



Autumn meeting in memory of Prof. Glyn Humphreys

Wednesday 26th – Thursday 27th October 2016

Clinical Neurosciences Centre, 33 Queen Square,
London, WC1N 3BG

ABSTRACTS

This Autumn BNS meeting is dedicated to the memory of Prof. Glyn Humphreys (1954-2016). Glyn was an inspirational scientist who had a major influence on neuropsychology in the UK and beyond. He was a tireless supporter of the BNS and was our President from 2012-2014. This meeting offers us the opportunity to celebrate Glyn's contribution to science and the many careers he influenced through his enthusiasm and support for young scientists.

BNS President



Sponsorship

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TALKS

Wednesday 26th October

10.00 Prof Humphreys' legacy in cognitive neuropsychology and its applications: Past, present and future

Nele Demeyere

*Department of Experimental Psychology,
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Glyn's first foray in test development came when he and Jane developed the Birmingham Object Recognition Battery (BORB) and published it in 1993. BORB provided a battery of tasks to tease apart the specific object recognition aspects which may be impaired in neuropsychological disorders of visual object recognition. It was not until the BCoS though, that a wider based screen was developed. This time aiming to provide a more holistic cognitive profile, covering several domains

of cognition and allowing for a screen to be completed in one hour, where batteries for each separate domain would normally take this time. The BCoS was published in 2012. For the first time, neuropsychological expertise was put in reach of non-specialized staff.

As we understood more and more how the stroke pathway was implemented, spending time in rehab hospitals and acute stroke units, the need for a short cognitive screen was clear, 20 mins max. The making of the new screen coincided with the move to Oxford and so the Oxford Cognitive Screen was born. The OCS again provides a meaningful 'cognitive profile' and was designed to be inclusive for patients with aphasia and neglect. OCS has now already been licenced to over 250 UK NHS sites. Glyn was committed to seeing the OCS used across the world, and many translations, norming & validation studies of OCS are ongoing. The final leap was the one towards tablet-based

adaptations, and using new technology to extract extra time-efficient measures. OCS-Plus is coming out soon.

10.40 The interaction of the self and executive control in neuropsychological patients

Jie Sui

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University of Oxford*

People show biases to self-related information on a range of tasks, which recruits a ventral network including the ventro-medial prefrontal cortex (vmPFC) and the left posterior superior temporal sulcus (pSTS). To contrast, attentional is associated with the dorsal frontal-parietal network. This study assessed the interaction between the self and attentional control networks² by testing a group of neuropsychological patients and assessing the relations between their lesions and any behavioural deficit on face and executive processing tasks (hypo- or hyper-self bias). We conducted factor analyses across multiple tasks. There were two factors formed - one reflecting self processing, and the other associated with executive control in behavioural tasks. Lesions in the right IFOF positively correlated with the self factor indicating the deficits of hypo- self bias, while lesions in the left arcuate, SLF2, and SLF3 positively correlated with the attentional control factor indicating hyper- self-bias and impaired rule finding (a task examining the function of executive control). In addition, voxel-based morphometry analyses demonstrated that lesions in the vmPFC were associated with the self factor (hypo-self bias), and lesions in the bilateral dorsal parietal cortex and the left inferior frontal cortex were associated with the attentional control factor (hyper- self bias and deficits in rule finding). The results indicate that the ventral self network and dorsal frontal-parietal attentional control networks play opposite roles in self-bias.

11.00 Alexithymia, not autism, is associated with impaired interoception

Punit Shah^{1,2*}, Richard Hall^{1,2}, Michel-Pierre Coll¹, Neharika Nair¹, Caroline Catmur³, & Geoffrey Bird^{1,4*}

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Objectives: Elevated rates of alexithymia in the autistic population have been shown to underpin several impairments thought to be symptomatic of Autism Spectrum Disorder (ASD), raising the possibility that interoceptive difficulties in ASD are also due to co-occurring alexithymia (Brewer, Happé, Cook, & Bird, 2015, *Neurosci. Biobehav. R.*). Following this line of inquiry, we sought to examine the relative impact of alexithymia and autism on interoceptive accuracy.

Methods: A well-established measure of interoceptive accuracy (The Heartbeat Tracking Task) was used to quantify interoception in non-clinical sample with varying degrees of autistic traits and alexithymia (Study 1). In Study 2, interoception was compared in individuals with and without a clinical diagnosis of ASD matched for alexithymia. Participants also completed a time estimation control procedure, an IQ test, and a variety of clinical trait measures potentially related to interoceptive ability (e.g. Trait Anxiety). Study 3 was a replication of Study 1 in an independent sample.

Results: There was no group difference in interoception between the ASD and control group. Rather, a series of regression analyses performed in two studies, converge to show that alexithymia, not autism was associated with atypical interoception. This pattern of results held after controlling for potentially confounding variables such as time estimation and anxiety scores. These patterns of results were replicated in an independent sample.

Conclusions: Results indicate that interoceptive impairments should not be considered a feature of ASD, but instead due to co-occurring alexithymia (Shah et al., 2016, *Cortex*). Nonetheless, interpreting atypical behavior within an interoceptive framework has potential to inform the management of autism and neuropsychiatric conditions.

12.00 Keynote lecture

Understanding functional specialisation in cognition and neural structure

Cathy Price

University College London

2.20 Data driven approach for function lesion mapping

Pia Rotshtein

School of Psychology, University of Birmingham

Traditional function-lesion mapping methods use a-priori assumptions when sampling the patients and defining the lesions. For example, patients are grouped based on absent or present of cognitive

deficits. Lesions are delineated to produce binary maps. These maps are used to compare between pre-defined patients groups or for dividing patients to experimental groups. This approach rely on multiple assumptions: 1) The cognitive mechanisms that govern the organization of the brain are known and the tools measure them accurately, and 2) only lesions which occupy space contribute to functional deficits in an all or none way. We propose a method to map function to lesion which is not depended on the truthiness of the above assumptions. We recruit large number of patients with various behavioural and neural profiles, but similar aetiology. To test for underlying cognitive mechanisms that support performances on various tasks, we have employed principle component analyses (PCA) detecting latent components that explained variability in patient's behaviour more parsimoniously; identifying shared and dissociated components across tasks. To assess the neural underpinning of these data we used voxel based morphometry (VBM) which is based on probability maps of grey or white matter integrity. Combing the neural-VBM with the cognitive-PCA data enables us to gain insight into the function-lesion mapping without the need to use a-priori assumptions which restrict the ability to generalize the findings. We would present examples of applying this method in studying the neuro-cognitive mechanism of writing and object processing.

2.40 Impaired attentional networks in hemispatial neglect

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When viewing compound visual stimuli, preference for global versus local hierarchical processing is reflected in target reaction times, which have been argued to represent lateralised hemispheric specialisation for allocating visual attention. Here we examine this assertion further using magnetoencephalography with simultaneous EEG during a novel global-local attentional processing paradigm. Ten healthy controls and four patients with right parietal lesions were tested with a divided-attention version of the global-local paradigm that allows assessment of lateralised contributions to global or local hierarchical level. The task comprised 864 randomised trials, half presented to the left and half to the right of central fixation, with post-stimulus masking. 25% of trials included global target letters, 25% local target

letters and 50% had no target. MEG and EEG data were pre-processed using Maxfilter and SPM 12. The evoked responses revealed a posterior distinction between left and right target presentations, with an earlier and more prominent N1m in the contralateral occipital region. Later components, corresponding to the N2-P3 complex, distinguished global versus local targets over posterior and anterior regions. In right-parietal patients, the early distinction between left and right targets was present but the global versus local difference was ameliorated. Together, these results reveal a sequential process for target detection, implicating multiple brain regions involved in identifying a global level target, with a significant contribution of the right parietal lobe to global processing, even in cortical regions remote from the locus of damage.

3.00 The effect of Computerized Progressive Attentional Training (CPAT) on sustained attention in adults with ADHD

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Attention and executive functions are substantially involved in different types of learning. Previous studies with various populations had shown that attention skills are significantly malleable. Thus, cognitive training has a great potential especially in populations who cope with attention difficulties. In the present study we examined the effects of the Computerized Progressive Attentional Training (CPAT) program, a multi-faceted cognitive training, on adults with Attention Deficit Hyperactivity Disorder (ADHD). Since difficulties in the ability to maintain attention during monotonic activities is one of the most frequent difficulties of individuals with ADHD we focused on the effects of the training on sustained attention. We measured sustained attention using a neuropsychological task (the Conjunctive Continuous Performance Task – CCPT) along with self-report of inattention symptoms. We compared between participants who completed 16 CPAT sessions (the active group) with participants who were assessed twice but did not undergo active training (the passive group). Significant interaction was obtained between group and time of testing on the performance in the CCPT as well as a marginally significant interaction on self-reported symptoms of inattention. Furthermore, a remarkable significant correlation was obtained between the objective and subjective change in the CPAT group but not in the passive group. These results suggest that the CPAT is beneficial for adults with

ADHD and most importantly it transfers to everyday functioning. Therefore, programs such as the CPAT should be further developed and studied in various settings of populations who suffer from attention difficulties.

3.20 The effect of a salient disfiguring feature on overt and covert attention to faces

Luc Boutsen, Nathan Pearson, Martin Jüttner
Department of Psychology, Aston University, Birmingham

Facial disfigurements can significantly alter a person's appearance and can influence how others interact with them, potentially leading to negative responses such as avoidance or stigmatisation. Such responses imply that observers "look differently" at persons with a facial disfigurement; yet how facial disfigurements might affect face perception and attention to faces is unclear. We studied overt and covert orienting to faces when these contained a simulated unilateral disfiguring feature (a 'port-wine stain'), a non-disfiguring feature (occluder), or no salient feature. We asked whether a disfiguring feature would capture (c)overt attention differently compared to a non-disfiguring feature, as measured through eye movements during free exploration (Experiment 1) and during covert orienting to a nonface target in the presence of peripheral or foveal distractor faces (Experiments 2-3). In Experiment 1, initial fixations were directed towards the side of disfiguring and occluding features, indicating attentional capture. This effect was stronger for left facial features, suggesting a within-face spatial bias. Further, cueing attention to a distractor face caused more interference when it contained a disfiguring feature (Experiment 2), especially when this feature was located near the target stimulus (Experiment 3). We suggest that the presence of a disfiguring feature can alter the distribution of attention across a face and discuss how this might impact on face-specific perceptual processes.

4.20 Exploring the role of affordances in movement planning after stroke: an insight into Limb Apraxia

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Limb apraxia is a disorder of skilled action not consequent on motor weakness or sensory

impairment following a brain lesion. Limb apraxia is found relatively frequently in left hemisphere stroke patients. Despite its prevalence and a long history of reporting on the disorder, limb apraxia remains poorly understood and there are no accepted treatments. We lack a coherent conceptual framework for explaining the disorder.

Recently, we (Rounis and Humphreys, 2015) have proposed a new account of this disorder which reframes it as a deficit in action selection involving 'affordances' (Fagg and Arbib 1998, Cisek 2007).

Traditional (qualitative) measures of apraxia were analysed using data-driven approaches to group patients' deficits. We tested whether apraxic deficits relate to the affordance network by relating these behavioural scores with connectivity measures using resting state fMRI.

A hierarchical cluster analysis using an average linkage algorithm was implemented using behavioural scores in 26 right-handed chronic left-hemisphere stroke patients, on a battery of praxis tasks and tests of upper limb function (ARAT). Seed-based connectivity analyses of resting-state fMRI revealed that when tests of gesture imitation are regressed onto connectivity measures between areas of dorsolateral and dorsomedial networks, the patients' connectivity of ipsilesional PMd with primary motor cortex (M1) seems reduced compared to controls. This was associated with increased AIP to PMv connectivity.

Taken together these results provide evidence for a new framework, which relates to the role of 'affordances' in driving motor behaviour in limb apraxic patients.

4.40 Rapid forgetting in working memory in disease

Nahid Zokaei
Affiliations TBC

The mechanisms underlying rapid forgetting in working memory are extremely controversial. New methods to measure the precision of visual short-term memory (VSTM) using continuous responses (rather than binary yes/no reports) provide a sensitive probe. These are tasks where participants are asked to firstly keep in mind a feature of an item (i.e. orientation/location) and following a short delay, are asked to reproduce the exact quality of the remembered feature. Here we use these techniques to examine rapid forgetting in different patient groups to reveal different signatures of deficit. We show that patients with Parkinson's disease (PD) and a population at risk of developing PD (patients with rapid eye-

movement sleep behavior disorder) have increased vulnerability to random corruption of visual short-term memory over just seconds. By contrast, individuals with Alzheimer's disease (AD) and mild cognitive impairment demonstrate increased "misbinding" of object features. These are errors where other items in memory systematically corrupt memory for an item- in this case, patients were likely to locate an item in the location of one of the other items in memory. Similarly, performance of a group of individuals with hippocampal sclerosis matched that of those seen in AD patients. Together these findings provide evidence for development of cognitive tools for early detection of neurodegenerative conditions.

5.00 *Keynote lecture*

Attentional episodes and cognitive control

John Duncan

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All human cognition is controlled in a series of attentional episodes, breaking complex problems into simpler, more solvable sub-problems. In human fMRI studies, a common or multiple-demand (MD) pattern of frontal and parietal activity is associated with diverse cognitive demands, and with standard tests of fluid intelligence. Based on behavioural, neuropsychological, fMRI and single unit data, I suggest that the core function of MD cortex is to control complex cognition in a structured sequence of attentional episodes. At the same time, I consider the complementary control functions of MD and "default mode" networks.

Thursday 27th October

9.00 *Keynote lecture*

Seeing, doing and knowing

Vicki Bruce

Newcastle University

Neuropsychological observations have played a critical role in developing our understanding of how objects and faces are visually represented and recognised, and in this talk I will re-visit several of these key observations. More than 20 years ago, Glyn Humphreys and I (Bruce & Humphreys, 1994) compared the recognition of objects and faces, noting some differences in representational processes but similarities in the overall organisation of the cognitive stages involved. At about the same time, Milner and Goodale's (1995) important differentiation of perceptual systems into

dorsal ('doing') and ventral ('knowing') streams distinguished action-oriented perception from conscious conceptual recognition. In the intervening years further neuropsychological investigations have demonstrated how action-oriented perception of object 'affordances' can directly influence recognition processes (e.g. Riddoch et al, 2003). I will consider the theoretical implications of such findings.

Bruce, V. & Humphreys, G.W. (1994). Recognizing objects and faces. *Visual Cognition*, 1, 141-180.

Milner, A. D. & Goodale, M.A. (1995). *The visual brain in action*. Oxford: Oxford University Press.

Riddoch, M.J., Humphreys, G.W., Edwards, S., Baker, T., & Wilson, K. (2003). Seeing the action: neuropsychological evidence for action-based effects on object selection. *Nature Neuroscience*, 6, 82-89.

10.00 **Objects in vision and touch**

Rebecca Lawson & Stefano Cecchetti

University of Liverpool

Objects are theoretically important across many aspects of perception and cognition. It has, though, proven difficult to formally define objects, even for vision (Feldman, 2003), and this issue has barely been considered for touch. Given the nature of the information acquired by touch, our limited ability to explore multiple objects simultaneously using touch alone, and the difficulty in perceiving scenes by touch, then it could be that objectness is unimportant for touch. Also, touch could rely on vision to specify objects. However, our results suggest that specifying what is an object may, nevertheless, play an important role in processing by touch. We compared regularity detection by vision and touch. Participants discriminated regular (symmetrical or repeated) stimuli from random stimuli for closed-contour shapes and for lines. We investigated whether symmetry is used as a cue to signal the presence of one object and repetition is used as a cue to signal the presence of multiple, similarly-shaped objects. Our results suggest that diverse cues combine to define objects to touch, with some cues (e.g., proximity and contour polarity - concavities and convexities along a contour) also being used by vision, but others (e.g., whether stimulus exploration involves one or two hands) being modality-specific. Thus the nature of an object may differ for vision and touch. These results support Feldman's (2003) claim that objects cannot be defined objectively by properties of the external world. Instead, objects appear to be specified relative to the system

processing them, and so require a modality-specific definition.

Feldman, J. (2003). What is a visual object? *Trends in Cognitive Sciences*, 7(6), 252-256.

11.00 CVIT 3-6, a screening test for cerebral visual impairment in young children

Kathleen Vancleef^{1,2}, Els Ortibus^{3,4}, Eva Janssens³, Silke Bäumer¹, Yasmine Petré¹ & Johan Wagemans¹

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The lack of tailored tests for Cerebral Visual Impairment (CVI) makes diagnosis complex. Test results are sometimes confounded by comorbid cognitive or motor difficulties. To address these problems, we developed the Cerebral Visual Impairment Test for 3 to 6 year olds (CVIT 3-6) focussing on object recognition, degraded object recognition, motion perception and local-global processing.

Norm data were collected from 348 children without visual and developmental disorders. Validity and reliability was evaluated in children with CVI, intellectual impairment, or with a typical development.

Cut-off scores for normal visual perception on CVIT 3-6 were determined based on our norm sample. CVIT 3-6 scores increased with age for children born at 35 weeks gestational age or later. A confirmatory factor analysis confirmed the hypothesized internal structure of CVIT 3-6. Cronbach's alpha in our norm sample was .65 and test-retest reliability in our validation groups was .80. With respect to convergent and discriminant validity, we found a non-significant correlation between CVIT 3-6 and a visual-motor integration task, probably related to the motor component of the second task. A high correlation was observed between CVIT 3-6 and scores on L94, a visual perception battery. Autistic traits were not correlated to CVIT 3-6 performance while visual acuity and IQ scores were.

We developed a screening test for CVI. Factor analysis confirmed the test measures four domains of visual functions. Age-dependent norm data are available. We observed good reliability of CVIT 3-6 and validity research showed satisfying results.

11.20 Paired-object affordance affects motor cortex excitability

Melanie Wulff¹, Joseph Michael Galea¹, Glyn W. Humphreys², & Pia Rotshtein¹

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²Department of Experimental Psychology, University of Oxford

Viewing graspable objects automatically activates corresponding motor programs even when no response is required. Here we investigated whether left and right motor cortex (M1) excitability is modulated by the position of functional object pairs using transcranial magnetic stimulation (TMS)-induced motor-evoked potentials (MEPs). Right-handed participants observed object pairs in three hand contexts: no hand, held with a neutral or with a tilted-interactive hand posture. The hand posture implied action relation when the hands were facing each other but not when the hands were facing away. The objects were aligned for right- or left-hand actions. Reliable effects were only observed in the non-dominant (right) hemisphere. MEPs were greater for action-oriented objects aligned for non-dominant (left) vs. right-hand actions. For non-action oriented objects, an effect of hand posture was observed, with lower MEPs for left-hand actions when the hand posture was tilted compared to when it was neutral. The results indicate that the excitation of the non-dominant (right) M1 was influenced by action relation, hand alignment, and hand posture, with stronger responses when the tool was gripped by the non-dominant hand and when the objects were action-oriented. The data suggest that M1 excitability is modulated by cognitive processes supporting paired-objects affordance.

11.40 Object affordances and attention

Sanjay Kumar

Oxford Brookes University

Our attentional system has limited capacity and therefore is designed to optimise functionally relevant selection for action. Direct vision to action module in the brain helps to facilitate attentional selection of action relevant stimuli. This interplay between attentional prioritization for action oriented selection has traditionally been overlooked into most of the classical theories of attention. Research has shown that presence of action relations between stimuli reduces visual extinction in patients with reduced attention to contralateral visual space. The action information is considered to be coded pre attentively (however, a recent paper by McNair & Harris, 2016 suggests attention is required for action relation coding). Here I will present evidence

from behavioural, electrophysiological and neuroimaging data that how action information from visually presented objects modulates perceptual and motor responses to objects rapidly and automatically. Action information from objects helps to reduce the attentional demand and make target selection easy.

1.20 Nosing around olfaction: Investigating memory and sense of smell in Transient Epileptic Amnesia

Sharon Savage¹, Chris Butler², Fraser Milton³, Yang Han⁴, Adam Zeman¹

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Objectives: Transient Epileptic Amnesia (TEA) is a form of epilepsy characterised by recurring amnesic seizures. Both interictal memory deficits and olfactory hallucinations also commonly occur, although olfactory ability has never been objectively assessed in this group. This study aimed to measure olfactory ability in TEA and explore whether olfactory symptoms relate to other clinical variables.

Methods: Fifty-five participants with TEA were recruited from The Impairment of Memory in Epilepsy database. Details regarding olfactory symptoms were obtained via case notes and clinical interview. Participants completed questionnaires regarding their olfaction and memory function, with olfactory ability measured using the University of Pennsylvania Smell Identification Test (UPSIT). TEA participants' performance was compared to 50 matched healthy control participants. Twenty-six TEA participants also completed neuropsychological tests including standard memory measures, accelerated forgetting and autobiographical memory.

Results: 55% of TEA cases reported olfactory hallucinations. TEA participants were significantly poorer than healthy controls in identifying smells ($p < .001$). Epilepsy variables, including history of olfactory hallucinations, were not predictive of olfactory ability. Patients reported ongoing memory difficulties and performed below normative values on objective tests, however, no correlation was found between memory and olfactory performance. Subjective complaints of route finding difficulty was associated with UPSIT score.

Conclusions: Impairments in odour identification are common in TEA and exceed changes in

normal ageing. Olfactory hallucinations occurs in approximately half of TEA cases, but do not always coincide with reduced sense of smell. Deficits in olfaction and memory ability both occur frequently in TEA but are not closely associated.

1.40 Varying the degree of motion in actions influences gestural action depictions in Parkinson's disease

Ellen Poliakoff¹, Stacey Humphries^{1,2}, Trevor Crawford³, Judith Holler⁴

¹*University of Manchester*, ²*University of Pennsylvania*, ³*University of Lancaster*, ⁴*Max Planck Institute for Psycholinguistics, Nijmegen*

In communication, speech is often accompanied by co-speech gestures, which embody a link between language and action. Language impairments in Parkinson's disease (PD) are particularly pronounced for action-related words in comparison to nouns. People with PD produce fewer gestures from a first-person perspective when they describe others' actions (Humphries et al., 2016), which may reflect a difficulty in simulation. We extended this to investigate the gestural depiction of other types of action information such as "manner" (how an action is performed) and "path" (the trajectory of a moving figure in space). We also explored whether the level of motion required to perform an action influences the way that people with PD use gestures to depict those actions.

37 people with PD and 35 age-matched controls viewed a cartoon which included low motion actions (e.g. hiding, knocking) and high motion actions (e.g. running, climbing), and described it to an addressee. We analysed the co-speech gestures they spontaneously produced while doing so. Overall gesture rate was similar in both groups, but people with PD produced action-gestures at a significantly lower rate than controls in both motion conditions. Also, people with PD produced significantly fewer manner and first-person action gestures than controls in the high motion condition (but not the low motion condition).

Our findings suggest that motor impairments in PD contribute to the way in which actions, especially high motion actions, are depicted gesturally. Thus, people with Parkinson's may have particular difficulty cognitively representing high motion actions.

2.00 Formal statistical models in neuropsychology

Andrew Olson¹ and Cristina Romani²

¹*The University of Birmingham*, ²*Aston University*

One of Glyn Humphreys' many contributions to neuropsychology was to integrate studies of patients and computational models. We present two examples of studies that address fundamental properties of cognitive systems by formalising the statistical properties of theories and comparing them through formal model selection. In a study of three jargonaphasia patients, we use target/error overlap to argue that there is a single locus for jargonaphasic errors at phonological encoding, that models for reading and repetition must involve summation of lexical and non-lexical information, and that correct responses are special, they are not just responses that have survived the error generation process intact. Our second example involves mechanisms of serial production. There are well-established models in short-term memory, in aphasic spelling and speech and in motor control. These are similar enough to imagine that a single set of mechanisms operates across domains. We present a set of patients who make single phoneme errors in speech. In one subset, where independent evidence suggests a deficit at phonological encoding, there was a strictly increasing pattern of error across position. This was consistent with existing models. In a second subset, in patients with more peripheral problems, errors decreased across position. Statistical modelling suggested neither had to do with position. The first was driven by the number of previous errors and the second by the number of previous phonemes correct. Existing models do not include mechanisms to account for both of these patterns. Together, these examples demonstrate the power of formal models for theory testing.

3.00 *Keynote lecture*

Trouble seeing it your way: On the nature of perspective taking deficits

Dana Samson

Université Catholique de Louvain

Understanding other people's point of view is crucial for successful social interaction. In this talk, I will retrace several studies conducted in collaboration with Glyn Humphreys which investigated the pattern of performance in patients with brain damage to unravel the cognitive and neural processes underlying this perspective taking ability. The focus of the talk will be particularly on deficits that selectively affect the ability to inhibit one's own perspective. I will discuss what these deficits tells us about (i) the relation between self-perspective inhibition and more domain-general executive processes, and (ii) the brain areas that may be critical for efficient self-perspective inhibition.

POSTERS

Session A

Social cognition post brain injury: Impact of theory of mind impairment on socialization outcome

Eiman H. Alismail, Saeed Al Zahrani, Jiri Pazdirek, Mohammed Si Larabi, Fadi Abdulaziz

Affiliations TBC

Theory of mind ToM is the phenomenon of imputing mental state, emotion, and intention to self and other, and hence, it intensely impacts social interaction competency. Though previous empirical data signify the occurrence of ToM impairment among brain-injured individuals, there is regionally great limitation, if none, in addressing its prevalence and its correlation with other cognitive mechanisms.

A total of 62 participants with a history of brain injury will be compared to a similar number of a matched, non-brain injured participants on social cognitive tests that inclusively measure cognitive and affective capacities of ToM and its correlation with brain injury outcome measure. It is anticipated that current data will reveal significant declining in both dimensions of ToM task for brain-injured sample, in compare to the matched control. It is therefore, anticipated that this effect will be mirrored by low outcome measure in socialization domain

Achieving current aims will inform current practice regionally, which therefore will assist in establishing a preliminary rehabilitation protocol limiting the vulnerability to encounter socially demanding events, as well as advancing conceptual & theoretical practice related to ToM in Saudi Arabia, and also to cross-cultural knowledge.

Pain and social interactions: An arctic expedition

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* denotes equal contribution

Social interactions are said to influence individual experiences and vice versa. However, designing research to disentangle the bidirectional, causal associations between social and individual phenomena is an empirically difficult endeavour.

We present here a longitudinal, tightly-controlled design combining social network and self-report methods to investigate and disentangle these processes within the context of a fundamental experience that drives much of human behaviour – physical pain. We collected daily ratings of social interactions and pain experiences from a group of adolescents participating in a 3-week hiking expedition in an isolated part of the Arctic Circle, during which time participants interacted predominantly with one another and were subject to the same environmental influences. Using stochastic actor-oriented models (SAOMs) we disentangle processes of pain-related popularity (selection of interaction partners based on their levels of pain), homophily (selection of interaction partners based on similar pain experiences) and contagion (influence of another's pain on one's own pain experience), and the interaction of each with sex. We found no evidence of homophily or contagion. However, we did find evidence that individuals, specifically males, who reported more pain received successively fewer nominations as interaction partners. Additionally, we found that males in pain tended to withdraw from interaction with females. The popularity of females, in contrast, was unaffected by their pain experiences. These results highlight the utility of combining longitudinal social network approaches with psychological methods in order to infer causality in the interplay between social and individual phenomena.

The power of self-reference in action: Prioritized processing of self-relevant stimuli extends from perception to response execution

Clea Desebrock
University of Oxford

Considerable evidence indicates that self-related (as opposed to e.g. other-person-related) stimuli receive prioritised processing which can confer a performance advantage. Sui and colleagues have further shown that the effect is independent of stimulus familiarity, modulating perceptual as well as higher level (e.g. memory) processes, and is supported by distinct neural circuitry (Sui, He, & Humphreys, 2012; Sui, Rotshtein, & Humphreys, 2013). At the centre of their work is a paradigm procedure in which participants are instructed to associate a social label (for example, “self” and “stranger”) with arbitrarily-assigned geometric shapes, and then to judge whether the shape-label pairings, presented in the subsequent speeded task, match the learned association. A robust speed-accuracy advantage on self-matching trials is revealed. Current work continues to examine this self-advantage in the perceptual-cognitive

domains (e.g. the processing locus; Siebold, Weaver, Donk, & van Zoest, 2015; Sui, Sun, Peng & Humphreys, 2014). However, no studies have investigated whether processing of self-relevant stimuli extends a performance-advantage to response execution. Accordingly, the present study directly measured (cf. Fring & Wentura, 2015) the influence of self-processing in perceptual-matching on the movement component of responses using a novel variant of Sui et al's (2012) procedure. Results indicate, in a finding that is difficult to incorporate within traditional models of information processing, that this self-advantage permeates response execution. Implications for theory and translational work are discussed.

Self and team prioritisation effects in perceptual matching: Evidence for a shared representation

Florence Enock
University of Oxford

Previous research has demonstrated that in-group favouritism occurs not only in higher-level judgments such as reward allocation, but also in low-level perceptual and attentional tasks. Recently, Moradi et al. (2015) found a novel effect of in-group bias on a simple perceptual matching task in which football fans responded more efficiently to stimuli newly associated with their own football team than stimuli associated with rival or neutral teams. This result is consistent with a robust self-bias effect that has been demonstrated using the same perceptual matching task (Sui, He & Humphreys, 2012). The present research utilised the same paradigm to investigate the relations between self and in-group prioritisation amongst a sample of college rowers. Across two experiments, we demonstrated a positive correlation between the self and team advantages in both accuracy and reaction time and also found that group identification moderated this relationship such that the correlations were stronger in those who identified more strongly with their group. Further, we found no relation between the team advantage and positive valence implicitly associated with the team, showing that the team effects are unlikely to be driven by emotional significance. The results suggest an overlap between self and in-group representation which may provide evidence for common mechanisms driving both self and in-group effects on perceptual matching.

What's yours may be mine: Differential correlation between psychopathy traits and self, friend and other learned relations to neutral shapes in a matching task

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In a series of studies, (reviewed in Sui & Humphreys, 2015) it has been shown that the association of personal relationships with neutral geometrical shapes can affect performance on perception and attention tasks. For example, same or different word-shape match judgements are faster and more accurate for self-associated shapes than friend or stranger, perhaps as a result of improved stimulus binding processes. To date there has been no investigation of self-association processing in psychopathy, a complex disorder characterized by deficits in emotion processing and executive function and here we ask whether self-association is correlated with psychopathic traits (anti-social and emotion dysfunction), measured with the Self-Report Psychopathy Scale-III (Paulhus, Hemphill & Hare, in press). In a first short training phase, the participants (N=83 of a community sample) were instructed to pair 3 shapes (square, circle and triangle) with 3 relationships, "self", "friend" and "stranger". Participants then detected whether a presented word-shape were of the same relationship category or not, with performance measured by accuracy (d-prime) and reaction times (RT's). Mixed effects logistic and linear regression were used to analyse the data. There was little impact of emotion dysfunction scores on task performance. However, participants who had higher (worse) anti-social behaviour scores showed selectively better matching (increased accuracy and decreased RT's) for friend word-shape matches but not self or stranger (per unit increase in SRP relative to self: d-prime: OR = 1.08, $p = 0.039$; log RT: $\beta = -0.006$, $p = 0.004$). Interestingly, anti-social behaviour traits can benefit performance on friend-stimulus associations.

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Paulhus, D.L., Neumann, C. S., & Hare, R.D. (in press). Manual for the Self-Report Psychopathy scale 4th edition.

Compensation in Autism Spectrum Disorder: The mismatch between social cognition and behaviour

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Objectives: Heterogeneity in outcome for individuals with Autism Spectrum Disorder (ASD) is vast, ranging from those who experience persistent social difficulties to a subset who no longer fulfil diagnostic criteria. One candidate mechanism underpinning divergent pathways to outcome is compensation, which is the phenomenon of improved observable autistic behaviour (e.g. social symptoms) despite continued core cognitive deficits (e.g. in Theory of Mind). Individual differences in the ability to compensate for a socio-cognitive deficit may not be reflective of the cognitive burden for ASD *per se*. Instead, compensation may be influenced by additional cognitive factors (IQ, executive functioning). Further, anecdotal reports suggest a cost of compensation to mental health.

Methods: This study investigated compensation in 12-14-year-olds with ASD (N=136) by examining the discrepancy between Theory of Mind (ToM) and observable autistic (social) symptoms. High compensation was assumed when poor ToM was accompanied by relatively few social symptoms and low compensation when equally poor ToM was accompanied by a high number of social symptoms. The relations between compensation and additional cognitive and mental health characteristics were explored.

Results: Compensation was positively associated with IQ and executive functioning but also self-reported anxiety. Compensation was not associated with other core characteristics of ASD.

Conclusions: Results suggest that amongst adolescents with ASD, the ability to compensate for a ToM deficit is linked with additional cognitive ability and is not reflective of the burden for ASD itself. Future longitudinal investigations will clarify the direction of the relations between compensation, IQ, executive functioning and anxiety.

Neurobehavioural characteristics of limbic encephalitis associated with voltage-gated potassium channel complex antibodies

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It is known that limbic encephalitis associated with antibodies to the voltage-gated potassium channel complex (VGKC-LE) may result in memory impairment with accompanying hippocampal damage. However, comprehensive characterisation of the neurobehavioural profile of VGKC-LE patients is currently lacking. Here, we present in-depth neuropsychological and structural MRI data from a group of VGKC-LE patients ($n > 20$) using manual medial temporal lobe delineation and whole brain voxel based morphometry. We confirm that VGKC-LE is radiologically characterised by focal hippocampal atrophy. Furthermore, cognitive impairment is confined to the memory domain and persists for years after initial presentation. To our knowledge, this is the first comprehensive neurobehavioural assessment of VGKC-LE and suggests that the syndrome is a good lesion model for studies of hippocampal function.

Mental arithmetic shifts spatial attention: Evidence from a temporal order judgement task

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People often rely on a visuospatial medium to manipulate numbers. Previous studies showed that numbers are generally represented in ascending order on a left-to-right oriented continuum. Because the representation of numbers is spatially oriented, it has been assumed that solving arithmetic problems involves shifting attention toward the side of the continuum where the answer is represented. We predict that the interaction between mental arithmetic and spatial attention is determined by the relative position of the answer on the visuospatial continuum: subtraction should shift attention leftward because the answer is smaller than the first operand, whereas addition should shift attention rightward because the answer is larger than the operands. In the present study, we used a temporal order judgement task to evidence the attention biases induced by arithmetic operations. Participants had to determine which of a left or right target appeared first on the screen while solving subtraction and

addition problems. The targets were flashed with different stimulus onset asynchronies to find the asynchrony at which participants gave an equal proportion of left and right responses. Results showed that this point was larger when participants were solving subtraction problems compared to addition problems, meaning that the right target should be presented several milliseconds in advance to the left target to be perceived as simultaneous during subtraction. This finding indicates that attention was biased to the left side of space during subtraction compared to addition. We conclude from these results that mental arithmetic shares common resources with spatial attention.

Exploring the role of the right inferior frontal gyrus in visual perspective taking using transcranial direct current stimulation

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Perspective taking and handling conflicts between our own and someone else's perspective require the contribution of different areas in the brain. Among the regions of interest, we focused in this study on the right inferior frontal gyrus (rIFG), the role of which remains unclear. Sixty participants performed a level-1 and a level-2 visual perspective taking (VPT) tasks. Both tasks required participants to judge either their own (self-perspective condition) or an avatar's perspective (other-perspective condition), these perspectives being either the same (consistent perspective condition) or different (inconsistent perspective condition). Participants performed the tasks under anodal, cathodal or sham transcranial direct current stimulation (tDCS). Stimulation led to different effects according to the task level. In the level-1 task, stimulation affected performance in the inconsistent perspective condition, irrespective as to whether the irrelevant perspective was the participant's own perspective or that of the avatar, suggesting a role of rIFG in the ability to inhibit both self- and other- perspectives in case of conflict. In the level-2 task, which unlike the level-1 task involves mental body rotation, stimulation had an effect on self-salience, improving the ability to process self-perspective trials as compared to other-perspective trials in the anodal condition, while impairing it in the cathodal condition. This latter result suggests a role of rIFG in mental body rotation inhibition, which in turn might have led to a change in conflict resolution demands between self- and other's perspective.

Towards social neuropsychology: Introducing OCS-Social

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Social cognition is a complex process that requires the integration of a wide variety of behaviours. Previous studies show that in the clinical population social cognition most often fails in one or more of four domains, namely theory of mind, empathy, social perception, and social behavior. Current measures often assess only one, rather than multiple, domains of social cognition. However, successful patient's management depends on a comprehensive assessment of social cognition to facilitate the planning of neuro-rehabilitation. Here, we introduce OCS-Social a new comprehensive tablet based social cognitive screening battery. OCS-Social measures social cognition in the domains of theory of mind, empathy, social perception and social behavior. OCS-Social is a fast and comprehensive assessment of social cognition that could be used as a clinical tool in many neurological conditions including stroke and dementia. In the long run, this novel tool could be used to help assess the impact of social cognitive problems on long-term outcomes. Furthermore, it could be used to assess the relations between impairments in social cognition and underlying neurological changes through brain imaging.

Counterintuitive Moral Judgement following Traumatic Brain Injury

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Populations exhibiting frontal pathology, including Traumatic Brain Injury (TBI), appear to produce an abnormally 'utilitarian' pattern of judgements to moral dilemmas; judgements that disregard deontological moral rules in favour of maximising aggregate welfare (Martins et al., 2012). However, this patient research has always used extreme dilemmas with highly valued deontological moral rules (e.g. do not kill). Data from healthy participants suggests that when a wider range of dilemmas are employed, moral judgement is sensitive to psychologically based moral intuitions, rather than the tension between utilitarian and deontological moral doctrines (Kahane et al., 2011). We sought the moral judgements of 30 TBI

participants and 30 controls on moral dilemmas where content (utilitarian/deontological) and intuition (intuitive/counterintuitive) were measured concurrently. Overall TBI participants made utilitarian judgements in equal proportions to controls; disproportionately favouring utilitarian judgements only when they were counterintuitive, and deontological judgements only when they were counterintuitive. These results speak against the view that TBI causes a specific utilitarian bias, suggesting instead that moral intuition is broadly disrupted following TBI.

Session B

Space perception in children with cerebral palsy: A deficit of hemineglect or executive function?

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Research in the scientific literature suggests that children with cerebral palsy may have deficits in space perception, either lateralised as in hemineglect, or non-lateralised as with global executive function deficits. In the present study, we tested space perception in 16 children with hemiplegic cerebral palsy and 16 age-matched healthy participants. Measures consisted of conventional hemineglect tasks, including the Bells cancellation test, the Apple cancellation test, and the Test of Attentional Performance. In addition, we developed a "MonAmour" target detection test using the interactive robot ReaPlan. Data analyses compared between groups and within responses to ipsi- and contra-lateral fields for each task. Results showed that children with cerebral palsy were less accurate and slower for responses in both visual fields in all tasks compared to healthy children. Furthermore, children with cerebral palsy were less accurate to targets in the contralateral than ipsilateral visual field, especially on the MonAmour task, while this lateralised difference was not present in the control participants. This study is one of the first to investigate space perception in children with cerebral palsy. Interestingly, these data support the two views present in the literature by showing that children with cerebral palsy have both a global non-lateralised deficit in target detection compared to

paired controls, and then also, more pronounced difficulties to accurately detect targets in the contralateral compared to ipsilateral field. These results are discussed in terms of understanding the neuropsychological deficits in children with cerebral palsy, and potential new diagnosis measures that can be developed for assessment.

Temporal orienting of attention in patients with basal ganglia damage

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Objectives: Neuroimaging studies have consistently implicated the basal ganglia (BG) in temporal processing. Here we assessed whether temporal orienting, the ability to allocate attention to moments in time, is compromised in patients with brain damage to this region.

Methods: Eight chronic stroke survivors with BG damage, 10 stroke survivors with brain damage outside the BG and 18 age-matched healthy controls participated in the study. Two temporal orienting tasks were used: a speeded reaction-time task and a non-speeded perceptual discrimination task using rapid serial visual presentation (RSVP). In both tasks, auditory cues (high or low pitch) indicated the likelihood of a target stimulus appearing after a short or long temporal interval (75% validity). In the speeded RT task, participants were instructed to use the cues to help them respond as quickly as they could to seeing a green patch appear at the fovea. In the RSVP task, participants were instructed to use the cues to discriminate a target letter in a stream of rapidly presented distracting letters.

Results: Overall, stroke survivors were slower on the speeded RT task and less accurate on the RSVP task compared to healthy controls. In addition, compared to healthy controls, patients with BG damage did not benefit from the auditory cues to enhance performance in the RSVP task. In contrast, their ability to use temporal information to speed up performance was preserved in the speeded response task.

Conclusion: These findings demonstrate that deficits in temporal orienting caused by BG lesions can be modulated according to the task context

and domain in which temporal expectations operate.

Neuromodulation of inhibition skills in binge drinking

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Binge drinking, an alcohol-consumption pattern characterized by the repeated alternation between large alcohol intakes and abstinence periods, has become widespread in adolescents and young adults. Studies in this last decade have demonstrated its cerebral and cognitive consequences. In particular, executive functions, like inhibition or decision making, were impaired in binge drinkers (e.g., Goudriaan et al., 2007). Given their importance in the regulation of behaviours, executive deficits may promote the onset of alcohol dependence (Maurage, 2014). This study, combining behavioural inhibition training with electrical stimulation (tDCS), aimed (1) to explore general and alcohol-specific inhibition processing in a binge drinking population and (2) to restore these processes through left dorsolateral prefrontal cortex (DLPFC) stimulation.

Two groups were selected among university students, a binge drinkers group (N=14) and a control group (N=12). One session was composed by (1) a training inhibition task while participants received 20 minutes of stimulation, and (2) immediately after the stimulation, they had to perform a specific inhibition task with alcohol stimuli. Each participant had to realize two sessions (one left DLPFC stimulation and one sham), separated by one week, in a counterbalanced order.

Preliminary results showed inhibition difficulties for binge drinkers (i.e., more false alarms) compared to control students. Moreover, an effect of neuromodulation indicated an overall improvement in inhibitory capacity after stimulation of the left DLPFC in both binge drinkers and control participants. Additional analyses are in progress to determine whether these effects generalize to the inhibition task using alcohol stimuli.

Deficit in feature-based attention following a left thalamic lesion

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Selective attention is an effective mechanism to prioritise the processing of relevant over irrelevant information. The theory of priority maps with stored attention weights provides a conceptual framework that accounts for this prioritisation mechanism. The theory states that selective attention to certain locations, features or whole objects is necessary to compute objects' attention weights. As a result, the "peak" of weights on the priority map determinates attentional selection. Converging evidence from neuroimaging and neuropsychological studies propose the involvement of thalamic and frontoparietal areas in selective attention. However, it is unclear whether the thalamus is critically involved in generating different types of modulatory signals for attentional selection. The aim of the current study was to investigate feature- and spatial-based selection in stroke patients with subcortical thalamic and non-thalamic lesions. A single case with a thalamic lesion, five cases with subcortical lesions sparing the thalamus and 34 healthy, age-matched controls participated in the study. Participant performed a go/no-go task on task-relevant stimuli, while ignoring simultaneously presented task-irrelevant stimuli. Stimulus relevance was determined by colour or spatial location. The thalamic lesion case was specifically impaired in feature-based selection but not in spatial-based selection, whereas performance of non-thalamic lesion patients was similar to controls' performance in both types of selective attention. In summary, our thalamic lesion case showed difficulties in computing attention weights based on features, but not based on spatial locations. The results suggest that different modulatory signals are generated mediating attentional selection for features versus space in the thalamus.

Post-stroke deficits in attention and working memory: Prevalence and impact on sub-acute and long term functional status

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In the UK there are approximately 1.2 million stroke survivors. Of that population over half will experience disability and over a third will be dependent on others in their daily lives (State of the Nation, 2016). It is important to understand what types of disability are experienced and how deficits can influence functional recovery. For

example, domain general cognitive impairments have been linked to wider spread cognitive deficits (Massa et al., 2015) and poorer functional recovery (e.g. Huijben-schoenmakers et al., 2016). This study aims to explore the prevalence of domain general deficits in attention and working memory, the relationship between these impairments and other subacute impairment (< 100 days) and finally the impact of deficits on long term (>9 months) functional recovery. In a large sample of 682 stroke patients, 53% had impaired selective attention, 36% had impaired sustained attention and between 25% and 33% had impaired working memory. These impairments were significantly correlated with poorer performance on multiple cognitive domains and functional status at the subacute phase of recovery. Furthermore, in a sample of 230 patients assessed at follow-up impaired sustained attention at the sub-acute stage significantly predicted functional status at 9 months post stroke, even when taking stroke severity and age into consideration. The results highlight not only the prevalence of these deficits, but also the short and long term influence they may play on cognitive and functional recovery. These findings indicate the importance of successful integration of cognitive assessment and rehabilitation into the stroke pathway.

This work was supported by European Union FP7 Marie Curie ITN Grant N. 606901 (INDIREA) and Birmingham Cognitive Screen data collection was funded by the Stroke Association as part of a multi-site screening study across the West Midlands.

ADL rehabilitation for stroke apraxia and action disorganization syndrome: RCT of the Cogwatch approach

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Apraxia and action disorganisation syndrome (AADS) after stroke can often disrupt activities of daily living (ADL). CogWatch is an intelligent and interactive system that can assist those with AADS in everyday activities, such as making a hot drink.

A randomized controlled trial of the efficacy of this system with AADS patients was conducted. This trial used a task model based approach focused on making a cup of tea; this involved monitoring progress and giving feedback on the completion of each subtask.

The trial demonstrated an improvement of both speed and accuracy with the AADS patients in completing the hot drink task, using the CogWatch system. In addition there was evidence for an

improvement of a generalization to a complex tea task.

The trial demonstrates evidence for successful implementation of technology in AADS rehabilitation. Furthermore the task model based approach was effective in improving AADS patient's performance on a hot drink task. The information we can take from this trial in relation to errors allows future refinement of these task model based approaches in ADL rehabilitation.

The effects of action representation on working memory and attention

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What information directs our attention in the environment? Previous research indicates that attention can be directed by the information currently held in working memory and by action-related information in the environment. How working memory representations and action information combine in directing attention is currently unknown. This study has set out to explore this issue. Experiment 1 tested whether holding an action representation related to a specific object in working memory modulated attention to a subsequent display where a hand depicting the same action was shown. In baseline condition an object was presented prior to the search display, but no action had to be prepared to the object. In the working memory condition, the visual settings matched the baseline with the addition of the correspondent action representation. Effects of the initial object were found, but only when an action representation was prepared and held in working memory. In order to assess how performance was modulated by the likelihood that the prepared action would direct attention to a target or distractor in the subsequent search display, experiment 2 explored the working memory condition with two different of validity likelihood: 50% and 80%. The data showed that validity effect only emerged when the cue was informative about which grip would be paired with the target, suggesting that the prepared grip does not cue attention to a matching grip automatically. The results are discussed in terms of the limits of action representation studies when considering objects and its correspondent grip forms.

The development of an integrative robot test for the diagnosis of hemineglect

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Hemineglect is a frequent and persistent consequence of brain-damage that affects different modalities and reference frames. In our research, we investigate egocentric, allocentric and motor hemineglect. While clinical diagnosis tests exist for egocentric hemineglect, few measures exist for allocentric, and no tests exist for motor hemineglect diagnosis. Here, we report the first phase of a new integrative robot diagnosis test for hemineglect, with the creation and validation of an egocentric hemineglect measure. We tested 15 patients (10 hemineglect) on two occasions (three-day interval for test-retest reliability). Participants had to detect a target randomly presented among distractors, responding by using the robot end-effector. Targets were presented across lateral space (egocentric left-to-right), and participant's mean response reaction time and percentage omissions to the targets were recorded. In addition, we administered standardised hemineglect assessments to test validity. A repeated and between measure ANOVA showed that the robot test detected significant differences between patients with and without hemineglect, with hemineglect patients showing an ipsilesional bias of attention. Significant correlations between the new and existing tests demonstrated good validity for egocentric hemineglect diagnosis. Furthermore, intra-class correlation between the results of the two test occasions showed good reliability. The results are discussed in terms of the added value provided by the test, along with a description of phase 2 of the project, where we integrate allocentric objects and motor response components (where patients point to targets using the robot). The complete test will allow for an integrative diagnosis of hemineglect, using accurate perceptive and kinematic measures.

Sustained changes in visual neglect six months after contralesional transcranial magnetic stimulation

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Objectives: No study to date has assessed the long term effects of rTMS in neglect rehabilitation beyond six weeks. We explored the effects of rTMS in rehabilitating both spatial and object neglect in sub-acute stroke and its efficacy in improving neglect both one week and six months post intervention.

Method: The design involved: (i) administering a battery of neuropsychological tests including neglect tests (e.g.: cancellation, neglect-based Activities of Daily Living (ADL)) at baseline, one week post rTMS and six months post rTMS, (ii) 6 x 20 minute 1 Hz rTMS sessions on alternate days at 90% of motor threshold. Inhibitory rTMS was administered to the left hemisphere's inferior parietal lobe (P3) for the treatment group and the vertex for the control group.

Results: All 14 patients had left spatial neglect (treatment group=8, control group=6). 10 of these patients had left object neglect (treatment group=5, control group=5). Key results for spatial neglect showed that as compared to baseline, the treatment group significantly improved in both left (neglected) and right (non-neglected) side's target cancellation as well as neglect-based ADL performance both one week after and six months after rTMS. However, control group significantly worsened in the neglected side's target cancellation at one week follow up. No significant results were seen for object neglect.

Conclusion: Inhibitory rTMS to inferior parietal lobe improved both left sided target cancellation and neglect based ADL in the treatment group. This improvement was seen one week post rTMS and was sustained up to six months post rTMS.

Lateralised continuous performance task can modulate attentional weights

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The Theory of Visual Attention (TVA) provides a mathematical formalisation of the "biased competition" account of visual attention, where

visual categorisations of objects compete to be encoded into a visual short-term memory (VSTM) characterized by limited capacity (Bundesen, 1990). Applying this model to individual performance in a free recall task allows the estimation of 5 independent attentional parameters: VSTM capacity; speed of information processing; perceptual threshold of visual detection; "attentional weights" (representing spatial distribution of attention or "spatial bias"); and distractibility (representing the level of interruption caused by irrelevant information). The current study aimed to test which of the TVA-derived attentional parameters can be modulated following a lateralised attentional training. In order to do so, we designed a novel task requiring participants to sustain visual attention to two concurrent streams of stimuli, presented on two sides of a computer screen, and to respond to a pre-defined target. Each participant's attentional functions were assessed based on a CombiTVA paradigm (Vangkilde et al., 2011) prior and after training. Participants were allocated to one of four experimental groups: No Training, Balanced-training (equal proportion of targets on both sides), Rightbias and Left-bias (with increased probability for target appearing on either left or right side respectively). Our results show that overall such attentional training can modulate spatial distribution of visual attention, but the attentional weights were affected only when trained towards the right side. The implications of our study are discussed in the context of lateralized attentional networks, cognitive training and brain plasticity.

A new neuropsychological test for the assessment of changes in attentional function in preclinical dementia

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Objectives: Focus is shifting to preclinical stages of dementia (before substantial neurodegeneration) in therapeutic trials. Existing cognitive measures that are currently used as endpoints were not designed, however, for individuals with mild or no cognitive impairment. This creates a demand for new measures that are responsive to subtle changes in cognition over time and under treatment. We present a newly developed test that is part of a multidomain cognitive battery (DZNEcog), which aims at tracking changes in attentional functioning in preclinical dementia.

Methods: The task involves indicating the presence of 4 target objects among distractor objects by button press. Graded difficulty is achieved by varying total set-size, target-distractor

similarity, and presentation time. 324 items were developed, 180 of them contain the target. They were field-tested in 50 elderly controls (mean age = 71.05, SD = 5.43). Data was Rasch-analyzed using eRm.

Results: Of the 180 target items, 151 items that cover a broad range of difficulties (-2.82 to +3.06 logits) and display sufficient item quality (item outfit and infit between 0.5 and 1.5) were identified. Person reliability of these was high ($r = .93$). Test-retest stability after a six-month interval with elderly controls ($N = 16$) was moderate ($r = .66$). Significant correlations ($r = .27$) were found with other attention tests (WAIS Digit-Symbol Coding: $r = .27$; TAP Alertness: $r = .26$).

Conclusions: To measure subtle changes in attentional function, items that are closely spaced along a difficulty continuum were developed with high reliability, validity, and moderate stability in a group of healthy elderly controls.

Exploring numerical effects on clock drawing in unilateral neglect: Line bisection, numerical midpoint estimation and numerical and alphabetical clock drawing analysis

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The clock-drawing test is a widely-used clinical task to detect the presence of spatial neglect (SN) in patients with right hemispheric lesions. It is relatively quick to administer and may elicit striking manifestations of representational neglect.

It has been shown that patients with neglect may also manifest numerical biases towards larger numbers, and these may contribute to the abnormal clock-drawing observed in this group. In a recent study, Arshad and colleagues demonstrated that standard clock-drawings can be experimentally distorted by combining visual and caloric stimulation, whereas this intervention does not affect 'alphabet clock-drawings, where each number is replaced with a corresponding letter.

In this study, we investigated whether spatial neglect would have a different effect on patients' ability to draw a clockface, depending on whether the clock contained numbers or letters. Six right-hemispheric stroke patients with SN and six healthy age-matched controls performed the following tasks: line bisection, numerical midpoint estimation and two clock-drawing tests - one numerical and one alphabetical.

Neglect patients showed a significant rightward bias in line bisection, but no significant bias for larger numbers in the numerical estimation task. Clock drawings produced by patients were not significantly different from those produced by controls. However, they showed a significant leftward shift in their centre of mass in drawing alphabet clocks, i.e., they drew radially extended ellipses.

These results suggest that the spatial and numerical components of clock-drawing do interact and shape patients performances in this clinical test. This should be taken into account when evaluating representational neglect.

Session C

Ignoring the leaves in order to see the forest: Global and local perception in autism

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Autism is a developmental disorder that appears in early childhood and includes social and communication deficits, along with fixated interests and repetitive behaviors (APA, 2013). A well-documented characteristic of people with Autism is their strong tendency towards processing of local information. It has been previously suggested that this tendency has a causal role in many Autistic symptoms (e.g. deficient face processing). The aim of the present study was to find out whether the local bias of people with Autism is constant or it can be influenced by manipulating the relative saliency of the global and local levels of the stimuli. 25 adolescents (aged 15-20) and 25 matched neuro-typical controls performed the "Navon Letter" task with global or local saliency manipulation. Results revealed that the autistic participants were more sensitive to increased local saliency, which was reflected in improved processing of the local level and difficulty in ignoring it when responding to the global level. However, similar to their typically developing peers, autistic participants also demonstrated improved global processing when global saliency was increased. Since human perception can be trained, these findings may have important clinical implications.

Motor resonance in Parkinson's disease: Evidence for intact imitative priming

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Incidental observation of another person's movement can influence the performance of actions in healthy individuals, but the effect of movement disorders such as Parkinson's disease (PD) on this process is unclear. Visuomotor priming (sometimes referred to as automatic imitation) demonstrates activation of the perception-action network, or motor resonance, whereby movement is influenced by compatibility between the intended action and a task-irrelevant action stimulus. Visuomotor priming has not been consistently found in PD; however, previous studies did not separate imitative compatibility from general stimulus-response compatibility effects (e.g., direction of movement).

We examined motor resonance in 23 participants with mild to moderate PD (63.5 ± 6.48 years; Hoehn & Yahr stage $2.0 \pm .71$) and 24 healthy older adults (68.3 ± 5.37 years), using a visuomotor priming task that pitted imitative compatibility against general stimulus-response compatibility effects. Participants made a button-press response following observation of task-irrelevant compatible or incompatible movement of a human finger or a rectangle.

Both groups showed an imitative compatibility effect for the human finger but not for the rectangle. Compatibility effects did not differ between groups, indicating intact motor resonance in PD.

By controlling for general stimulus-response compatibility effects, these results represent the first unambiguous demonstration of imitative priming in both PD and healthy ageing. Motor resonance has an important role in learning and social interaction, and the present findings have implications for therapeutic techniques to facilitate action, as well as the understanding of social cognition in PD.

Recognizing and executing movements: An investigation using Voxel-Based Morphometry (VBM)

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The skills to execute and understand actions are crucial for everyday life and likely depend on both overlapping and distinct processes, although the debate is still open.

Of central interest for this study was the relation between different apraxic symptoms in action recognition, production and imitation and the brain areas possibly involved. To this end, the scores obtained by a sample of 341 patients to tasks of Action Recognition, Gesture Production and Imitation were entered in a large-scale lesion-symptom analysis to predict changes in signal intensity from GM and WM brain regions.

On average the three tasks related to signal changes on the left anterior cingulate (ACC) and medial temporal cortex. The Action Recognition task had the stronger relation with those areas. However a cluster extending to the left middle temporal cortex also related to Gesture Production, where the patients had to reproduce meaningful gestures on verbal command. This suggests a role of this area in retrieval on relevant information from Long Term Memory (LTM).

Brain areas for Gesture Production also extended on the left supramarginal gyrus, moreover a small cluster on the frontal cortex was linked to Imitation only.

Finally, the scores to the three praxis tasks also predicted signal changes in WM tracts within the superior temporal gyrus in the left hemisphere. Similarly to the GM analysis, a major contribution of Action Recognition emerged.

These results will be discussed in the context of existing literature. Moreover, beside the theoretical implications, their possible contribution in guiding neuropsychological testing and patients' therapeutic treatment will be treated.

Material-specific impairment to face memory in a case study of focal right perirhinal cortex damage

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It is well established that medial temporal lobe (MTL) structures, including hippocampus and perirhinal cortex (PrC), support long-term memory. Less well established is the segregation of MTL structures in terms of process- and material-specificity. In a first case study with a patient with left-lateralised damage to perirhinal cortex specific deficits were observed in familiarity for words and

nonwords compared with unfamiliar faces and abstract objects with unimpaired recollection across all stimulus categories. However, it is currently unknown how a lesion to right perirhinal cortex impacts upon recognition memory. Given lateralisation of verbal material processing to left and nonverbal to right hemisphere it is expected that right-sided damage will impair familiarity of nonverbal compared to verbal, specifically faces compared to scenes, memory for which is supported by HC. In the current, similarly rare case study, a 48-year-old male with focal damage to right PrC following a cerebral abscess that spares the hippocampus demonstrated normal performance on a range of standard neuropsychological tests. However, a specific deficit was detected in recognition memory for faces, compared with scenes and words. Performance on the Cambridge Face Perception Task was unimpaired suggesting that this recognition memory deficit was not associated with impaired perception of faces. These results support material-specificity for recognition memory within right MTL structures, but leave open the question of process-specificity. Ongoing experiments test for a material-specific dissociation between familiarity and recollection processes in right PrC.

The impact of Posterior Cortical Atrophy on activities of daily living

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Aim: Posterior Cortical Atrophy (PCA) is an atypical variant of Alzheimer's disease (AD), characterised by visuospatial and visuoperceptual deficits. The impact of PCA on a patient's activities of daily living (ADL) has not been previously investigated, yet better understanding of ADLs is essential for disease management.

Method: Twenty-six PCA patients and caregivers participated in this cross-sectional study. The Disability Assessment for Dementia (DAD) was administered to caregivers to provide outcome measures about ADLs. We examined basic and instrumental ADLs (BADLs, IADLs), and three components of performance: initiation, planning and execution of everyday actions.

Results: PCA patients were severely affected, with the majority of patients demonstrating moderate to severe functional impairment. Patients were impaired on both IADLs and BADLs, as well as in each performance measure examined.

Conclusions: PCA has a devastating effect on ADLs. Our work has clear implications for informing disease management and prognosis in PCA.

Reduced interhemispheric Stroop-like interference in childhood and ageing

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One of the most important structural changes that occur in the brain of both children and older people relates to the corpus callosum (CC), the largest neural pathway that connects the two cerebral hemispheres. The CC continues to myelinate during childhood until puberty and that endures a process of demyelination in aging. Hence, a primary question of interest is whether these changes in callosal myelination have functional consequences on interhemispheric communication. To investigate interhemispheric function in children and older people, children (aged 7-8 years), older adults (aged 61-82 years) and control young adults (aged 18-23 years) were tested with a divided visual field Stroop-like task. In this modified version of the Stroop paradigm, a number of dots (2 or 3) were paired with either an incongruent or congruent Arabic digit ("2" or "3"). The stimuli were presented tachistoscopically with the two components either distributed across the two hemifields or presented to a single visual half-field. The Stroop effect, the difference in reaction times between the incongruent and congruent trials, was not affected by stimulus presentation in the control group. However for both children and older adults, the Stroop effect was significantly smaller for bilaterally-presented stimuli than for unilaterally-presented stimuli, indicating reduced interhemispheric interference in those groups. These findings suggest that age-related callosal thinning has specific functional consequences likely due to a decrease in interhemispheric connectivity. In particular, the condition appears to affect the ability of one hemisphere to interfere with the operation of the other hemisphere.

Effect of Ebbinghaus illusion on perceptual and grasping judgements

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The theory of two visual systems assumes that visual perception relies on a ventral pathway extending from the striate cortex to the inferior temporal cortex, whereas visually-guided action

relies on a dorsal pathway extending from the striate cortex to the superior parietal cortex. The finding that size-contrast illusions deceive perception but not action has long been taken as supporting the independence of these two pathways. For example, the Ebbinghaus illusion shows that the size of a central circle is perceived as smaller or larger according to the size of surrounding circles. However, it is still unclear whether action resists this illusion because of the difficulty to match size judgement and real action in terms of visual and proprioceptive feedback. To overcome this problem, we tested the effect of Ebbinghaus illusion on grasping judgements implying a covert activation of the motor programs involved in grasping. The task required participants to decide whether or not they felt able to grasp the central circle of an Ebbinghaus pattern without moving their hands. As a control, we asked other participants to decide whether or not the central circle was smaller than a previously seen circle used as a reference. In both tasks, participants' performance provides strong evidence that the Ebbinghaus illusion affects both perception and action. These results suggest that common processes underly the computation of object size irrespective of vision aim, i.e. vision for perception or for action.

Coming to grips: The effect of perceived hand grip on action decisions to handheld tools

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Evidence suggests that object perception includes the detection of 'affordances', i.e., the potential for objects to afford manual actions, even in the absence of the intention to such actions. For example, bimanual responses to tools whose graspable part (handle) is oriented towards the responding hand are facilitated. Furthermore, responses to objects held by a hand in a grip that is congruent with the object's typical use, are facilitated compared to when the handgrip is incongruent (Yoon & Humphreys, 2005, *Mem. & Cog.*, 33, 1131-46). We evaluated the effect of handgrip congruency on brain electrical activity using the lateralized readiness potential (LRP), an index of response preparation. Observers performed verification tasks in which centrally presented images of left- and right-oriented hand-gripped objects were preceded by an object name or an action word (cf. Yoon & Humphreys, 2005). Hand grip was either typical for the object's normal use (congruent) or atypical (incongruent) and was task-irrelevant. During action word—but not object name—verification, the time course of image-locked LRPs showed an early (~150 ms) deflection

to correct hand response preparation for action-congruent hand grips, and an incorrect preparation for action-incongruent hand grips; response-locked LRPs showed a similar modulation. LRPs were unaffected by the orientation of the handgripped object, and response times showed no congruency effects by hand grip or orientation. These findings suggest that during action decisions without the intention to perform the action, perceived hand grip facilitates response preparation.

Vestibular impairments and visuo-spatial dysfunction: Comparison of subjective and objective cognitive assessment in patients with bilateral vestibular loss

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Studies that have investigated cognitive and emotional problems in patients with bilateral vestibular loss have typically used questionnaires, with these showing significant increased complaints compared to control participants (Smith et al., 2010). However, currently, no research has explored the specific link between these subjective complaints and objective cognitive assessments. In the present study, we compared patient's subjective responses to questionnaires of Dizziness Handicap Inventory (Jacobson & Newman, 1990), Hospital Anxiety Depression Scale (Zigmond & Snaith, 1983), and Neuropsychological Vertigo Inventory (Lacroix et al. 2016) to an objective neuropsychological assessment battery. We tested 13 patients with bilateral vestibular loss and 13 age and sex matched controls on the same assessments. Data analyses were performed using between groups ANOVA, with various independent variables associated with the different measures. The results showed a clear difference between groups for the subjective measures, replicating previous research, and showing that vestibular patients present with more subjective cognitive complaints than matched controls. However, interestingly, results on the objective neuropsychological measures failed to show statistically significant effects. These preliminary results suggest that even if patients believe that they have reduced cognition caused by their vestibular deficits, it remains challenging to demonstrate the effects using simple (standard) objective cognitive measures. We discuss the mismatch in results in

terms of cognitive specificity and complexity. We also propose that the objective measure may more likely show effects if combined with a dual task, adding strain to cognitive resources.

Neuropsychology and Cross-Cultural Differences: View through computational modelling

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Research in the area of neuropsychology is strongly influenced by the individualists European American data and in extend the rehabilitation approaches identified are based on the outcomes of this research. However, it has been found that one area that individualist European and American cultures differ from collectivist East Asian culture is the picture perception [1]. Collectivists in comparison to Europeans are more likely to attend to perceptual field as a whole rather than the salient item. To investigate the affect that this cross-cultural difference has in stroke patients we employed the spiking Search over Space and Time model (sSoTS) that has previously simulated cross-cultural differences [2] and has been used in Neuropsychology [3] to simulate lesioning in collectivists group. The outcomes of the research highlight that the lesioning affect is more pronounced in collectivist than individualist group. The outcomes are further discussed.

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Disrupted size-weight and material-weight illusions in Visual Form Agnosia

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Objectives: In the size-weight illusion (SWI), small-volume objects are judged as heavier than larger-volume objects of equal weight. In the material-weight illusion (MWI), objects of a given size and weight are judged as heavier if the object's surface makes it appear to be made of a less dense material (e.g. wood vs stone). Current

explanations emphasise the mismatch between predicted and experienced weight: objects that are lighter-than-expected are perceived as relatively light, and objects that are heavier-than-expected as relatively heavy. Prior anecdotal reports suggest that a patient with Visual Form Agnosia (DF), having impaired visual perception of object size and identity, does not experience the SWI when the object is previewed visually, but does show the illusion when she can gauge object size haptically.

Methods: We tested the visual and haptic SWI, and the visual MWI, across repeated lifts, in patient DF and in six healthy controls.

Results: We confirmed that DF does not experience the visual SWI or MWI, but does show a robust haptic SWI. The visually-based illusions were absent despite the fact that DF could make gross perceptual discriminations between objects of different size, and could accurately assess the object's surface appearance (polystyrene, wood or stone).

Conclusions: Visual Form Agnosia disrupts the formation of normal sensorimotor expectations from visual cues. Interestingly, this was true even though DF could distinguish between the objects viewed, suggesting that conscious expectations are not critical, but that more direct implicit knowledge of object properties may be required.

Session D

Winner of the BNS Undergraduate Project Prize **Memory consolidation in children: Does wakeful rest boost consolidation of newly formed memories in the classroom?**

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How can we improve learning and memory retention at school? Research in adults suggests that a short wakeful rest immediately after learning supports memory consolidation (strengthening). Therefore, the present study aimed to examine whether a similar effect is present in children in the classroom. Children underwent a 'learning session' where new information was taught, followed by an immediate recall test which determined how much had been encoded. The control (task) group were then given a 15-min perceptual game interval where they completed spot the difference tasks, and the experimental

(rest) group were given 10-mins of 'quiet time' where they were asked to quietly lay their heads on their desks and relax, followed by a 5-min spot the difference task. Free recall was then tested at this stage (15-min delayed recall), and again 7 days later (7-day delayed recall) to determine how much information had been retained at each time point. A recognition test was also introduced after 7 days. Using this paradigm, two separate experiments were conducted, differing in the type of materials learned: Experiment 1 used information based on real-life classroom materials – a powerpoint presentation based on facts of Papua New Guinea; and Experiment 2 used a standardized wordlist from the Rey Auditory Verbal Learning Test. Results showed no significant benefit of resting after learning the standardised wordlist (Experiment 2). However, a significant benefit of resting was found after learning classroom materials (Experiment 1). The results from Experiment 1 are consistent with previous findings in adults and suggest that rest provides children's memory systems with an opportunity to consolidate recently-learned information.

Do you remember? Semantic support during encoding ameliorates but does not normalise memory performance in Posterior Cortical Atrophy

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Background: Posterior cortical atrophy (PCA) is the visual variant of Alzheimer's disease (AD), characterised by atrophy in the parieto-occipital cortex. Diagnostic criteria suggest that memory is initially intact. However, we have previously shown that memory in PCA is significantly impaired on a simple screening test. We hypothesised that memory impairment in PCA is motivated by characteristic parietal atrophy and will therefore be normalised by strategic support during learning and retrieval.

Methods: 18 PCA, 50 amnesic AD, 25 healthy controls (HC) were tested with (1) The Rey Auditory Verbal Learning Test (RAVLT), incorporating standard learning and free recall and (2) The Free and Cued Selective Reminding Test (FCSRT), incorporating controlled encoding to focus attention, free and cued recall components.

Results: On the RAVLT, PCA patients were impaired compared to controls, with similar learning and long-term percentage retention over trials for both patient groups. While the same pattern emerged on the FCSRT for encoding, free recall was significantly better in the PCA group compared to AD, although still not normal. Critically, there was no significant difference in the results between PCA with short (<3 years) or long (>3 years) symptom duration.

Conclusion: Memory is impaired early in PCA, but strategic support during encoding partially improves memory retention. However, memory function is not returned to normal. The results suggest that diagnostic criteria for PCA should take memory dysfunction into account.

Multisensory enhancements in expressive aphasia

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Complex cortical and subcortical neural networks, including temporal, frontal, and parietal associations regions, subserve multisensory processes. Converging evidence suggests that the activation of multisensory networks is not only dependent on the task at hand and attention, but also stimulus type. Here we report two patients with stroke and expressive aphasia, and deficits in reading and number processing. MRI scans show that both patients have large lesions extending through the left temporal, parietal and frontal regions, including the superior temporal gyrus. Multisensory processes were assessed using a letter (i.e., graphemes' and phonemes' of stop consonants) and a matched complex symbol-sound discrimination task. Stimuli were presented temporally synchronously and with stimulus onset asynchronies (SOAs). Healthy adult controls showed the classic profile with optimal multisensory enhancements for letter and novel stimuli with SOAs in close temporal proximity within 100 ms. In contrast, patients showed a deficit in multisensory processes when discriminating letters, but not novel complex symbols; patients' responses were delayed when auditory phonemes were presented first, and multisensory enhancements were not observed

when the graphemes were presented first. Interestingly, both patients showed typically enhanced responses to audio-visual novel sounds and symbols when presented in close temporal proximity. These results suggest a possible dissociation of multisensory processes for letters, and perhaps more general language related stimuli, from novel audiovisual object processing. Importantly, some multisensory processing and enhancements remain intact in patients with expressive aphasia. We further demonstrated that multisensory enhancements could generalise to drive long-term improvements in language related processes (e.g., phoneme and grapheme identification).

Can cognitive screening tasks inform capacity to consent to research in chronic stroke?

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Ethical and legal practice requires all researchers to obtain a valid informed consent from anyone participating in research. Considering that the capacity to consent relies on the employment of cognitive resources, individuals with impaired cognitive function may be at risk for lacking capacity, as defined by the Mental Capacity Act. In participants who have suffered a stroke, capacity cannot be assumed, given the potential of various cognitive deficits following brain injury. The current study examined 22 chronic stroke patients for their capacity to consent to research. Patients completed two dementia screens, the Montreal Cognitive Assessment (MoCA), and the OCS-Plus. The four pillars of the Mental Capacity Act (understanding, retention, using or weighing up information, and communicating a decision) were assessed by means of a semi-structured interview (current gold standard). Pairwise comparisons, chi-square tests, and bivariate correlations were employed to investigate the relationship between capacity outcomes on the separate domains and cognition. Language, executive function, and memory tasks yielded significant differences between patients with normal vs. limited capacity. Results suggest the importance of measuring each pillar of capacity separately, and that domain-specific measurement with the OCS-Plus provides more reliable means of assessing consent capacity than a pass/fail score on the MoCA.

Cognitive function in low-income and low-literacy settings: Validation of the OCS-Plus screen in a rural South African population

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We present a cross-sectional study of a sample of 1,402 men and women aged 40-79 from the HAALSI (Health and Aging in Africa: A Longitudinal Study of an INDEPTH Community in South Africa) study. The aim of the study was to further theoretical contributions in cognitive neuroscience with an emphasis on issues specific to Low and Middle Countries (LMIC) related to age-related cognitive decline and cognitive reserve. Participants were administered the Oxford Cognitive Screen - Plus (OCS-Plus) along with health and socio-demographic assessments. We found that OCS-Plus has excellent construct and external validity for basic measures of orientation and verbal memory. OCS-Plus scores also show consistent associations with age and education level, so that younger respondents and the more educated do better on all assessments. In addition, we found that domain-specific scores associate with alcohol consumption and depression. We conclude that the OCS-Plus represents a major methodological advance in cognitive aging studies in LMICs and enhances understanding of cognitive aging.

Modelling optic ataxia via attentional loading in central vision

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Objectives: This study investigated the effect of attentional load at fixation upon reaching responses to targets at different eccentricities. The aim was to address whether attentional load would modulate reaching errors, and whether this would mimic the character of optic ataxia. The prediction was that attentional load would increase errors towards the point of fixation, and that this effect would be greater for more eccentric targets.

Methods: A large touchscreen computer was used to present fixation and pointing stimuli. Participants monitored a stream of stimuli at fixation, using a keyboard to respond when a target item was shown. They concurrently reach toward the screen to touch targets that appeared at different eccentricities. The attentional load of the fixation

task was manipulated blockwise (low, medium, high).

Results: In accord with the hypothesis, increased attentional load amplified pointing errors, with the most pronounced errors being toward fixation for the most eccentric targets. Interestingly, at the smallest eccentricity, errors tended to be further from fixation under high attentional load. Inspection of prior literature suggests that similar patterns may be observed at near eccentricities in at least some patients with optic ataxia.

Conclusions: These data suggest a possible 'model' of optic ataxia in the normal brain, and provide further support for a causal role of attention in these visuomotor symptoms.

Towards a more ecological assessment of verbal memory

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Verbal memory measures are the most crucial and indicative measures of precipitous memory decline associated with Mild Cognitive Impairment and Alzheimers Dementia.

We examined whether a more ecologically valid story recall task could provide a more sensitive baseline of healthy ageing memory decline than the typical 5 word encoding and recall measure.

We developed a novel story recall approach with two distinct storylines, to allow immediate and delayed recall to be assessed independently of one another. Each 'stream' contained 15 target elements. We contrasted performance on this task to performance on the MoCA 5 word immediate and delayed recall.

A sample of 59 healthy ageing participants (>50 years old) were tested on the MoCA and the novel Story Recall Task. In addition, a sample of 33 chronic stroke patients also completed both tasks.

Both immediate (SD=0.68) and delayed recall (SD=1.34) in the MoCA showed lower variation than immediate (SD=9.22) and delayed recall (SD=10.65) in the Story Recall Task. The distribution of scores on the novel task demonstrated a normal distribution for the healthy controls, and a shifted and wider distribution for the patients.

We conclude that this more ecologically valid measure given a large normative data sample

taking into account age and education levels, could be a step forward in determining subtle signs of early decline as well as allowing a larger range of impairment levels diagnosis (mild, moderate, severe – as opposed to binary decisions).

Dissociating neglect dyslexia and visual neglect following stroke

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Visuo-spatial neglect is a common neuropsychological syndrome characterized by lateralized attentional deficits. Neuropsychological evidence suggest that neglect can selectively impair perception in multiple reference frames. In this study, we investigated neglect dyslexia (ND) using a sentence reading task and spatial and object neglect using the Hearts Cancellation and Apple Cancellation tasks (OCS and BCoS respectively). 942 subacute stroke patients were included with data for both tasks. We found 33.2% exhibiting neglect towards the contralesional side of the perceived space ('Egocentric' neglect) and 32.4% neglecting the contralesional part of a perceived object ('Allocentric' neglect). Neglect Dyslexia (ND) occurred in approximately 2.7% of patients and was characterized by consistently lateralized errors when reading words. Although ND is often thought to be associated with visuo-spatial neglect, any presumptive relation is still unclear. We identified 22 patients with clear cases of ND. Of these patients, 16 exhibited right lateralized ND and 6 left lateralized ND. ND was found to be dissociated from both allocentric (ND= 14) and egocentric neglect (ND= 10). 5 ND patients were found to perform normally when asked to read pronounceable pseudowords, suggesting that ability to read words with lexical content may be selectively damaged in some cases of ND. Cumulatively, these findings suggest that ND is caused by a reading-specific attentional/perceptual cognitive deficit which can occur independently of both allocentric and egocentric neglect.

Cognate effects in Bengali-English bilingual aphasia

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Cognate advantage in word production refers to higher accuracy and shorter reaction times (RT) for cognate words (words with similar meaning and

forms; e.g., /bʌtən/ in English and /bɔtʌm/ in Bengali) over non-cognate words (words with similar meaning but different forms; e.g., /haus/ in English and /bʌri/ in Bengali). Bilingual research have yielded mixed results, ranging from cognate advantage in healthy and in aphasia (better performance for cognates¹), disadvantage in some cases with aphasia (poor performance for cognates²) as well as no effects³. These findings have been attributed to language dominance, structural distance between the languages (e.g., structurally similar languages, Italian-English vs. structurally distinct languages, Chinese-English) and neurological status. In aphasia literature, it remains unresolved whether cognates are beneficial or detrimental in word production. We investigated the effects of cognate word status for seven Bengali-English non-fluent individuals with aphasia (IWA) and seven Bengali-English age-, gender- and education-matched healthy adults (HA). All participants were Bengali dominant, had learnt and used English for verbal and written communications. Participants named pictures of 38 cognates and 38 non-cognate nouns both in English and Bengali in two separate sessions. Accuracy and RT of naming responses across word types (cognates vs. non-cognates) and languages (Bengali and English) showed that cognates were named faster than non-cognates in English (i.e., non-dominant language) by both HA and IWA. However, this effect was stronger for HA compared to IWA. Theoretical and clinical aspects of these results would be discussed in the context of variables influencing word production in bilinguals.

Can a strategy overcome a failure to inhibit?

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Background and aims: Inhibition of prepotent responses is crucial for appropriate and adaptive behaviour. Although initiation and inhibition difficulties are well documented following frontal damage, our understanding has been limited by task differences. The Hayling Sentence Completion Test was designed to assess verbal initiation and suppression within the same task. The current study investigated profound inhibition deficits in two patients with large left frontal tumours, and the ability to use a strategy to suppress verbal responses on the Hayling Test.

Method: Patients KI and PM completed baseline cognitive tests, including the Hayling Test, and two experimental tasks: (1) a Selection Sentence Completion task containing high and low constraint sentence frames that varied selection demands (high and low); and (2) the Hayling Strategy Trials task comprising four strategies aimed to override a suppression failure and facilitate production of an unconnected completion word.

Results: The patients were able to initiate responses to complete sentences high in constraint on the Hayling Test. This was in contrast to their impaired ability to suppress responses in order to produce an unconnected word. KI was also impaired when initiating responses to complete low constraint sentences, consistent with a selection deficit, and he was virtually unable to benefit from a strategy to overcome a suppression failure. PM, however, was unimpaired when initiating responses to complete low constraint sentences and was able to implement each strategy to overcome a suppression failure.

Conclusion: KI and PM presented with a suppression failure but KI also had a selection deficit and was unable to implement a strategy. By contrast, PM's selection ability was intact and her deficit was in generating rather than implementing a strategy. The differential performance of KI and PM provides insights into verbal initiation, suppression, selection and strategy mechanisms, which has implications for neurorehabilitation.

Title TBC

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According to the Stroke Association, stroke is the most common cause of adult disability in the United Kingdom. Language impairment, namely aphasia, is one of the most frequent cognitive deficits following a stroke and it is clear from research that early diagnosis of language impairments and their adequate rehabilitation post-stroke is crucial for successful recovery. However, in light of the little time Speech and Language Therapists have and the limited resources allocated to rehabilitation within the NHS, diagnosis is rarely thorough and the time spent with patients is insufficient for effective rehabilitation to be carried out. My research is concerned with computerised rehabilitation programmes for patients detected with language problems on a stroke-specific cognitive screen (the Oxford Cognitive Screen). I present here results on the efficacy of short and long training programmes for improving the processing of prepositions in aphasia. A single patient with expressive aphasia

took part in two computer training programmes to improve preposition processing. There were significant improvements after both short and longer therapy regimes for phrases and sentences, and the benefits transferred to prepositions not included in the training. The improvement was greater when reading rather than listening on the sentence task but the opposite pattern emerged for the phrase task. Despite the large improvement, performance on prepositions remained impaired (relative to near perfect performance in controls). The findings are discussed in terms of post-stroke recovery and cost-effectiveness of rehabilitation, as well as effects of memory impairments on language rehabilitation.

and counselling, to potentially benefit cognitive function and general wellbeing.

It's neuro-sex-ological! Using traditional and novel assessments to explore associations between sexual activity and cognitive function in healthy older adults

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Research in the area of sex and cognition in later life is limited. Wright & Jenks (2016) established a significant association between sexual activity and cognitive function, in a large nationally representative cohort of men and women aged 50-89 years. One limitation of this study was the two broad measures of cognitive function, where performance on both could be underpinned by working memory.

The current study aimed to: i) explore whether sexual activity is associated with performance on a wider range of cognitive tests, and ii) assess the role of frequency of sexual activity in this association.

Seventy-three healthy volunteers (50-84 years) completed a health and wellbeing questionnaire, and two cognitive assessments: ACE-III and OCSd. Preliminary analyses show significant linear trends for increasing frequency of sexual activity (e.g. never, monthly, weekly) and increasing performance on a range of tests of different cognitive domains.

We discuss the potential underlying biological mechanisms linking sexual activity and memory, limitations of ceiling effects in traditional cognitive assessments, and benefits of contemporary computerised tests such as OCSd. We conclude that sexual activity is associated with cognitive function generally, but may be linked more specifically to working memory in particular. Our results ultimately have implications for the importance of intimate relationships in later life, as well as the provision of sexual health screening