social words modulates automatic imitation in reach-to-grasp action

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The actions of others can influence our own movements, both in initiation time and unfolding kinematics. Cook and Bird (2011) reported enhanced motor priming in initiation time following a sentence-completion task containing social words compared with one containing non-social words. We extend this finding to unfolding kinematics of reach-to-grasp actions and briefly-presented task-irrelevant word primes. On each trial, a 150 ms word prime preceded a life-sized film of a model executing a reach-to-grasp action. Block-by-block, word primes were either social (e.g., couple) or nonsocial (e.g., individual). Trial-by-trial, the model’s wrist trajectory followed either a direct or an exaggerated, higher-lifting path toward her target, and she either gripped or overshot the target. Participants were instructed to reach directly for their target whenever the model gripped hers. In the prosocial word-prime blocks, participants lifted their wrists higher following observation of an exaggerated reach versus a direct reach, whereas this effect was nonsignificant for nonsocial word-prime blocks. Relevant to the common conceptualization of motor priming as automatic imitation (Heyes,
2011), participants could not entirely voluntarily suppress the model’s influence on their reaches. The word-priming results, however, suggest that externally-induced changes in social disposition determine whether elements of others actions transfer into our own.

**Why the long face? The importance of vertical image structure for biological ‘barcodes’ underlying face recognition**

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Humans are experts at face recognition. The mechanisms underlying this complex capacity are not fully understood. Recently, it has been proposed that face recognition is supported by a coarse-scale analysis of visual information contained in horizontal bands of contrast distributed along the vertical image axis – a biological facial ‘barcode’ (Dakin & Watt, 2009). A critical prediction of the facial barcode hypothesis is that the distribution of image contrast along the vertical axis will be more important for face recognition than image distributions along the horizontal axis. Using a novel paradigm involving dynamic image distortions, a series of experiments are presented examining famous face recognition impairments from selectively disrupting image distributions along the vertical or horizontal image axes. Results show that disrupting the image distribution along the vertical axis is more disruptive for recognition than matched distortions along the horizontal axis. Consistent with the facial barcode hypothesis, these results suggest that human face recognition relies disproportionately on appropriately scaled distributions of image contrast along the vertical image axis.

**How many types of reasoning are there? Part 2: A high-dimensional state-trace analysis**

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An ongoing debate in reasoning research is whether inductive reasoning and deductive reasoning can be better accounted for by single-process or dual-process theories. Single-process accounts assert that people apply the same cognitive mechanisms to problems of induction and deduction, such as reasoning based on a single scale of evidence for argument strength. Dual-process accounts propose that separate processes, such as heuristic and analytic processes, contribute to reasoning. We present a test of these two accounts by appropriately extending the logic of state-trace analysis. We show how high-dimensional state-trace analysis can be used to identify the latent dimensionality of inductive and deductive judgements. We perform a meta-analysis on existing research that has investigated people’s inductive and deductive judgements for logically valid and invalid arguments. We look for data patterns that would lead to the rejection of a single-process account, supporting the need for a multiple-processes account. We find limited evidence of such data patterns.
However, most existing studies have not been adequately designed to differentiate between the two accounts. We discuss the important future research that is required to help resolve the debate.

**Head-tilt and fertility contribute to different aspects of female attractiveness**

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Subjective attractiveness ratings of facial portraits of women taken at the fertile phase of the menstrual cycle are higher than those of portraits of the same women taken during non-fertile periods. Since female faces tilted downward are rated as more attractive and female courtship behaviours change across the menstrual cycle, we investigated whether the increase in attractiveness of the fertile-phase portraits was due to differences in the pitch of the head. In the original study, the fertile-phase portrait of each woman was deemed more attractive 53-55% of the time. When the portraits were reclassified by head-pitch, the more downward-tilted portrait was preferred 57-59% of the time. The fertile-phase portrait was no more likely to be the downward-tilted one, however, suggesting that effects of fertility on attractiveness are not simply due to changes in head position. We also had these portraits rated (n=130) for physical attractiveness and behavioural alluringness. Fertile-phase portraits were rated as more physically attractive than non-fertile portraits, while more downward-tilted portraits were rated as more behaviourally alluring than less downward tilted ones. These data confirm reported effects of head-tilt and fertility on perceived female attractiveness, but also suggest that these factors influence different components of the attractiveness percept.

**Asymmetries in three-dimensional space**

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The distribution of visuospatial attention in two-dimensions on both horizontal and vertical axes, as well as over near and far space, has been thoroughly investigated. However, there is limited knowledge on attentional asymmetries in three-dimensional space. In particular, fine relative discrimination judgements in three-dimensional space are not well understood. In order to measure visuospatial biases during fine depth discrimination we developed an appropriate task using anaglyph stereoscopic images. Furthermore, we investigated how fine depth discriminations change according to the type of judgement participants are instructed to make (i.e closer or further judgements). Our findings are interpreted in context of the neural mechanisms involved in processing stimuli from different hemifields.
Transposed letter (TL) effects in the absence of basewords

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In order to recognise a visually presented word, its individual letters must not only be identified, but also assigned to their appropriate position for lexical access to occur. One method of exploring this issue has been to examine interference in classifying a letter-string as a nonword when it has been generated through the transposition of a real word (e.g., palstic from the baseword plastic). This is the TL interference effect. Various models have been proposed to explain this effect, most of which incorporate a matching of the letter combinations found in the stimulus to the stored representation of the baseword. Such accounts would therefore be challenged if TL effects were observed when there is no existing baseword. Consider pilben versus tilben. Transposition of the i and l creates a legally structured letter-string for the former (i.e., pliben), but an illegal one for the latter (i.e., tliben). The current study suggests that nonword classifications are indeed influenced by the legality of the base nonword and therefore supports a model where there is inexact assignment of letters to their position prior to any attempt at lexical access.

Global processing of contour and textures

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Integration of information around contours shows that some shapes are processed as global units. Here we show this global integration is involved in the processing of textures. Radial frequency (RF) patterns, shapes deformed from circular by sinusoidally modulating the radius, have been used to demonstrate integration of contour information: indicated by the lower thresholds required to detect shape change as larger sectors of the contour are modulated. In this psychophysical study we use fields of Gabor patches to examine integration of shape information in sampled RF patterns either alone or placed within an orientation-noise background, and textures with local orientations conforming to an underlying RF shape-structure. The data show additional noise elements did not hinder spatial pooling of sampled RF contours and that shape information is integrated in textures comprising of appropriately oriented elements with a random radial position. This sensitivity increase for the discrimination of modulated texture from circular cannot be explained solely by the presence of more local texture elements carrying the signal. Stimuli composed by randomly permuting the location of RF elements produce significantly shallower integration slopes consistent with local analysis. Global pooling of systematic modulation information is required in both contours and textures for integration.
Reading Chinese non-characters: An account of word recognition models

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The study of Chinese psycholinguistics has become of great interest to researchers investigating the types of information represented in the mental lexicon. Previously studied models of word recognition have been developed from English and other alphabetic writing systems. Studies of the drastically different orthography in Chinese have produced a number of important and interesting findings that have great implications for proposed models of language processing. Most psycholinguists concur that Chinese characters have a unique representation at lexical level, but whether there are sub-lexical levels of representation (potentially containing radicals, strokes and features), and their involvement in lexical accesses is still under debate. For example, the Lexical Constituency Model (LCM) suggests that radicals contained in compound characters would activate its own standalone character pronunciation, whereas the Hierarchical Interactive Activation Model (HIAM) suggests that radicals do not have direct access to phonological activation. Therefore, an experimental study of native Chinese speakers, in a pseudo-character naming paradigm will be used to validate predictions based on said models. The LCM predicts the generation of stem-pronunciations and the HIAM, type-pronunciations. Additionally the properties of Character structure will be examined by comparing horizontal and vertical pseudo-characters. Results will be analysed using a 2x2 within-subjects ANOVA.

The orientation dependence of motion streak aftereffect reveals reciprocal gain interactions between orientation and motion neurons

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The extended integration time of neurons leads to fast-moving objects leaving neural cues to pattern orientation along the axis of motion. The current model argues these ‘motion streak’ orientation cues are multiplicatively combined in V1 with directionally ambiguous motion signals, to increase the precision of the motion direction. We used a combination of psychophysical aftereffects and computational modeling to estimate the tuning of the motion streak mechanism. We surprisingly found that tuning was more than double that for static orientation, suggesting motion streaks are not treated exactly like orientation information. Furthermore, the direction that motion is altered by adaptation is spatial frequency dependent, unlike static orientation, which is selective for spatial frequency. We provide a new model showing motion streaks are detected by orientation-selective neurons in V1 that exert gain onto motion-selective neurons in V5. The involvement of V5 results in the observed broad tuning and dependence on spatial frequency.
Distractibility in pseudoneglect: Overt or covert attentional mechanisms?

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Healthy participants tend to direct more attention to the left side, which mirrors the rightward attentional bias seen amongst neglect patients. Interestingly, leftward biases are stronger when distractors occur in upper space relative to lower space. In order to eliminate potential confounds introduced by the stimuli used in previous research, Study 1 employed distractors that were located further into the periphery. Number of fixations on each distractor was included as a measure of overt attention. Stronger leftward biases were observed when distractors were presented in upper space, replicating previous findings. Interestingly, distractors were rarely fixated. This suggests a covert attentional shift to upper space underlies the observed stronger bias. Study 2 used a cueing paradigm to overtly direct attention toward upper or lower space. When attention was overtly directed away from the central stimulus, the visual field difference was eliminated and leftward biases were similar across both conditions. It is concluded that covert shifts of attention toward upper space lead pseudoneglect to be stronger.

A reach-to-touch investigation on the nature of reading in the Stroop task

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The Stroop effect is an important tool in both cognitive and applied psychology. Accounts of the Stroop effect postulate that participants read the words despite instructions to ignore them and focus on the print colour. Recent research, however, suggests that context and task demands can moderate the extent of reading in Stroop experiments (e.g., Melara & Algom, 2003). To investigate the nature of reading in the Stroop task we employed an innovative forced-reading Stroop task as a benchmark, where each and every word is known to be fully processed. Furthermore, we calculated the Stroop effect from arm-reaching trajectories, which allow one to observe experimental effects during stimulus processing-time. The Stroop effect, as gauged by (i) curvature in trajectory and (ii) the speed of arm-movement, was significantly larger in the forced-reading Stroop task compared to the classic Stroop task. Our findings suggest that in the classic Stroop task reading may not occur on every trial, or that words may not be fully processed. These findings have profound clinical and practical implications.
Composite effects for static and dynamic facial expressions

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There is consistent evidence that facial expressions are recognised holistically, based on an integration of all of the information in a face. However, the majority of this research has been conducted using static images of expressions, which neglects the fact that in the real world facial expressions involve movement. The current study used the composite task to determine whether facial expressions in motion show similar hallmarks of holistic processing to static images of expressions. Dynamic stimuli were short video clips of six expressions (anger, disgust, fear, joy, sadness, surprise). Static stimuli were single frames of the peak expression. Upright and inverted conditions were included to test whether evidence for holistic processing was specific to upright facial expressions and also to attempt to isolate the influence of the motion per se. Overall, results ($n = 30$) showed clear evidence for holistic processing of both static and dynamic upright expressions but not for inverted expressions. The magnitude of the composite effect in static and dynamic expressions was similar for all expressions except for fear. Findings suggest that while dynamic expressions appear to be processed in a similar holistic manner to static expressions, motion may emphasise featural information in expressions of fear.

Short-term false recall and the irrelevant speech effect

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To date very little research has examined false recall under short-term conditions, instead the research has focussed on long-term false recall. A false memory is a type of systematic memory error that occurs when events that were not present are remembered as genuine and authentic memories. The current experiment examined short-term false recall for associatively related words by manipulating the phonemic features of an unattended stream of irrelevant speech. The irrelevant speech effect occurs when unattended background speech disrupts memory performance. Participants were required to remember lists of 6 words for immediate serial recall that were either associatively related or unrelated to one another. The phonemic features of the irrelevant speech, which was played during list presentation, either supported the phonemic features of a non-presented critical lure or had no phonemic information in common with the non-presented critical lure. As predicted, false recall was evident under short-term recall conditions. Furthermore, false recall was significantly greater for associatively related items that were presented under conditions where the phonemic information of the irrelevant speech supported a non-presented critical lure.
Can rating feature similarity improve face matching accuracy?

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Verifying the identity of an unfamiliar person using face images is highly error-prone. This is problematic because many security procedures rely on accurate identification – such as at border crossings. To mitigate risk, professionals who perform face matching as part of their work are trained to use comparison strategies. For example, they are taught to compare the similarity of facial features before making a same/different identity decision. In Experiment 1 we found that this strategy improved matching accuracy, suggesting that featural comparison is beneficial to matching performance. In Experiment 2, we examined performance in a group of experts who have experience and training in face matching (specialists from the Australian Passport Office). Experts were more accurate than novices – both in terms of their overall accuracy and in the diagnostic value of their feature similarity ratings. This finding suggests that trained experts benefit from an improved ability to compare faces in a piecemeal fashion. Intriguingly, we also observed a reduced inversion effect in experts compared to novices. Together, these results show that rating feature similarity improves the veracity of unfamiliar face matching decisions, and that this method of comparison could be implemented in professional settings to increase accuracy in this security-critical task.

Food for thought: The effects of high-fat high-sugar diets on spatial learning and memory

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People who eat a diet that is rich in fat and sugar are likely to become overweight, even obese, and suffer from a variety of metabolic diseases. They are also likely to exhibit a faster rate of normal age-related cognitive decline and a faster progression into age-related neurological disorders. Rodents who eat such a diet for an extended period of time (months) also exhibit cognitive deficits, especially in hippocampal dependent task, e.g., the use of spatial cues to navigate to a hidden platform in the water maze. Three experiments used rats to examine the effect of relatively short exposures to a high-fat high-sugar diet on spatial and object recognition. They showed that rats exposed to this diet for as little as 5-6 days were impaired on a hippocampal-dependent place recognition task but not on a perirhinal-dependent object recognition task. These experiments also showed that this selective deficit occurred in a plain arena but not in an arena whose walls provided distinctive visual information. The results suggest that the diet affects either a geometry module or the calculation of distance information.
Models of visual working memory: Discrete slots or continuous resource?

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There are two predominant theories for how information is stored in visual working memory (VWM). According to the slots model, VWM consists of a fixed number of discrete memory slots, each capable of storing one whole visual object in memory. On the other hand, the resources model proposes that VWM uses a limited pool of mnemonic resource that can be flexibly distributed across as many items as required. We quantitatively tested the predictions of the two models by fitting mathematical slots and resources models to the data of two visual change detection experiments in which participants were required to judge whether an item changed from study to test. Experiment 1 assessed the two models’ ability to account for the effect of study array size on VWM performance, while Experiment 2 contrasted the models’ ability to predict the shape of receiver operating characteristic curves by manipulating the probability of an item changing from study to test. The results of the two experiments suggested that neither model provides a comprehensive account of the data: performance in Experiment 1 was better explained by the slots model, while Experiment 2 showed evidence for the resources model. Possible explanations for the conflicting results are discussed.

Directional asymmetries in the discrimination of non-native Danish vowels

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The Natural Referent Vowel framework (NRV; Polka & Bohn, 2003, 2011) claims that a change from an acoustically less-peripheral vowel to a more-peripheral vowel should be easier to detect than a change from a more- to less-peripheral vowel. Although NRV was devised to account for directional asymmetries observed in infant speech perception, NRV claims that they should also be observed for adult non-native vowel perception. Results of a recent study (Tyler, Best, Faber, & Levitt, 2014) suggest that asymmetries occur only when adult participants assimilate the non-native vowels to the same native category, but new data are required to confirm that finding. Here, native Australian-English (AusE) speakers categorised and rated the goodness-of-fit of four Danish vowels /i, e, ɛ, a/ to their native vowel categories and performed an AXB discrimination task. Danish /i/ and /e/ were both assimilated to AusE /i/, and /ɛ/ and /a/ were both assimilated to AusE /ɛ/. Participants discriminated /ɛ/-/ɛ/ more accurately than both /i/-/ɛ/ and /ɛ/-/a/, but directional asymmetries were only observed for the less peripheral pair, /ɛ/-/a/. Clearly, directional asymmetries do occur in adult non-native vowel discrimination, but the factors determining when they will emerge are yet to be understood.
Evolving the stimuli to suit the brain

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Finding a target in clutter is a common task studied for 30 years using the visual search paradigm. A reliance on factorial experimental designs, however, has limited visual scene complexity to impoverished displays. Here we examine search in complex displays using a genetic algorithm (GA). Human subjects searched a series of complex displays and those supporting fastest search were selected to reproduce (‘survival of the fittest’). Their display properties (‘genes’) were crossed and combined to create a new generation of ‘evolved’ displays. Displays evolved quickly over generations towards a stable, efficiently searched array. Contrary to current models, evolution was serial, not parallel: colour evolved first, followed by orientation. The evolved displays also contained spatial patterns suggesting a coarse-to-fine search strategy not predicted by current models. The GA, therefore, not only simplifies evaluation of complex search spaces, it adapts the display to the brain and reveals its own search strategies.

Action video games do not improve the speed of information processing in simple perceptual tasks

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Previous research suggests that playing action video games improves performance on sensory, perceptual, and attentional tasks. For instance, Green, Pouget, and Bavelier (2010) used the diffusion model to decompose data from a motion detection task and estimate the contribution of several underlying psychological processes. Their analysis indicated that playing action video games leads to faster information processing, reduced response caution, and no difference in motor responding. Because perceptual learning is generally thought to be highly context-specific, this transfer from gaming is surprising and warrants replication in a large-scale training study. We conducted two experiments in which participants practiced either an action video game or a cognitive game in five separate, supervised sessions. Prior to each session and following the last session, participants performed a perceptual discrimination task. In our second experiment we included a third condition in which no video games were played at all. Behavioural data and diffusion model parameters showed similar practice effects for the action gamers, the cognitive gamers, and the non-gamers and suggest that, in contrast to earlier reports, playing action video games does not improve the speed of information processing in simple perceptual tasks.
Phase locking to amplitude modulations in infants and children: An EEG study

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Amplitude modulations in speech convey important information contained in the speech signal across multiple time scales. According to multi-time resolution models of speech perception, amplitude modulation below 10 Hz (corresponding to brain oscillations of delta 1-4 Hz and theta 4-8 Hz) is relevant for the extraction of prosodic and syllable level information, while amplitude modulations between 25 Hz-50 Hz (corresponding to gamma 25-100 Hz brain oscillations) is important for the extraction of phonetic information. Here we measured EEG response to different rates of amplitude modulated white noise in 20 month old infants and 6- to 12- year-old children. Auditory steady state response (ASSR) was measured for with amplitude modulations of 2 Hz, 5 Hz, 8 Hz, 16 Hz, 32 Hz and 60 Hz while participants watched a silent video. The results will be discussed in terms of the ASSR amplitude across frequencies and between hemispheres and their relation to speech perception in infants and children.

Semantic preview effects: Do they depend on skilled reading proficiency?

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Skilled readers of English extract information from words in both foveal and parafoveal vision. While orthographic and phonological preview benefit effects are uncontroversial, the evidence for parafoveal semantic activation has become a renewed focus of considerable debate in the eye movement literature. Some recent studies have found semantic preview benefit whilst others have failed to find any evidence of early semantic effects in the parafovea. In the present study, we investigated whether there are individual differences in the extraction of semantic information from the parafovea by assessing participants on measures of reading comprehension and spelling ability. Participants’ eye movements were recorded as they read sentences in which the parafoveal preview of a target word was manipulated using the gaze-contingent boundary paradigm. The preview was either identical (e.g., toad), semantically related (frog), orthographically related (toul) or unrelated (defy) to the target. In contrast to previous studies, we found semantically related words yielded preview benefits equivalent to identical previews across a range of fixation measures. However, this semantic preview benefit was significantly modulated by reader proficiency. The implications for computational models of eye movement control in reading are discussed.
Recognition of human action: Memory for gist or surface form?

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In language and visual scene recognition, the overall meaning or ‘gist’ of information is retained, while the exact surface form is rapidly forgotten. As a result, observers remember semantic, or goal-relevant, detail, but forget syntactic, or goal-irrelevant, detail. If similar processes underpin memory for actions, then this might mean better recognition of body postures that are similar, relative to dissimilar, to the action goal. Two experiments investigated memory for action posture, with manipulation of the similarity of test posture to the action goal (Similar, Dissimilar), the number of items to be remembered (Two, Three), and action coherence (Coherent, Incoherent). Participants observed sets of multi-static actions and made ‘old/new’ responses to single postures at test. As hypothesized, recognition was best for ‘similar’, relative to ‘dissimilar’, postures after observation of coherent, relative to incoherent, actions. As in memory for language and scenes, the gist of actions is retained, with better recognition of goal-similar, compared to goal-dissimilar, body postures.

Testing the dimensionality of confidence

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Differences in calibration curves have been taken as evidence that confidence ratings about the accuracy of sensory and general-knowledge tasks have a different basis (Juslin & Olsson, 1997; Keren, 1988). However, Baransi and Petrusic (1995) found that calibration-curve differences were largely due to task difficulty confounds. We took an alternative approach to controlling task difficulty within the context of state-trace analysis. State-trace analysis is a non-parametric method of determining the number of latent processes mediating the relationship between two dependent variables (Bamber, 1979), in this case confidence and accuracy. When we applied Prince, Brown and Heathcote’s (2012) Bayesian state-trace analysis to data from brightness and general knowledge items of varying difficulty, we found strong evidence in favour of a different basis for the relationship between confidence and accuracy in these two types of tasks.
Lexical interference from object part-relations in spoken word production

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Over 3 experiments, we explored semantic context effects in speaking. In particular, we investigated recent reports of contrasting interference and facilitation effects for categorical and part-whole relations, respectively, in picture naming. In Experiments 1 and 2, we used the picture-word interference (PWI) paradigm to test whether reports of facilitated naming latencies with distractors denoting object parts might reflect the influence of conceptual feature distinctiveness according to feature production norms (e.g., a periscope is a distinguishing feature of a SUBMARINE, whereas a rudder is not). Compared to distractors denoting parts of unrelated objects, neither distinctive nor non-distinctive part distractors influenced target picture naming latencies significantly, irrespective of whether the part was visible in the picture. Experiment 3 employed the blocked cyclic naming paradigm to test whether relations among object parts can elicit interference when presented in homogeneous (i.e., parts of the same object) vs. heterogeneous (i.e., mixed object parts) contexts. We observed significant interference in the homogeneous context. These findings indicate that (1) part-whole facilitation in PWI might not be a reproducible phenomenon, and (2) object parts can be active lexical competitors depending on the semantic context in which they are encountered.

Representation of perceptual colour-orientation conjunctions in human visual cortex

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While visual feature binding has been studied extensively using psychophysical methods, the neural mechanisms of binding remain largely unidentified. Here, we investigate the neural correlates of perceptually bound feature pairs in early visual cortex. Varying the alternation frequency of colour-orientation feature pairs affected binding in one of two displays, measured psychophysically. In one display, feature binding was accurate independent of alternation frequency, while performance on the other display was poorer only at lower alternation frequencies. This design and stimulus was adapted to an fMRI paradigm. Neural correlates of perceptual feature binding were evident in the overall response of areas V2, V3, V3AB, and hV4, but not V1, in terms of significant display type by alternation frequency interactions. Multivariate pattern analysis was employed to decode feature conjunctions in each condition. In V1, colour-orientation conjunctions could be decoded in all conditions. In V2, only conditions which allowed accurate perceptual feature binding generated significant decoding performance. Thus, activity in V2 but not V1 was modulated in a way that correlated with perception. This study provides evidence that human visual cortex as early as V2 may code for perceptual feature conjunctions.
Contextual effect on surprise expressions: a developmental study

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Although research succeeds in eliciting spontaneous feelings of surprise with participants, these participants rarely show a prototypical expression of raising eyebrows, opening mouth and widening eyes. In other words, there seems to be a discrepancy between the display and feeling of surprise. To get a better understanding of this discrepancy, we assessed what factors influence the display of surprise in children (study 1) and adults (study 2). In both studies, we conducted a quiz-like experiment, in which we manipulated the social context (participants either competed or collaborated), and various quiz questions to extract reactions of surprise (either caused by unexpectedly correct or unexpectedly incorrect answers). Results show that cause and social context did not affect the appearance of specific features in participants’ surprise display. However, we did find these factors to interact with regards to the intensity of perceived surprise displays of adults. For children, these relations were less complex. Overall, we can conclude that the expression of surprise is indeed moderated by contextual factors, namely cause of the surprise, social context and age.

Temporal cues and the attentional blink: A further examination of the role of expectancy

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Although perception is typically constrained by limits in available processing resources, these constraints can be overcome if information about environmental properties, such as the spatial location or expected onset time of an object, can be used to direct processing resources to particular sensory inputs. Our work examines these temporal expectancy effects in greater detail in the context of the attentional blink (AB), in which identification of the second of two targets is impaired when targets are separated by less than about half-a-second. We replicate previous results showing that presenting information about the expected onset time of the second target can overcome the AB. Uniquely, we also show that knowledge about expected onset: a) reduces susceptibility to distraction; and, b) can be derived from temporal consistencies in inter-target interval across exposures as long as these consistencies are salient. These results imply that temporal expectancy can benefit object processing at perceptual and post-perceptual stages, and that participants are capable of flexibly encoding consistent timing information about environmental events to aid perception.
The relevance of category labels in semi-supervised learning depends on category structure

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The study of semi-supervised category learning has shown mixed results on how people jointly use labeled and unlabeled information in learning categories. Here we investigate the possibility that the value of labeled items depends on the nature of the task and the structure of the underlying categories. We use an unconstrained free-sorting categorization experiment to show that when the distribution of stimuli involves distinct clusters, participants prefer the same sorting strategy regardless of whether they were given any additional category label information. However, when the stimuli distribution was ambiguous, participants given additional category label information were able to use this as a guide to sort the objects. We capture performance in both cases by an extension of Anderson’s Rational Model that does not know the exact number of category labels in advance.

Access to semantic representations in iconic memory

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Iconic memory was initially conceptualised as a rapidly decaying memory store that is of high capacity and capable of retaining information in visual form for several hundred milliseconds. This research aimed to investigate whether higher-order semantic representations can be accessed in iconic memory tasks. This was done using a modified partial-report paradigm with word stimuli where participants were asked to report all four words (full-report) or only one word (partial-report). Experiments 1 and 2 investigated whether semantic category cues (instruction to report a word belonging to a particular semantic category) could be used to select words for report. Partial-report superiority was found when the cues were presented before stimulus onset and after stimulus offset. Experiment 3 investigated whether location cues (instruction to report a word from a particular spatial location) could be used to select words for report. Partial-report superiority was found indicating that words can also be selected based on visual information. Hence, contrary to previous findings with single alphanumeric characters, these results provide evidence for both visual and semantic processing in iconic memory tasks when stimuli with greater semantic content are used. These results therefore challenge the initial conceptualisation of iconic memory and its application in clinical research.
Task set modulates attentional capture and disengagement from photorealistic spider distracters

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What one is set to look for can influence whether a threat distracter interferes with attentional allocation. Top-down target set has been shown to modulate whether delayed disengagement from a spider silhouette is observed (Vromen, Lipp, & Remington, submitted). As top-down modulation of attention to silhouette threat stimuli may be relatively easy it remains an open question whether top-down modulation can be observed with more realistic threat stimuli. The current study employed a spatial cueing paradigm that allowed us to assess delayed disengagement from and capture by 6 photorealistic spider distracters. Top-down set was modulated by including a spider in the target set (Experiment 1) or not (Experiment 2). Delayed disengagement from spider distracters was observed when a spider was part of the target set but not when it was not, indicating top-down modulation of delayed disengagement with photorealistic stimuli. Capture by photorealistic spider distracters also showed top-down modulation, but was not entirely eliminated when the spider was not part of the target set and the competing distracter contained no target features. Thus, top-down modulation of threat interference can be observed with photorealistic threat stimuli but for disengagement and capture.

Holistic processing of face, face-like and squiggly stimuli

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One of the hallmarks of face processing is the more integrative or ‘holistic’ manner in which the stimuli are processed. A strong source of evidence for holistic processing comes from the ‘composite effect’, in which the alignment of a task-relevant upper face half, with a task-irrelevant lower half, impairs recognition performance in comparison with a non-aligned version of the upper and lower halves. We wondered what aspects of a face drive the composite effect. Relatively few studies have investigated whether the effect holds across viewpoint. Confirming one earlier study, we find that it does. This then allowed us to see if it also works for face silhouettes, which it does. From there we played with simple outline shapes and found some, though not all also showed ‘composite’ effects. This approach is bringing us closer to understanding what features actually underlie the composite effect, and hence holistic processing.
Should participants be given a mobile? Effects of novelty vs. utility

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Mobile telephones may herald a great opportunity for ecological momentary assessment, offering researchers unobtrusive communication with participants via apps or text messaging. Researchers seeking to use a specific app (for example, one compatible only with iPhones) may need to standardize the response platform, either by excluding participants without the correct type of phone, or giving participants an appropriate phone. Given that mobile telephone ownership is ubiquitous in Australia (ACMA, 2011), lending a phone often involves replacing a phone already in use. Though some research has given participants a mobile phone to facilitate participation (i.e. Alfven 2010), how this impacts on response behaviour when participants already own a mobile has not been explored. This talk discusses differences in response behaviour between participants who use their own phone, and participants who are given a phone to use for the purposes of research. Using iPhones, 180 undergraduate participants completed a six-item questionnaire in response to 20 SMS prompts across two days via app, or text message. Response behaviour (response completeness and promptness) was analysed by way of a series of multilevel models, with responses nested by participant. Recommendations for researchers considering providing participants with mobile telephones for the purposes of research are offered.

The other-race effect in face memory cannot be overcome by motivation, but early-life inter-racial contact can help

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One theory of the other-race effect (ORE) - better memory for own-race than other-race faces - attributes it to lack of motivation-to-individuate members of other races, and claims that poor recognition of other-race faces is improved by instructions designed to increase motivation. Previous tests, however, have tested only one race of observers (usually White Americans with African-American faces), and have not asked participants to report their effort or strategies. We test the full crossover design (observers: Asian overseas-students, Caucasian; faces: Asian, Caucasian). Contrary to the social-motivation theory, (a) we found no reduction in ORE with the motivation instructions, and (b) participants reported that, without motivation instructions, they applied more effort to other-race than own-race faces, which they attributed to realising they had more perceptual difficulty with other-race faces. Results instead supported an origin in lack of early-life contact. Supporting results were (c)
the ORE correlated with reported primary school contact with the other-race but not adult contact, and (d) Asian-Australians (fully Asian ancestry but born and raised in Australia) showed no ORE (without motivation instructions). We conclude social-motivation theories of the ORE do not apply in Australia or Asia, and that lack of early perceptual experience is a plausible explanation.

Orthographic learning in children with different profiles of dyslexia

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Background. Previous studies have indicated that children with dyslexia are less efficient at orthographic learning than typically-developing readers (e.g., Ehri & Saltmarsh, 1995). Building on existing orthographic learning paradigms, we report on an investigation of orthographic learning in children with dyslexia using a new learning task that taps both the accuracy and fluency of learning novel words. Children were asked to learn novel words in three learning cycles, and learning was measured after each cycle. Method and Results. In Study 1, we examine learning in two groups of children with different reading profiles: 12 with impaired phonological decoding skill, 12 with impaired orthographic knowledge, and 12 controls. Both dyslexic groups performed equally but were less efficient in their learning than the controls. Study 2 explored predictors of orthographic learning in 91 children with dyslexia using the same paradigm as outcome measures. We found that both phonological decoding skill and orthographic knowledge predicted orthographic learning, and orthographic knowledge is particularly important fluent recognition of the learned words is involved. Conclusion. This study provides important insights into how children different profiles of dyslexia learn to read novel words, and how their learning process may be compromised by their less proficient orthographic and/or phonological skills.
Effect of peri-saccadic visual stimulation on saccade execution

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It has been suggested that stimuli not perceived during a saccade may still serve a visual function. Visual motion that does not match that expected to be generated by making a saccade may be useful for estimating saccade endpoint errors and inducing subsequent corrective saccades. This was tested by presenting a brief moving dot field stimulus during a saccade, moving with or against the saccade. It was predicted that the motion may induce a catch-up saccade to correct for the unexpected peri-saccadic visual motion and that the direction of the saccade would match that of the direction of the visual motion. This was not found to be the case. Corrective saccades were made on approximately half of all trials however the number and direction of these saccades did not depend on the direction of peri-saccadic motion. Additionally, there was no difference in the size of the corrective saccade depending on the distance travelled by the motion stimulus. This suggests that visual motion generated by making a saccade is not used to estimate post saccade fixation accuracy.

Fat or fiction? Body-schema disturbances in an undergraduate population

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Pervasive disturbances in the way in which one’s body weight or shape is experienced often accompany disordered eating. Such disturbances have recently been found to extend beyond the body image to the body schema, with body-scaled actions of Anorexia Nervosa patients seemingly based upon an enlarged representation of body size. To explore the relationship between eating-disordered behaviour and body schema integrity, a body-scaled motor imagery task was utilised. Undergraduate participants judged whether a projected door-like aperture was wide enough for them to pass through, the chief parameter of interest being the relative width of the aperture for which participants believed that they would start to rotate their body (A/S crit). Females below the median BMI had a significantly higher A/S crit than those above the median BMI. Interestingly, although both groups desired weight loss, only those in the former expressed ideal body weights that would render them underweight. The findings raise the intriguing possibility that body schema integrity is predictive of unsafe weight management practices and body-composition goals within the undergraduate population.
Help! I need somebody! Context modulates approachability judgements to emotional faces

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Research examining the mechanisms that underpin how we process facial expressions has largely neglected the potential role that situational context plays in determining the meaning we extract from a facial expression. The aim of the current study was to examine how context influences the perception of approachability from emotional faces. Approachability judgements were provided to emotional faces (i.e., angry, disgusted, fearful, happy, neutral, and sad expressions) when an individual evaluated whether they would approach them to either receive help, give help, or when no contextual information was provided. Facial expressions were also rated for level of perceived threat. Faces depicting negative emotions were significantly more approachable in the giving help context, than in the receiving help context. Moreover, faces portraying distress-related emotions (i.e., sadness and fear) were deemed unapproachable in the receiving help context and approachable in the giving help context. Threat perception ratings were significantly related to approachability ratings across contexts for happy, angry and neutral expressions, while context modulated this relationship for sad, fearful and disgusted expressions. These findings provide support for the adaptive function of facial expressions in social interactions, and highlight the important role that context and perceived threat play in the evaluation of approachability.

Hybrid lists and task difficulty in the production of short-term false memories

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The Deese-Roediger-McDermott (DRM) false memory paradigm has been shown to produce robust false memory effects, operationalised as recall or recognition of a particular non-represented item (‘lure’), associated to the presented items. These effects have been exhibited in the short term domain when semantic and phonological word lists are employed. The use of ‘hybrid’ word lists, comprised of semantic and phonological associates of a single lure has been explored in the long term domain, however is yet to be explored in the short term. Furthermore, the effect of task difficulty on false memory effects has, similarly, not yet been investigated. This study examines the effect of ‘hybrid’ semantic and phonological word lists in comparison to pure lists. Participants recalled lists of pure \((n = 20)\) or hybrid \((n = 20)\) associates immediately after presentation. Stronger false memory effects were present in the hybrid word lists, compared to pure. To extend the research, additional participants \((n = 36)\) were exposed to hybrid lists in a DRM tasks whilst presentation rate, articulatory suppression, modality and retention interval were manipulated. False memory effects were
more prevalent in related trials compared to unrelated trials and when the task modifications interfered with episodic recall.

**Movement matters: Coordinating tapping and tracking with a visual moving target**

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The study examined the accuracy of discrete versus continuous perceptual-motor coordination by determining how good people were at either tracking or synchronously tapping with a rhythmically oscillating visual target. In the experiment, a visual target that oscillated horizontally was presented and participants were required to continuously match the finger movement (shoulder rotation, wrist and elbow fixed) with the target motion (tracking task) or by finger tapping in synchrony with the reversal point of the target motion (tapping task). The target motion varied from a sinusoidal to a Rayleigh oscillation; the motion frequency from slow (0.5 Hz) to fast (1 Hz). We hypothesized that Rayleigh oscillation would lead to more accurate tracking and tapping since for this motion the target slowed down movement when approaching reversal points. We also predicted that the performance across the tasks should correlate. Twelve participants were tested and the results showed that Rayleigh oscillations did not facilitate coordination. We found that participant movements were more accurate when tracking than tapping and the performance of both had a higher correlation at fast frequencies. The results will be discussed in comparison with previous findings.