



UNIVERSITY OF
CAMBRIDGE

Department of Psychology

Undergraduate research within the Department of Psychology 2015-16

A guide for PBS Tripos Part IIB students and NST
Part II psychology students

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Introduction

Part IIB students in the [Psychological and Behavioural Sciences Tripos](#) must take PBS 7: Research Dissertation, conducting their own research to be written up in a substantial piece of work, known as a **dissertation**. [NST or MVST Part II](#) students, taking either the Psychology or Cognitive Neuroscience options, or [NST Part II Physiology and Psychology](#) students choosing to conduct psychology research, must write an account on research they have conducted, known as a **report**.

In order to provide the widest variety of projects to all such students, the administration of undergraduate research in the Department of Psychology has been combined as much as possible. This guide will detail what projects are available to you, how to submit your preferences, and what to expect in terms of workload and assessment.

Aims of your research

Your research project provides you with an opportunity to conduct some hands-on research. Students are encouraged to make suggestions about experimental design and to conduct their own independent reading of relevant material. Some projects may require you to master new experimental techniques, and supervisors will provide you with initial guidance after which you should aim to work more independently. Although your supervisors will be available to provide guidance, you will be expected to set up and organize the experiments, collect the data and conduct the statistical analyses of data yourself. Courses are organised to cover the statistics necessary for analysing project data. While many projects are collaborations between a pair of students, you must submit an independent dissertation/report of the study. A sample of successful past projects is available for inspection in the Departmental Library.

For PBS students, and NST students who have taken Part IB Experimental Psychology and the Psychology option of Part II Psychology, receiving a passing mark for your research and gaining a least a second class honours will mean that you will be eligible for [graduate membership in the British Psychological Society](#). This will allow you to pursue certain forms of postgraduate training in psychology.

Research projects sometimes make substantive contributions to knowledge, and every year some result in publications, sometimes in very prestigious journals.

Differences/similarities between PBS 7 and the Part II Project

For PBS Part IIB students, PBS 7: Research Dissertation is worth 25% of your overall final class, and must have a word count of between 6 to 10,000 words.

For NST/MVST Part II students, the Research Project is worth 20% of your overall class, and cannot exceed 5,000 words.

This means that PBS 7 is a more substantial piece of work than the Part II Project, PBS students will therefore be expected to complete a greater workload, for which projects will be designed around once students are assigned. Due to this it is not expected that PBS and NST/MVST students will not be assigned to work together on

the same project, so that supervisors may provide the same level of support and expect their students to work to the same standards.

Supervisions

You can expect in general the following support from your supervisor:

- Your supervisor will initially provide you with references to preliminary readings, and encourage you to conduct further independent library research.
- Initial guidance will be given to you regarding the technical aspects of your research and your supervisor will be available for consultation during term time.
- Your supervisor will provide guidance on statistical analysis of your data, although you are expected to conduct the actual analysis yourself.
- Your supervisor will be available to discuss your ideas about the structure and content of your dissertation/report, but will not read drafts of your write up.
- Your research methods and results will be reviewed and discussed by your supervisor.

Lectures

Separate lectures will be given for how to write up your dissertation/report. A series of lectures will also be given on statistical analysis and how to design your research. These lectures will not be directly assessed, but are important for you to attend so as to assist you in your research.

Choosing a project

Below are a list of projects that academics within the Department of Psychology, and those in associated institutes, are able to supervise.

You may choose six projects that you wish to be supervised on, ordered in preference.

You will be sent the link to this survey on **Wednesday 7th October**.

You should respond to complete the survey to register your top 6 preferences by **Wednesday 14th October**.

The abstracts below give a basic rationale of a project and an idea of what research methods you will use. How many students can be allocated to a project are noted, there may be a minimum number required or students may have to work in pairs/teams.

You are strongly encouraged to talk to several prospective supervisors before you make your choice of projects. Questions you might like to ask yourself include whether you would prefer a project that allows more or less contribution by you in terms of design and setting up, and discuss this with the prospective supervisor. So

that you have time to contact or meet academics the deadline for submitting your preferences is one week after the start of term.

Projects will be allocated by the course organiser so as to maximise the happiness of as many students as possible, whilst also ensuring academics are able to support students appropriately. Projects in certain subject areas do attract a large number of applicants, and we cannot guarantee that you will be assigned your most preferred project. You are therefore strongly recommended to consider other preferred subject areas that are likely to be less competitive. The allocation of projects will be relayed to students and staff soon after the 14th October deadline.

Bespoke projects

Some students may have already found a supervisor to support a research project of their own making. If so, you will still need to complete the on-line survey to indicate what you will be doing. Details of your dissertation/report and supervisor need to be noted so as to be approved by the relevant authority. Such projects may also be listed below, for other students to join in the same research.

NOTE

The list of available projects gives the “places available”. This should be read as “minimum-maximum”. Thus, 1-2 means the project could accommodate a single student or a pair – that is, students who pick this project might end up working on it alone, or with another student from their course, depending on the demand for the project. 2-2 means the project requires a pair, and so on.

Available research projects

A: Uncovering common neural fingerprints of consciousness between sleep, sedation and vegetative state patients.

Supervisor: [Anat Arzi](#), [Dr Tristan Bekinschtein](#).

Places: 1 - 2

Abstract:

Consciousness is a central aspect of our experience of the world. The neural fingerprint of this experience, however, remains one of the least understood aspects of the human brain. No agreement has yet emerged on which aspects of brain function underlie its presence, and what changes are connected to its disappearance or fragmentation in the healthy brain, as well as in pathological conditions as disorders of consciousness. This project proposal will address the question of how the human brain represents and processes information in the absence or near-absence of conscious awareness. In order to elucidate the common principles of processing under loss of consciousness, the project focuses on 3 states: sleep, anaesthesia, and disorders of consciousness. The aim is to uncover common neural fingerprints of consciousness/unconsciousness between states by looking at information-integration measures, brain synchrony and complexity in human high-density EEG (electroencephalographic data). Students involved in this project will have the opportunity to participate in all stages of this study, data collection, analyses and interpretation/discussion. They will gain first-hand experience in the use of the latest technologies in cognitive neuroscience, critical to our understanding of consciousness.

B: Investigating visual awareness.

Supervisor: [Will Harrison](#), [Dr Tristan Bekinschtein](#).

Places: 1 - 2

Abstract:

We understand quite well how photons of light are converted into electrical signals within the eyes, but we know far less about how these electrical signals are processed by the brain to produce the phenomenon of sight. Many visual signals that reach the brain go entirely unnoticed, and only a select portion produces our vivid visual experience. What determines whether or not something in our visual environment reaches our awareness? In our research, we combine psychophysics, high-resolution eye tracking, and electroencephalography (EEG) to understand the neural computations giving rise to conscious vision. We tightly control the physical properties of a stimulus presented to an observer, and quantify how small variations of the stimulus affect the observer's perception, eye movements, and neural signals. We aim to show how different brain states can predict whether or not we notice an event in our visual environment, before that event even takes place. Students involved in this project will have the opportunity to participate in all stages of this study, from giving input to experimental design, to data collection and analysis. They will gain first-hand experience in the use of the latest technologies in cognitive neuroscience, critical to our understanding of consciousness.

C: Fragmentation of cognitive processes with sleep onset.

Supervisor: [Valdas Noreika](#), [Andres Canales](#) and [Dr Tristan Bekinschtein](#).

Places: 2 - 3

Abstract:

One natural change in consciousness, which most of us experience each day, is sleep. But little is known about how cognitive processing is altered when we fall asleep. In order to characterize how different executive functions are impacted by the transition from awake to drowsy states, we will measure brain activity (EEG) while individuals are listening to and responding with button presses to a series of sounds or words while falling asleep. Such tasks will allow us to investigate the ways in which the mental abilities we employ while awake, such as paying attention and decision making, change as we fall into natural unconsciousness, and how its recover when we get back to be fully conscious. Students involved in this project will participate in all stages of this study, from giving input to experimental design, to data collection and analysis. They will gain first-hand experience in the use of the latest technologies in cognitive neuroscience, critical to our understanding of consciousness.

D: Hemispheric laterality in language comprehension: Investigation of grammatical processing using hemifield presentation.

Supervisor: [Dr Mirjana Bozic](#).

Places: 1 - 2

Abstract:

Neuroimaging and neuropsychological data suggest that two interacting but functionally distinguishable brain systems support language comprehension. One is distributed over both hemispheres, while the other is located in the left hemisphere only. The bihemispheric system supports sound-to-meaning mapping for simple and frequent words like dream. The left-lateralised system is selectively tuned to grammatical computations, and is engaged by regularly inflected verbs such as played or jumped, whose processing requires segmentation into the stem (play, jump) and the suffix (-ed). These processing characteristics of the two systems have so far been investigated using neuroimaging techniques. This project aims to test whether they can also be identified behaviourally.

This will be investigated by presenting simple words like dream and grammatically complex words like played using the so-called 'hemifield' technique. Here, a word is presented at either left or right side of a screen, and participants are asked to make a decision about it (for instance, whether it is a real word or not). Given the contra-lateral connections of the visual system this creates 'processing priority', such that words presented to the right hemifield are initially processed in the left hemisphere and words presented to the left hemifield are initially processed in the right hemisphere. We will measure the reaction times for simple words and grammatically complex words presented at either left or right hemifield, to assess how they interact with the underlying organisation of the language processing network.

This project can be started immediately. Supervisors will be available to discuss the project further with interested students.

References:

Bozic, M., Tyler, L.K., Ives, D.T., Randall, B., & Marslen-Wilson, W.D. (2010). Bi-hemispheric foundations for human speech comprehension. *PNAS*, 107, 17439-17444.

Marslen-Wilson, W.D., & Tyler L.K. (2007). Morphology, language and the brain: the compositional substrate for language comprehension. *Philosophical Transactions of the Royal Society: Biological Sciences*, 362, 823-836.

Mohr, B., Pulvermüller, F. & Zaidel, E. (1994). Lexical decision after left, right and bilateral presentation of function words, content words and non-words: Evidence for interhemispheric interaction. *Neuropsychologia*, 32, 105–124.

Shillcock, R., Ellison, T.M., & Monaghan, P. (2000). Eye-fixation behaviour, lexical storage and visual word recognition in a split processing model. *Psychological Review*, 107, 824-851.

E: Grammatical computations in spoken word recognition.

Supervisor: [Dr Mirjana Bozic](#).

Places: 2 - 2

Abstract:

For the majority of listeners, understanding spoken words is so effortless that we often overlook that we need to perform complex computations in order to actually recognise what somebody is saying. These computations involve the selection of the correct lexical candidate amongst competing alternatives, analysis of its meaning and its grammatical properties, and mapping onto the stored lexical representation. Research has shown that lexical selection starts very early on, and that some words can be uniquely identified when only half or less than half of their acoustic content has been heard (Marslen-Wilson, 1987). In this project we want to explore the timing of grammatical computations in spoken word recognition and the acoustic cues that trigger these processes.

Previous research has shown that grammatically complex words like the form *play+ed* require increased processing compared to simple words like *dream*, as the grammatical suffix *-ed* is stripped away from the stem *play*. We have recently linked this process to a specific brain activity in the left perisylvian network and an increase in gamma oscillations between temporal and frontal areas (Fonteneau et al, 2014). Critically, these processes occur before the suffix has been heard, suggesting that the acoustic input preceding the suffix carries information that enables the listener to predict the presence of grammatical complexity. The current project will use the gating paradigm (Tyler & Wessels, 1983) to define the precise time when listeners are aware of the presence of a grammatical suffix. We will manipulate the presence of the grammatical suffix *-ed* in spoken words and present auditory chunks with increasing size. Participants will be asked to decide what they are hearing for each chunk. By doing so, we can track the exact timing and the nature of auditory cues that help the listener to predict the presence of grammatical complexity.

This project can be started immediately. Supervisors will be available to discuss the project further with interested students.

References:

Fonteneau, E., Bozic, M. & Marslen-Wilson, W. (2014). Brain network connectivity during language comprehension: interacting linguistic and perceptual subsystems. *Cerebral Cortex*. doi: 10.1093/cercor/bhu283

Marslen-Wilson, W. (1987). "Functional parallelism in spoken word recognition." *Cognition*, 25, 71-102.

Tyler, L. K., & Wessels, J. (1983). Quantifying contextual contributions to word-recognition processes. *Perception & Psychophysics*, 34, 409–420.

F: Bottom-up and top-down influences on the processing of grammatical structure and word meaning. The interplay of form and meaning in visual word recognition.

Supervisor: [Dr Billi Randall](#), [Dr Mirjana Bozic](#) and [Prof William Marslen-Wilson](#). Places: 1 - 2

Abstract:

Successful language comprehension involves extracting linguistic information from the input and accessing a unique representation from all of the stored representations within the mental lexicon. We accomplish this quickly and effortlessly, but recent behavioural and neuroimaging evidence has revealed that there are many stages involved in mapping from a word to its meaning. This project aims to investigate how lexical representations of visual words are accessed, and how a reader's prior semantic knowledge could modulate this process.

A key behavioural method for examining early stages of word access is the masked priming paradigm, where words are presented so briefly that participants do not report seeing them, but their responses are affected by unconscious processing of the masked word. Recent evidence using this paradigm has shown that words containing a stem and a suffix (e.g. farmer = farm + -er) will facilitate a response to the stem (farm), suggesting both words map onto the representation of the stem. The same effect occurs for words like brother, even though the meaning isn't equivalent to broth + -er. This is thought to demonstrate early segmentation of words containing a stem and affix based on purely bottom-up orthographic information from the input, before word meaning is accessed.

This project will investigate semantic and orthographic information interact during visual word recognition using a masked priming task. By presenting an additional prime prior to the masked prime, we can examine whether the automatic segmentation of a word is modulated when it is seen in the context of semantically related words. This can provide valuable information about the dynamics of the language system, with brain regions constantly interacting based on incoming input and prior knowledge.

The project can be started immediately. Supervisors will be available to discuss the project further with interested students.

References:

Dehaene, S., Naccache, L., Cohen, L., Bihan, D.L., Mangin, J.F., Poline, J.B., & Riviere, D. (2001). Cerebral mechanisms of word masking and unconscious repetition priming. *Nature Neuroscience*, 4, 752-758.

Marslen-Wilson, W.D., Bozic, M., & Randall, B (2008). Early decomposition in visual word recognition: dissociating morphology, form, and meaning. *Language and Cognitive Processes*, 23(3), 394-421.

Rastle, K., Davis, M.H., Marslen-Wilson, W.D., & Tyler, L.K. (2000). Morphological and semantic effects in visual word recognition: A time-course study. *Language and Cognitive Processes*, 15(4-5), 507-537.

Whiting, C., Shtyrov, Y., & Marslen-Wilson, W. (2014). Real-time functional architecture of visual word recognition. *Journal of Cognitive Neuroscience*, 27(2), 246-265.

G: Investigation of the cholinergic mechanism underlying attention on the 5-Choice Serial Reaction Time Task (5-CSRTT) in rats, using a new and upcoming pharmacosynthetics technique; designer receptors exclusively activated by designer drugs (DREADDs).

Supervisor: Beth Fisher, [Prof Tim Bussey](#).

Places: 2 - 2

Abstract:

Background:

Preclinical drug discovery for the development of procognitive enhancer drugs to alleviate attentional impairments in normal and pathological aging (i.e. Alzheimer's Disease), Schizophrenia and Attention Deficit Hyperactivity Disorder is hindered by a lack of sophisticated techniques for the investigation of the cholinergic pathways underlying attentional processes, for drug discovery to subsequently target.

Cholinergic projections from the basal forebrain to the medial prefrontal cortex have been identified via cholinergic-selective lesion experiments to underlie attentional functions on the well-known 5-CSRTT attentional task. However, lesion studies lack spatiotemporal control and can be used only in an 'all or nothing' fashion (they can only impair performance). On the other hand, the new and upcoming DREADDs technique allows for more sophisticated investigation of the cholinergic pathways underlying attention. DREADDs involve 'designer' receptors (modified cholinergic G-protein-coupled receptors: GPCR) that are designer ligand-dependent, built to gain precise spatiotemporal control over GPCR signalling using viral gene transfer. DREADDs can stimulate, or inhibit cholinergic pathways from the basal forebrain to enhance and impair attentional performance, respectively, via administration of the pharmacologically inert compound Clozapine-N-oxide (CNO).

Aims/hypothesis:

To stimulate and inhibit cholinergic pathways from the basal forebrain via activating Cre-dependent DREADD receptors to enhance and impair attention,

respectively, in Cre-driving ChAT rats on the well-known, cholinergically validated, 5-CSRTT, to enable a better understating of the role of cholinergic pathways underlying attentional functions.

Methods:

Students will be involved in the training of 48 rats on the 5-CSRTT. Rats will then undergo brain surgery in which a Cre-dependent DREADDs virus will be infused into the basal forebrain of Cre-driving rats. 1/3 of rats will receive Gq DREADDs to eventually stimulate cholinergic neurons via systemic CNO administration, 1/3 Gi to eventually inhibit cholinergic neurons, and 1/3 will act as controls. Students will have the opportunity to observe the surgical procedure. Subsequent to rats recovering from surgery students will test the rats under a range of probes to challenge and test different aspects of attention, including reduced stimulus duration probes. CNO will be administered on such probes, systemically, to activate both stimulatory (Gq) and inhibitory (Gi) DREADD receptors and manipulate attentional performance; students will observe the injection procedure. An occupational health screening is required, due to animal work.

References:

Role of basal forebrain, and basal forebrain-medial prefrontal cortical cholinergic projections in attentional function:

McGaughy, J., Kaiser, T. & Sarter, M. 1996. Behavioral vigilance following infusions of 192 IgG-saporin into the basal forebrain: selectivity of the behavioral impairment and relation to cortical AChE-positive fiber density. *Behav Neurosci*, 110, 247-65.

Turchi, J. & Sarter, M. 1997. Cortical acetylcholine and processing capacity: effects of cortical cholinergic deafferentation on crossmodal divided attention in rats. *Brain Res Cogn Brain Res*, 6, 147-58.

McGaughy, J. & Sarter, M. 1998. Sustained attention performance in rats with intracortical infusions of 192 IgG-saporin-induced cortical cholinergic deafferentation: effects of physostigmine and FG 7142. *Behav Neurosci*, 112, 1519-25.

Botly, L. C. & De Rosa, E. 2012. Impaired visual search in rats reveals cholinergic contributions to feature binding in visuospatial attention. *Cereb Cortex*, 22, 2441-53

Farrell, M. S & Roth, B. L. (2013). Pharmacosynthetics: Reimagining the pharmacogenetic approach. *Brain Research*, 1511, 6-20.

DREADDs:

Armbruster, B. N., Li, X., Pausch, M. H., Herlitze, S. & Roth, B. L. (2007). Evolving the lock to fit the key to create a family of G protein-coupled receptors potently activated by an inert ligand. *Proceedings of the National Academy of Sciences of the United States of America*, 104 (12), 5163-5168.

Rogan, S. C & Roth, B. L. (2011). Remote control of neuronal signalling.

Pharmacological reviews, 63 (2), 291-315.

Dalley, J. W., Theobald, D. E., Bouger, P., Chudasama, Y., Cardinal, R. N. & Robbins, T. W. (2004). Cortical cholinergic function and deficits in visual attentional performance in rats following 192 IgG-saporin-induced lesions of the medial prefrontal cortex. *Cereb Cortex*, 14, 922-32.

H: Development of a touchscreen task for the assessment of attentional set-shifting in rodents.

Supervisor: [Benjamin Phillips](#), [Dr Johan Alsiö](#), [Dr Chris Heath](#), [Prof Timothy Bussey](#), Places: 2 - 2

Abstract:

Deficits in cognitive flexibility occur across numerous psychiatric disorders, including schizophrenia, obsessive-compulsive disorder (OCD) and mood disorders. These deficits are frequently treatment resistant and can result in lifelong functional impairment. Methods for the comprehensive assessment of cognitive flexibility in animal models are therefore essential in enhancing understanding of their underpinning mechanisms.

To assess cognitive flexibility in animal models, the laboratory currently employs a touchscreen visual discrimination and reversal learning task which requires rodents to respond at one of two (e.g. A but not B) visual stimuli to receive a reward. When this discrimination has been learned to a high degree of accuracy, the contingencies are reversed, and the animal is required to learn the new rule (e.g. B but not A). The speed at which the new rule is acquired is taken as a measure of cognitive flexibility. These tasks have proven useful in revealing the neural and neuropharmacological basis of cognitive flexibility, including the contributory roles of the sub-nuclei of the striatum and neuromodulators including dopamine and serotonin.

The intra-dimensional extra-dimensional shifting task (IDED), developed for the Cambridge Neuropsychological Test Automated Battery (CANTAB), assesses attentional set-shifting. IDED requires the subject to initially learn a simple discrimination, followed by the superimposition of another discriminatory pair irrelevant to reward. Once the discrimination pairs are learned, a novel stimulus pair in the original dimension is presented (intra-dimensional shift). Subsequently, the previously irrelevant dimension becomes relevant (extra-dimensional shift). These shifts are frequently referred to as 'set-shifting', since they require the adoption of a new attentional set.

This project focuses on the development of the IDED task in the operant touchscreen apparatus for both rats and mice. This would both complement the currently used task and facilitate detailed study of the neural basis of intra and extra-dimensional shifting.

An occupational health screening is required, due to animal work.

References:

Alsiö, et al. *Psychopharmacology* 2015 (In press)

Dias, et al. *Nature* 1996 **380**: 69-72.

Slamecka NJ *Psychological Bulletin* 1968 **69(6)**: 423-38

I: Impact of Diet and Exercise on Episodic Memory.

Supervisor: [Dr Lucy Cheke](#)

Places: 2 - 4

Abstract:

My current research focuses on the causes and consequences of episodic memory deficits in the “normal” population. I recently received an MRC Centenary young investigators award to investigate episodic memory in obesity. Using my novel What-Where-When memory test, this project revealed a substantial memory deficit in overweight individuals (Cheke, Simons & Clayton, in review) and identified the neural correlates of this deficit (Cheke, Clayton & Simons, work in progress).

In this paradigm, participants are required to “hide” items around a context-rich scene over the course of two “days” (See Fig. 1). They are then required to indicate what they hid where, and on which “day” (WWW integration test). Memory for the individual components of the episode (item, spatial location, temporal order) is also tested separately. This allows for investigation of not only the extent of memory dysfunction, but also identification of the specific nature of the deficit. For example, while two populations may both struggle to remember an episode, in some this might stem from a spatial memory deficit, in others from a temporal memory deficit and in others in a problem integrating spatial and temporal information, but not in remembering either individually.

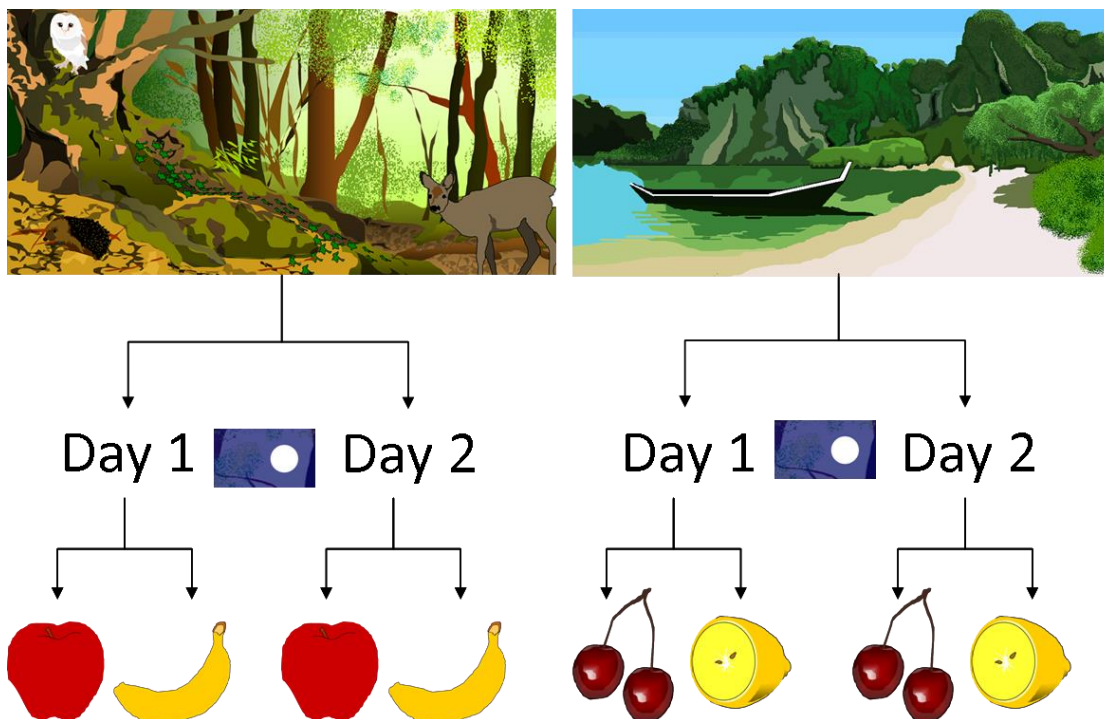


Figure 1. What-Where-When encoding. Participants hide items in two scenes. In each scene, two items are hidden, once on each “day”. Thus, there are 4 items, 2 time-points, 8 locations and 8 item-location-time combinations.

I have now extended investigation using this task to other populations. In this way I have been able to demonstrate that factors such as sub-clinical depression and schizotypy (Cheke et al., in prep) and normal aging (Cheke, in prep) have impacts on episodic memory that are similar in degree but different in kind. For example, while older adults demonstrate difficulties with temporal order and integrated what-where-when memory, individuals with depression have comparable difficulties with integrated what-where-when, but preserved temporal order memory, with instead a deficit in spatial memory.

Aims of the research project:

One question that naturally arises from the finding that obesity is associated with memory deficits is the specific mechanism by which this association occurs. The obese “syndrome” consists not only of high adiposity, but of a tendency towards a high-fat high sugar diet and low levels of exercise. The proposed project aims to investigate these contributions individually. Using technology that allows the measurement of percent body-fat and visceral-fat (Tanita scale® and skinfold calipers), daily exercise (Fitbit Flex) and caloric intake (Food Diary App. For mobile phones) it is possible to isolate individual components of the “obese syndrome” in order to assess the relative contribution of these different factors to memory problems.

Please contact the supervisor for further information regarding how you will be involved in this research.

J: Relationship between Episodic Memory and Beck’s Depression Inventory.

Supervisor: [Dr Lucy Cheke](#)

Places: 1 - 4

Abstract:

This project shall investigate the performance of individuals who score high vs low score on the Beck’s depression inventory on a computerised episodic memory test. Individuals with depression have been shown to demonstrate memory deficits in some domains. We have developed a novel episodic memory test which may be more sensitive to deficits in memory for integrated episodes. The aim of this study is to investigate whether subclinical depressive symptoms will be associated with deficits on this task.

Please contact the supervisor for further information regarding how you will be involved in this research.

K: Memory and Consumption.

Supervisor: [Dr Lucy Cheke](#)

Places: 2 - 4

Abstract:

Episodic memory is the ability to store, maintain and retrieve contextually rich representations of events from one’s own life [1]. There is increasing evidence to suggest that this type of memory may play a major role in allowing us to regulate consumption. A series of studies has demonstrated that manipulations of memory for recent meals has considerable impact on the long-term satiating effect of those meals [e.g.2,3,4]. Individuals who experience vivid memories for recent meals consume less than those who were distracted during eating and reported less vivid

memories. Indeed, it has been found that if perceived consumption and actual consumption are manipulated orthogonally (so that people either think they ate a lot or did eat a lot), it is remembered consumption, rather than actual food ingested, that predicts feelings of hunger some hours later [5].

This project aims to build on this previous research to establish whether individual differences in memory-quality has an effect on the long-term satiating effect of a meal. This will allow us to investigate whether factors that lead to memory impairments may also change the way people eat. We have recently demonstrated that obesity may lead to changes in memory function [6], leading to reduced accuracy in memory. If this change in memory were also to have an impact on consumption levels, then these factors may contribute to a “vicious cycle” of obesity.

There will be a range of options as to how this study is conducted that will be up for discussion with the interested students.

References:

1. Tulving E, Donaldson W, Bower GH, United States. Office of Naval Research. (1972) Organization of memory. New York,: Academic Press. xiii, 423 p. p.
2. Higgs S, Williamson AC, Attwood AS (2008) Recall of recent lunch and its effect on subsequent snack intake. *Physiol Behav* 94: 454-462.
3. Oldham-Cooper RE, Hardman CA, Nicoll CE, Rogers PJ, Brunstrom JM (2011) Playing a computer game during lunch affects fullness, memory for lunch, and later snack intake. *Am J Clin Nutr* 93: 308-313.
4. Higgs S, Donohoe JE (2011) Focusing on food during lunch enhances lunch memory and decreases later snack intake. *Appetite* 57: 202-206.
5. Brunstrom JM, Burn JF, Sell NR, Collingwood JM, Rogers PJ, et al. (2012) Episodic memory and appetite regulation in humans. *PLoS One* 7: e50707.
6. Cheke LG, Simons, JS, Clayton, NS. (in press) The Amnesic Effects of Obesity. *PLoS One*: in press

L: Could you say that a little louder? Auditory perspective taking in adults.

Supervisor: [Prof Nicky Clayton, Dr Idalmis Santiesteban and Dr Edward Legg](#) Places: 1 - 2

Abstract:

We’ve all come across someone who is playing music so loudly on their headphones that anyone nearby can hear the music. Obviously some individuals may not care if you can hear their music but another possibility is that adults might not be so good at auditory perspective taking (the ability to take into account how others hear things).

Recent work has suggested that adults are slower to respond to, and make more errors, on visual perspective taking tasks in which they have to take into account conflicts between their own and another individual’s perspective (Apperly et al. 2010; Back and Apperly 2009; Keysar et al. 2000, 2003). These results have been used to claim that perspective taking and more generally theory of mind remains cognitively demanding even in adulthood.

However, a necessary step towards establishing that adults struggle with perspective taking in general is to demonstrate that such biases occur for different forms of perspective taking. This project will test biases in adults' auditory perspective taking and thus provide an important step in establishing the extent of adults' difficulties with perspective taking.

References:

Apperly, I.A., Carroll, D.J., Samson, D., Qureshi, A., Humphreys, G.W. & Moffatt, G. (2010). Why are there limits on theory of mind use? Evidence from adults' ability to follow instructions from an ignorant speaker. *Quarterly Journal of Experimental Psychology* 63: 6, 1201 — 1217

Keysar, B., Barr, D. J., Balin, J. A., & Brauner, J. S. (2000). Taking perspective in conversation: The role of mutual knowledge in comprehension. *Psychological Sciences*, 11, 32-38.

Keysar, B., Lin, S. & Barr, D. (2003) Limits on theory of mind use in adults. *Cognition* 89:25–41.

M: Theory of Mind – Is thinking about others really that special?

Supervisor: [Katharina Brecht](#) , [Prof Nicola Clayton](#).

Places: 1 - 1

Abstract:

Theory of mind, the ability to think about others' thoughts, beliefs and desires, is considered to be a central ability to many of our social interactions. It has been claimed that theory of mind is based on a specialised mechanism. As such, it operates on social input only and is not utilised for non-social processing (Leslie & Thaiss, 1992). However, others have argued that theory of mind recruits domain-general processes (Stone & Gerrans, 2006). In an attempt to resolve this debate, Cohen et al. (2015) recently reported faster reaction times when participants had to answer a question about the belief of another person (i.e., reasoning about a mental state) compared to the content of a handwritten note (i.e., reasoning about a non-mental state). They take their findings as support for a specialised view of theory of mind. The aim of the project is to put the claims and assumptions made by Cohen et al. (2015) to a test. Similar to Cohen et al.'s (2015) study, reaction time and response accuracy in a theory of mind task will be measured in human adults.

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N: Personality in a social context in juvenile Eurasian jays.

Supervisor: [Rachael Miller, Prof Nicola Clayton.](#)

Places: 1 - 2

Abstract:

Consistent individual differences - sometimes referred to as 'personality' - have recently been found in a wide range of non-human species, including primates, birds, fish and insects (Gosling, 1999; Bell et al., 2009). Personality in animals is typically measured through experimentally induced behavioural responses, such as response to novelty (e.g. objects, environments), behavioural observations, or through human rating questionnaires (Briffa and Weiss, 2010). Few studies have combined approaches to investigate the potential relationship between - and reliability of different measures. Further, many previous studies have investigated personality in animals tested in isolation, despite the likely influences of social environment on behaviour in social species.

The aim of this study will be to investigate personality in 16 hand-reared juvenile Eurasian jays (*Garrulus glandarius*), using both experimental and observational approaches, collected in a social context. Eurasian jays are members of the corvid family that includes ravens and crows – species' that have been found to possess sophisticated cognitive abilities that rival the great apes (Emery and Clayton, 2004). The experiment (Part A) will involve repeatedly presenting the birds with various types of novel items whilst in a group context, measuring behaviours such as latency to approach. The behavioural observations (Part B) will focus primarily on object interactions, as well as social relations, such as affiliated and agonistic behaviours.

Students will be required to collaborate in planning and running this study, i.e. data collection, as well as analysing the data. Students will work independently to write up their own projects. Part A and B will be run simultaneously throughout the duration of the study period, however, it may be possible to separately allocate primary responsibility for each Part to allow each student the opportunity to individually lead a key element of the study. The project is based in Madingley, approx. 30 min cycle or 15 min drive from Central Cambridge. An intermittent bus runs from Cambridge to Madingley, with more frequent services running from Cambridge to nearby Coton (~ 20 min walk from Madingley).

An occupational health screening is required, due to animal work.

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O: Do rooks (*Corvus frugilegus*) pair with individuals who demonstrate a similar level of boldness and dominance?

Supervisor: [Dr Natalie Williams](#), [Prof Nicola Clayton](#).

Places: 1 - 2

Abstract:

Rooks (*Corvus frugilegus*), like many bird species, form stable, long-term monogamous partnerships (Emery et al 2007). Accordingly, the longevity of a pair bond makes mate choice an important decision yet more could be known on the forces driving mate selection in rooks.

Consistent, individual behaviour patterns, sometimes referred to in the literature as personality, are found in a range of non-human animals (Gosling 1999). These traits are generally ascertained by assessing varying individual responses to a consistent event (either naturally occurring or manipulated). Just as in humans, the personality of a rook could well be a driving factor in whether they are chosen as a mate. But do rooks choose a partner with similar personality traits or do differences make for a more productive partnership? Rooks are known to form linear hierarchies (Clayton & Emery 2007) so perhaps an individual's standing in this hierarchy is key in being selected as a mate. With the ability to successfully forage for food, key in raising healthy offspring, perhaps boldness is a desirable trait in a potential partner.

The aim of this project is to gain hierarchy and boldness data from a group of captive adult rooks. This information will be used to investigate similarity of personality traits between paired individuals and can be used alongside additional physical data such as size and weights, to explore the characteristics that drive mate choice.

This project will be split into two parts, run concurrently. Part A will involve an observational study in which aggressive or dominant interactions between members of the rook group will be recorded in order that a dominance hierarchy may be established. Part B will be experimental and involve the placement of novel, baited objects into the rook enclosure and latency of approach by individuals recorded, in order that boldness can be assessed. This information can then be used in conjunction with current established recordings of rook pairs.

An occupational health screening is required, due to animal work.

References:

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Gosling, S.D. & John, O.P. (1999). Personality dimensions in non-human animals: A cross-species review. *Current Directions in Psychological Science*, 8, 69-75

P: Are behaviourally-inflexible animals vulnerable to cocaine addiction?

Supervisor: [Dr Jeff Dalley](#) and [Dr Bianca Jupp](#).

Places: 1 - 2

Abstract:

Research spanning several decades suggests that drug addiction is not a random disorder but afflicts a small sub-group of individuals by virtue of acquired traits and personality styles. Of these the most widely characterised include abnormalities in response inhibitory control that often lead to impulsive acts and decisions and repetitive, compulsive behaviour (Dalley, Everitt and Robbins 2011). However, for obvious reasons, the causal impact of such behaviours to addiction is difficult to unravel in active human addicts, not least because chronic drug misuse itself can weaken impulse control and encourage certain compulsive behaviours. The present project overcomes this obstacle by investigating whether natural variation in perseverative behaviour in rats (a form of behavioural inflexibility) predicts the subsequent rate and persistence of intravenous cocaine self-administration. Rats will be categorised according to low- and high perseverative behaviour (LP and HP rats, respectively) on a spatial-discrimination reversal learning task (Barlow et al., 2015) and later trained to press a lever to receive cocaine infusions. We will assess whether HP rats more readily acquire and escalate cocaine self-administration and whether they show a higher motivation and propensity to reinstate drug-taking following a period of enforced abstinence. Depending on the precise findings, and if time permits, we will also investigate markers of serotonergic transmission in selected brain regions of LP and HP rats (e.g. orbitofrontal cortex, raphé nucleus, amygdala, hippocampus, ventral striatum) to advance earlier findings that reduced serotonergic function underlies the development of compulsive drug-seeking and taking (Pelloux et al. 2012).

References:

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Neuropsychopharmacology 40: 1619-1630.

Dalley JW, Everitt BJ and Robbins TW (2011) Impulsivity, compulsivity, and top-down cognitive control. Neuron 69: 680-694.

Pelloux Y, Dilleen R, Economidou D, Theobald DE and Everitt BJ (2012) Reduced forebrain serotonin transmission is causally involved in the development of compulsive cocaine seeking in rats. Neuropsychopharmacology 37: 2505-2514.

Q: Diet-induced thermogenesis: “starving a fever”.

Supervisor: [Dr Jeff Dalley](#) and [Dr Bianca Jupp](#).

Places: 1 - 2

Abstract:

Rising rates of obesity in many Western societies is a major unmet public health crisis. In large part this is believed to be due to the increased availability of high-incentive food products. This project investigates the hypothesis that such foods trigger inflammatory processes in the periphery and central nervous system that contribute to a dysregulation in body weight (Olefsky and Glass 2010). When switched from a low-fat diet to one rich in saturated fats, animals show a dramatic increase in food intake, doubling their caloric intake during the first 24 hours. They

also exhibit an 8-10% increase in energy expenditure which occurs primarily in the thermogenic, brown adipose tissue. Increased energy expenditure in response to high-fat feeding is known as diet-induced thermogenesis (DIT). Although the relationship between DIT and obesity is unclear it is increasingly recognised that obesity is associated with elevated levels of pyrogenic cytokines such as TNF α , IL1b and IL6 in both mice and humans. Indeed, when administered in the brain, IL1b and IL6 increase energy expenditure and activate brown adipose tissue, consistent with a fever response (Olivadoti and Opp 2008) that depends on increased sympathetic tone to brown adipose tissue (Morrison et al., 2014).

This project will be carried out jointly between the Department of Psychology and Institute of Metabolic Sciences at Addenbrooke's Hospital, and will investigate the hypothesis that inflammatory cytokines generated by high-fat feeding cause a pseudo-fever and mediate DIT. In practical terms we will firstly measure the time course of IL-6 production in response to high-fat feeding. Secondly, mice lacking IL-6 and wild-type controls will be placed on a high-fat diet and their energy expenditure measured by indirect calorimetry. Finally, by blocking catecholamine production, sympathetic outflow to brown adipose tissue will be measured in wild-type and IL-6 knockout mice.

References:

Morrison SF, Madden CJ and Tupone D (2014) Central neural regulation of brown adipose tissue thermogenesis and energy expenditure. *Cell Metab.* 19: 741-756.

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Olivadoti MD and Opp MR (2008) Effects of i.c.v. administration of interleukin-1 on sleep and body temperature of interleukin-6-deficient mice. *Neuroscience* 153: 338-348.

R: Monoamine oxidase (MAO): discovering new roles for Mary Bernheim's ubiquitous enzyme

Supervisor: [Dr Jeff Dalley](#) and [Dr Bianca Jupp](#).

Places: 1 - 2

Abstract:

During her graduate studies at Cambridge University, Mary Bernheim ("Molly") made an astonishing discovery now acknowledged as 'one of the seminal discoveries in twentieth century neurobiology' (Slotkin 1999). Molly had discovered monoamine oxidase (MAO), an enzyme found in many cells whose function was the catalytic degradation of a variety of substances with a monoamine structure; these conspicuously include noradrenaline (NA), dopamine (DA) and serotonin (5-HT), which are widely implicated in the aetiology and treatment of a number of neuropsychiatric disorders (e.g. ADHD, OCD, schizophrenia, depression, substance use disorder). Recent research suggests that the two isoforms of MAO (MAO-A and MAO-B) may play a specific role in setting the tone of serotonergic transmission in the forebrain (Barlow et al., 2015) and this may be relevant to understanding why some people develop persistent patterns of drug abuse that continue despite growing adverse consequences for the addicted individual (Pelloux et al., 2012). This project investigates the hypothesis that MAO activity in

the brain is mandatory for optimal suppression of reward-related behaviour and that inhibition of this function may lead to deleterious outcomes. The effects of selective MAO-A and MAO-B inhibitors (e.g. clorgiline, selegiline) will be investigated in rats trained on a spatial-discrimination reversal learning task, given either systemically or locally in the dorsal raphe nucleus (DRN) or orbitofrontal cortex (OFC). The results of this research will inform the debate whether MAO plays a necessary and sufficient role in the expression of behavioural flexibility with relevance, therefore, to disorders where rigid, stereotyped behaviours prevail.

References:

Barlow RL, Alsio J, Jupp B, Rabinovich R, Shrestha S, Roberts AC, Robbins TW and Dalley JW (2015) Markers of serotonergic function in the orbitofrontal cortex and dorsal raphe nucleus predict individual variation in spatial-discrimination serial reversal learning. *Neuropsychopharmacology* 40: 1619-1630.

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Slotkin TA (1999) Mary Bernheim and the discovery of monoamine oxidase. *Brain Research Bulletin* 50: 373.

S: The Family Thinking Skills Project.

Supervisor: [Dr Michelle Ellefson](#), collaborating with [Prof Claire Hughes](#). Places: 1 - 2

Abstract:

Recent advances in developmental cognitive neuroscience suggest a link between executive functions (EF) and school achievement. Briefly, executive functions include our ability to reason, plan ahead, multi-task or switch between tasks, sustain attention, delay gratification, and make complex decisions and change dramatically between childhood and adulthood. Children from Asia are widely reported to outperform children from North America Europe on EF tasks, but this evidence is focused almost entirely on young children and largely ignores the question of whether there are cross-cultural differences in EF for older children and adults. This project includes two studies that have been carefully designed to establish the validity, magnitude and universality of any East-West contrast in children's EF performances.

Together, these studies have three key goals.

- 1 To improve the measurement of children's EF by developing psychometrically robust, culturally-fair task batteries that are suitable for use across a broad range of ages;
- 2 To enhance our understanding of putative cultural contrasts by examining links between within-group variation in EF performance and parenting factors; and
- 3 To explore whether the link between EF and academic achievement show cultural universality and the extent that parental factors influence this link.

Students working on this project will participate in some data collection as well as various aspects of data management – including scoring and entering previously

collected data. All students will have access to a large database of over 600 children and parents – with a large number of potential research questions available. Students who are part of the project will create specific research questions in collaboration with Dr Ellefson and will be given opportunities to use advanced statistical techniques to address those questions.

We use Excel and the statistical programme JMP for our database. Students don't need to know JMP, as they'll learn more about it through working with us. A CRB check may be necessary, although we also have a large research database so students could work on existing data and would only need the check if they are collecting new data.

More information about The Family Thinking Skills Project can be found at:
<https://sites.google.com/site/instructlab/projects/family-thinking-skills>

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adolescents' psychological functioning: A longitudinal investigation in the United States and China. *Child Development*, 78, 1592–1610.

T: The Development of Executive Functions: Longitudinal Data on Older Children.

Supervisor: [Dr Michelle Ellefson](#).

Places: 1 - 2

Abstract:

We have a large database of over 120 million cells of data that include over 400 children participating in various types of tasks of executive function, general cognitive ability and academic skills as well as measure of behavior and views on learning across two academic years. The children were part of a longitudinal study to explore whether playing chess can improve thinking skills in psychology and academic domains. Students working on this project won't be able to explore the specific influence of chess the chess intervention, but they can look at longitudinal change or how skills at one timepoint predict skills at later timepoints.

With this large database there are a large number of potential research questions available. Students who are part of the project will create specific research questions in collaboration with Dr Ellefson and will be given opportunities to use advanced statistical techniques to address those questions. Depending on the research question – there might be opportunities to do additional data entry and scoring in addition to the data analyses.

We use Excel and the statistical programme JMP for our database. Students don't need to know JMP, as they'll learn more about it through working with us.

More information about The Family Thinking Skills Project can be found at:

<https://sites.google.com/site/instructlab/projects/mind-match-chess>

References:

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45.

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U: Young Children's Reasoning about Chemistry.

Supervisor: [Dr Michelle Ellefson](#).

Places: 1 - 2

Abstract:

This inter-disciplinary project, combining cognitive psychology paradigms with education and chemistry approaches, aims to explore children's knowledge of how substances mix prior to systematic chemistry instruction. More specifically, the project aims to study children's earliest understandings of chemistry, with experiments on how 4- to 11-year-olds understand what happens when substances / materials mix. When a solid is mixed with a liquid, it might dissolve forming a solution, with the solid disappearing in the liquid, or it might suspend in the liquid, with particles diffused throughout, or it may do nothing, just floating/sinking, or the two might be involved in a chemical reaction, forming new substance(s). The outcome depends on various chemical properties of the different substances, including substance-kind (roughly, different molecular structure and bonding within molecules) and form (roughly, depending on bonding between molecules).

Students working on this project will participate in some data collection as well as various aspects of data management – including scoring and entering previously collected data. All students will have access to a large database of over 400 children – with a large number of potential research questions available. Students who are part of the project will create specific research questions in collaboration with Dr Ellefson and will be given opportunities to use advanced statistical techniques to address those questions.

We use Excel and the statistical programme JMP for our database. Students don't need to know JMP, as they'll learn more about it through working with us. A CRB check may be necessary, although we also have a large research database so students could work on existing data and would only need the check if they are collecting new data.

More information about The Family Thinking Skills Project can be found at:

<https://sites.google.com/site/instructlab/projects/children-s-chemistry-reasoning>

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W: Auditory-Visual Speech Processing in Developmental Dyslexia.

Supervisor: [Prof Usha Goswami](#), [Dr Lincoln Colling](#), [Dr Sheila Flanagan](#). Places: 1 - 2

Abstract:

Research with children with dyslexia has revealed auditory processing difficulties focused around rhythmic and prosodic processing, which have a developmental impact on the mental lexicon developed by affected individuals. In particular, processing of the sound structure (phonological structure) of words is adversely affected. When babies begin acquiring a spoken language system, they use visual as well as auditory prosody (e.g., opening and closing of the jaws). In a recent study, we showed that when degraded speech (vocoded speech) is presented as "auditory alone", dyslexics are significantly worse than controls at recognising speech. However, when visual temporal information is provided by showing a talking head that has been pixellated so that the face is not visible, then dyslexics become as good as controls. This suggests that the dyslexics use the low frequency visual temporal information to boost the auditory signal via auditory-visual oscillatory entrainment. The current project extends this investigation by using target sentences rather than single words. The prediction is that low frequency visual information helps participants with dyslexia. The sentence stimuli are already prepared, but the student/s would need to programme (with help) the task delivery and design a range of background measures. Programming work on this project can start immediately, with testing over Xmas and early Lent.

References:

Goswami, U. (2011). A temporal sampling framework for developmental dyslexia. *Trends in Cognitive Sciences*, 15 (1), 3-10.

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X: Coughs, Sneezes, Laughter and Developmental Dyslexia.

Supervisor: [Prof Usha Goswami](#), [Dr Lincoln Colling](#), [Dr Sheila Flanagan](#).

Places: 1 - 2

Abstract:

Research with children with dyslexia has revealed auditory processing difficulties focused around rhythmic and prosodic processing, which have a developmental impact on the mental lexicon developed by affected individuals. In particular, processing of non-speech auditory cues to timbre is adversely affected. Timbre is important in assigning speaker identity to heard non-speech sounds like coughs, sneezes and laughter. Recent adult work involving these kinds of stimuli suggests individual differences in neuro-typical adults, however no-one has yet explored the ability of adults with dyslexia to assign speaker identity to such stimuli. The current project would be the first such investigation. The prediction is that participants with dyslexia would be worse at assigning identity when non-speech sounds involve timbre. The student/s would need to design and programme (with help) the task/s (experimental and control conditions) and design a range of background measures. Programming work on this project can start immediately, with testing over Xmas and early Lent.

References:

Goswami, U. (2011). A temporal sampling framework for developmental dyslexia. *Trends in Cognitive Sciences*, 15 (1), 3-10.
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Y: Emotion Recognition through Voice Alone in Developmental Dyslexia.

Supervisor: [Prof Usha Goswami](#), [Dr Lincoln Colling](#), [Dr Sheila Flanagan](#).

Places: 1 - 2

Abstract:

Research with children with dyslexia has revealed auditory processing difficulties focused around rhythmic and prosodic processing, which have a developmental impact on the mental lexicon developed by affected individuals. In particular, processing of the sound structure (phonological structure) of words is adversely affected. We have tested implications of these findings in undergraduates with dyslexia, showing for example that perception of syllable stress is impaired. Further, perception of English sentences when spoken by non-native speakers (whose prosody can be different) is also affected. The current project extends our prosodic focus to the perception of emotion in the voice. Students would (with help) design an emotional processing task suitable for adults in which voice alone cues are contrasted with visual alone cues. The prediction is that recognition of different emotions may be impaired in participants with dyslexia when judged by voice alone. The student/s would need to design and programme (with help) the task/s (experimental and control conditions) and design a range of background measures. Programming work on this project can start immediately, with testing over Xmas and early Lent.

References:

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Z: Differential evaluation by gender: a meta-analysis

Supervisor: [Prof Melissa Hines](#)

Places: 1 - 2

Abstract:

Numerous studies have observed that the work of men is rated more highly than the work of women, even when the work is identical (e.g., [1] [2]). However, the magnitude of this effect and its consistency across time, work domain, and evaluative dimension, are unknown. This project will use meta-analytic techniques to begin to answer these questions.

References:

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AA: Cross cultural comparisons of children's gender-typed play

Supervisor: [Prof Melissa Hines](#)

Places: 1 - 2

Abstract:

There is extensive evidence that boys and girls in Western, industrialized countries differ in their toy, activity, playmate and colour preferences [1,2]. Relatively little is known, however, about similar gender differences in other cultures, particularly in cultures where Western media are unavailable. This project analyses data from children in Cambridge, and children in remote areas of Peru, to identify similarities and differences in gender-related preferences. It might also be possible to help collect data in Cambridge.

References:

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2. Wong WI, Hines M: **Preferences for pink and blue: the development of color preferences as a distinct gender-typed behavior in toddlers**. *Archives of Sexual Behavior* 2015, **44**:1243-1254.

AB: Family relationships in adolescence: a young person's view.

Supervisor: [Prof Claire Hughes](#) and [Dr Rory Devine](#).

Places: 1 - 2

Abstract:

Historically, the nature-nurture debate was focused on explaining contrasts in particular traits or abilities between children in different families. Over time, findings from behavioural genetic research (e.g., twin studies) have consistently demonstrated that the most powerful effects of family environment are typically specific to individual children (i.e., 'non-shared') rather than common to all children in the family (i.e., shared). One explanation for this is that it is not life-events or conditions per se that matter, but rather how we perceive these life events. This insight has led to an increased emphasis on gathering a child's-eye view of family relationships. This project is embedded within ongoing longitudinal research involving a socially diverse sample of about 120 children who have been seen at ages 4, 6, 10, 12 and 13 (with 90 of these children also seen at ages 2 and 3). For a discussion of findings from early time-points, see my book about this sample *Social Understanding Social Lives* (a set text for PBS 3 and 8) tracks the children from ages 2 to 6. We are now planning a wave of age 14 phone-interviews with the study children and their siblings. The main aim of this interview-based project is to use a set of well-validated questionnaires (Furman & Buhrmester, 1985) applied at previous time-points in order to track changes in the quality of sibling relationships between age 10 and 14 (i.e., across the transition to secondary school and across the onset of puberty). There is a rich data-set from previous time-points such that it should be possible to explore a wide variety of potential moderating influences (e.g., gender, socio-economic status, symptoms of depression or anxiety). It would therefore be possible for 2 to 3 students to collaborate on this project (one student has already chosen to work on this project and is in the process of obtaining ethical approval).

References:

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AC: Theory of mind and mind-mindedness in teenagers.

Supervisor: [Prof Claire Hughes](#) and [Dr Rory Devine](#).

Places: 2 - 3

Abstract:

Studies of maternal mind-mindedness suggest that this construct (defined as the propensity to view one's child as a mental being with his or her own thoughts, feelings and intentions) is determined by relationship quality rather than individual

traits such as level of education (e.g., Meins et al 2014). To date, however, no study has attempted to examine whether mind-mindedness is related to the quality of the sibling relationship or to children's more general mind-reading skills. This study is embedded within ongoing longitudinal research involving a socially diverse sample of about 120 children who have been seen at ages 4, 6, 10, 12 and 13 (with 90 of these children also seen at ages 2 and 3). For a discussion of findings from early time-points, see my book about this sample *Social Understanding Social Lives* (a set text for PBS 3 and 8) tracks the children from ages 2 to 6. We are now planning a wave of age 14 phone-interviews with the study children and their siblings. The aim of Project B is to obtain an open-ended account of the sibling relationship using a 3-minute speech sample. This has been widely used in both clinical studies and in the developmental literature on parent-child relationships (Sher-Censor, 2015) and has also been validated as a tool for examining sibling relationship quality (Yelland & Daley, 2009). Funding is available to pay participants and to cover the costs of professional transcription of these speech samples. The project students will then use these transcripts to code for warmth and criticism, as well as references to siblings' mental as opposed to physical attributes. Key questions to be addressed are both methodological (e.g., what is the agreement between questionnaire-based and speech-sample coding of sibling relationship quality) and conceptual (e.g., do measures of theory of mind at age 10 predict individual differences in 'mind-mindedness'?). There is a rich data-set from previous time-points such that it should be possible explore a wide variety of potential moderating influences (e.g., gender, socio-economic status, symptoms of depression or anxiety). It would therefore be possible for 2 to 3 students to collaborate on this project.

References:

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McHale, S.M., Updegraff, K.A., Whiteman, S.D. (2012). Sibling Relationships and Influences in Childhood and Adolescence *Journal of Marriage and Family*, 74, 913-930.

Sher-Censor, E. (2015) Five Minute Speech Sample in developmental research: A review. *Developmental Review*, 36 127-155.

Yelland and Daley (2009) Expressed emotion in children: associations with sibling relationships. *Child: care, health and development*, 35, 4, 568–577

AD: Playing with Preschoolers: Parental Influences on Children's Theory of Mind.

Supervisor: [Dr Rory Devine](#) and [Prof Claire Hughes](#). Places: 2 - 3

Abstract:

Recent literature reviews (e.g, Hughes & Devine, 2014, 2015) have shown that individual differences in children's ability to reason about mental states show robust association with variation in a number of parental characteristics, including frequency of conversational reference to mental states. This project capitalizes on the availability of observational data from 120 families gathered at two time-points, when the study child was aged, approximately 4 and 5 years. The main aim of the project would be to apply an established coding scheme in order to conduct

transcript-based analysis of parent-child talk (e.g., during 5-minute unstructured lab session with playdoh and a 5-minute lab session with a wordless picture book). Key questions to be addressed concern longitudinal associations between parental behavior and children's social cognition. This work requires establishing inter-rater reliability and so would be ideal for a small group of 2-3 students. There is a rich data-set such that it should be possible explore a wide variety of potential moderating influences (e.g., age, gender, hours child spends at home / nursery, number of older siblings etc).

References:

Ensor, R., Devine, R.T., Marks, A. & Hughes, C. (2014). Mothers' cognitive references to 2-year-olds predict theory of mind at age 6 and 10. *Child Development*, 85, (3), 1222 – 1235. DOI: 10.1111/cdev.12186

Ruffman, T., Slade, L. & Crowe, E. (2002). The relation between children's and mothers' mental state language and theory-of-mind understanding. *Child Development*, 73 (3), 734-751. DOI: 10.1111/1467-8624.00435

Hughes, C. & Devine, R.T. (2015). A social perspective on theory of mind. In M. Lamb and R.M. Lerner (Eds.). *Handbook of Child Psychology and Developmental Science* (7th ed.), Volume III: Social, Emotional and Personality Development. Hoboken, NJ: Wiley. DOI: 10.1002/9781118963418.childpsy314

Hughes, C. & Devine, R.T. (2015). Individual differences in theory of mind from preschool to adolescence: Achievements and directions. *Child Development Perspectives*, Early Online View. DOI: 10.1111/cdep.12124

AE: Playing with Preschoolers: Parental Influences on Children's Executive Function.

Supervisor: [Dr Rory Devine](#) and [Prof Claire Hughes](#).

Places: 2 - 3

Abstract:

From a Vygotskian perspective, young children's executive functions emerge through their interactions with more experienced social partners (e.g., children learn how to plan and problem solve with assistance from parents who provide both cognitive and emotional support). However, existing studies are largely cross-sectional in design, such that it is not known whether: i) individual differences in parents' provision of 'scaffolding' support are stable over time; ii) predictive associations between scaffolding and child performance on tests of goal-directed activity are significant over extended periods of time. To address these questions, this project capitalizes on the availability of observational data from 120 families gathered at two time-points, when the study child was aged, approximately 4 and 5 years. The main aim of the project would be to apply a video coding scheme that has already been used successfully with Time 1 videos to assess parental scaffolding at Time 2. This work requires establishing inter-rater reliability and so would be ideal for a small group of 2-3 students. There is a rich data-set such that it should be possible explore a wide variety of potential moderating influences (e.g., age, gender, hours child spends at home / nursery, number of older siblings etc).

References:

Hammond, S., Müller, U., Carpendale, J. I. M., Bibok, M. B., & Liebermann-Finestone, D. P. (2012). The effects of parental scaffolding on preschoolers' executive function. *Developmental Psychology*, 48, 271-281.

Hughes, C., (2011). Changes and challenges in 20 years of research into the development of executive function. *Infant and Child Development*, 20 251-271.

Hughes, C. & Ensor, R. (2009). How do families help or hinder the emergence of early executive function? *New Directions for Child and Adolescent Development*, 123, 35 – 50.

Müller, U., Baker, L., and Yeung, E. (2013). A developmental systems approach to executive function. *Adv. Child Dev. Behav.* 45, 39–66.

AF: Individual variability in learning ability.

Supervisor: [Prof Zoe Kourtzi](#).

Places: 1 - 2

Abstract:

Experience shapes performance on a variety of tasks, but why are some people better at learning than others? This project will aim to systematically investigate individual variability in learning ability in young adults. The main goal of the work is to evaluate the role of learning in decisions when external noise in the physical input results in high uncertainty in the observers' ability to make decisions (i.e. discriminate targets in cluttered scenes). We will develop a battery of tests based on established experimental paradigms that measure cognitive abilities (e.g. attention, memory, reasoning) and evaluate the role of these functions in individual variability in learning performance. We will aim to identify prototypical learning profiles that may differ across individuals.

References:

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2. Li S, Mayhew SD, & Kourtzi Z (2009) Learning shapes the representation of behavioral choice in the human brain. *Neuron* 62(3):441-452.
3. Goldstone RL (1998) Perceptual learning. *Annual Review of Psychology* 49:585–612.
4. Li RW, Levi DM, & Klein SA (2004) Perceptual learning improves efficiency by re-tuning the decision 'template' for position discrimination. *Nat Neurosci* 7(2):178-183.

AG: Learning to generalise.

Supervisor: [Prof Zoe Kourtzi](#).

Places: 1 - 2

Abstract:

It is well known that practice makes perfect, but how do we generalise knowledge from previous experience to new situations? The aim of this project is to investigate whether training generalises beyond the context of the trained task or skill to support our ability for flexible behaviour. First, we will test whether learning in the context of perceptual tasks improves performance in cognitive skills (i.e.

working memory, attention), providing evidence that learning of underlying structures and principles promotes flexible cognition. Second, we will examine whether training on cognitive control skills (i.e. working memory, attention) improves performance not only on these tasks but also facilitates our ability for learning (i.e. infer perceptual structures in novel settings).

References:

1. Baker R, Dexter M, Harwicke T, Goldstone A, Kourtzi Z (2014) Learning to predict: exposure to temporal sequences facilitates prediction of future events. *Vision Research*, 99, 124-33.
2. Chang D, Kourtzi Z, Welchman AE (2013) Mechanisms for extracting a signal from noise as revealed through the specificity and generality of task training. *J Neuroscience*, 33, 10962-71.
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4. Doshier BA, Jeter P, Liu J, Lu Z-L. An integrated reweighting theory of perceptual learning. *Proceedings of the National Academy of Sciences*. 2013 Aug 13;110(33):13678–83.

AH: Learning profiles across the lifespan

Supervisor: [Prof Zoe Kourtzi](#).

Places: 1 - 2

Abstract:

Experience and learning are key factors for human development known to shape cognitive abilities in the young adult human brain (1-3). However, the mechanisms of brain training that sustain cognitive abilities and help maintenance of function in ageing remain largely unknown. Understanding the role of learning in making perceptual decisions (e.g. identifying a friend in the crowd) across the lifespan is complicated by between-individual variability caused by differences in learning strategies and styles. ? The aim of this project is to derive profiles for 'high' or 'low' performers based on their learning efficiency. In particular, we will test whether variability in cognitive functions (i.e. memory, attention, reasoning), learning performance independent of age.

References:

1. Draganski B, et al. (2004) Neuroplasticity: changes in grey matter induced by training. *Nature* 427(6972):311-312.
2. Kourtzi Z (2010) Visual learning for perceptual and categorical decisions in the human brain. *Vision Res* 50(4):433-440.
3. Goldstone RL (1998) Perceptual learning. *Annual Review of Psychology* 49:585–612.
4. Christian J, Goldstone A, Kuai S, Chin W, Abrams D, Kourtzi Z (2015) Socio-cognitive profiles for visual learning in young and older adults. *Frontiers in Aging Neuroscience*.

AI: Visuospatial tasks (such as 'the computer game Tetris') can reduce intrusive memories of experimental trauma: is it a modality-specific or a general load effect in working memory?

Supervisor: [Alex Lau-Zhu \(PhD Student\)](#); [Dr Ella James \(Post-doctoral Researcher\)](#), [Prof Emily Holmes \(Principal Investigator\)](#)

Places: 1 - 2

Abstract:

Most people will experience or witness a traumatic event in their lifetime. A hallmark symptom of clinical post-traumatic distress is the recurrent, intrusive distressing memories of trauma. We have carried out laboratory studies using the trauma film paradigm as an experimental analogue of witnessing real-life trauma. Participants view a film with stressful content then keep a diary in everyday life to monitor any intrusive memories of the film. We have previously shown that visuospatial tasks (e.g. concealed pattern tapping, computer game Tetris) performed during (Holmes, Brewin, & Hennessy, 2004) and after the stressful film (Deepröse, Zhang, Dejong, Dalgleish, & Holmes, 2012; Holmes, James, Coode-Bate, & Deepröse, 2009; Holmes, James, Kilford, & Deepröse, 2010; James et al., 2015) can reduce the frequency of later intrusions, whereas control tasks (e.g. counting backwards in 3's, computer game Pub Quiz) are less effective. We suggested a modality-specific hypothesis that visuospatial tasks selectively compete for resources required for the consolidation of image-based memories, whereas other types of tasks do not. Nevertheless, our studies until today fail to answer the question of whether the visuospatial nature of the task, as we predicted, is critical. Our hypothesis stands in contrast to mainstream neuroscientific models which suggest that any demanding cognitive task should be effective in disrupting memory. This Part II project aims to resolve these competing accounts. An experiment will compare established visuospatial against verbal tasks drawn from the working memory literature, matched for demand on general executive resources. This comparison would permit conclusions to be drawn about modality specificity versus general demand. This project can be started immediately, and would be of special interest for students interested in the intersection between experimental cognitive and clinical psychology.

References:

Deepröse, C., Zhang, S., Dejong, H., Dalgleish, T., & Holmes, E. A. (2012). Imagery in the aftermath of viewing a traumatic film: Using cognitive tasks to modulate the development of involuntary memory. *Journal of Behavior Therapy and Experimental Psychiatry*, 43(2), 758-764. doi: 10.1016/j.jbtep.2011.10.008

Holmes, E. A., Brewin, C. R., & Hennessy, R. G. (2004). Trauma films, information processing, and intrusive memory development. *Journal of Experimental Psychology: General*, 133(1), 3-22. doi: 10.1037/0096-3445.133.1.3

Holmes, E. A., James, E. L., Coode-Bate, T., & Deepröse, C. (2009). Can playing the computer game "Tetris" reduce the build-up of flashbacks for trauma? A proposal from cognitive science. *PLoS ONE*, 4(1), e4153. doi: 10.1371/journal.pone.0004153

Holmes, E. A., James, E. L., Kilford, E. J., & Deepröse, C. (2010). Key steps in developing a cognitive vaccine against traumatic flashbacks: visuospatial Tetris versus verbal Pub Quiz. *PLoS ONE*, 5(11), e13706. doi: 10.1371/journal.pone.0013706

James, E. L., Bonsall, M. B., Hoppitt, L., Tunbridge, E. M., Geddes, J. R., Milton, A. L., & Holmes, E. A. (2015). Computer game play reduces intrusive memories of experimental trauma via reconsolidation update mechanisms. *Psychological Science*, 1-15. OnlineFirst. doi: 10.1177/0956797615583071

AJ: Context effects in decision making.

Supervisor: [Dr George Farmer](#), [Dr William Matthews](#).

Places: 2 - 4

Abstract:

People's decisions between alternatives can be biased by the presence or absence of options that should be irrelevant to their choice. For instance, the 'attraction effect' (Huber, Payne, & Puto, 1982) occurs when an obviously bad option, which nobody chooses, nonetheless has an impact on which of the other alternatives is chosen. These types of effect are labelled 'contextual preference reversals', and are a challenge to explain since they violate key axioms in rational decision making models. Contextual preference reversals are robust, having been observed in animals (Parrish et al 2015), humans (Huber et al 1982; Wedell 1991; Noguchi & Stewart 2014) and even slime mould (Latty & Beekman, 2011), as well as across a broad range of decision types including decisions between gambles (Wedell, 1991, Soltani et al, 2012), perceptual decisions (Trueblood et al, 2013) and decisions between consumer products (Noguchi & Stewart, 2014). This project will examine whether we can understand contextual preference reversals by taking in to account the characteristics of the environment in which decisions are made. For example, these effects might actually be useful if they are the result of people making sensible inferences about the broader environment they are operating in. This is an approach that has been successful in recent studies of apparent irrationalities in animal decision making (Trimmer, 2013; McNamara et al 2014).

Students will normally work in pairs because this facilitates large-scale data collection. Different versions of the project are possible, so two pairs could be accommodated.

References:

- Huber, J., Payne, J. W., & Puto, C. (1982). Adding asymmetrically dominated alternatives: Violations of regularity and the similarity hypothesis. *Journal of consumer research*, 90-98.
- Latty, T., & Beekman, M. (2011). Irrational decision-making in an amoeboid organism: transitivity and context-dependent preferences. *Proceedings of the Royal Society of London B: Biological Sciences*, 278(1703), 307-312.
- McNamara, J. M., Trimmer, P. C., & Houston, A. I. (2014). Natural selection can favour 'irrational' behaviour. *Biology Letters*, 10(1), 20130935.
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Wedell, D. H. (1991). Distinguishing among models of contextually induced preference reversals. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 17(4), 767.

AK: Putty in our hands? Presentation-format effects on judgment and decision-making.

Supervisor: [Dr William Matthews](#).

Places: 2 - 4

Abstract:

Would you rather have a 5% chance of winning £100 or a 50% chance of winning £20? When faced with such decisions, people rarely choose in accordance with the dictates of normative economic theories (e.g., Kahneman, 2011). Rather, their preferences show a range of “irrationalities” that provide insight into the cognitive processes that underlie our judgments and decisions. In particular, decisions are shaped by the “framing” of the options or the mode of the response – for example, whether the same outcomes are presented as gains or losses and whether people are asked to make a choice to put a financial value on each option can both lead to reversals in people’s preferences (e.g., Tversky & Kahneman, 1981). This project will investigate new aspects of problem-presentation. There is scope for several different lines of enquiry, focused on (1) the spatial and temporal arrangement of the options (e.g., Matthews & Dylman, 2014), and (2) the use of spoken language rather than written formats. The project(s) will use simple computerized and/or pen-and-paper tasks, and may involve web-based testing. There may be scope for formal mathematical modelling, depending on the student’s appetite for that kind of thing.

Students will normally work in pairs because this facilitates large-scale data collection. Different versions of the project are possible, so two pairs could be accommodated.

References:

Kahneman, D. (2011). *Thinking, Fast and Slow*. London: Penguin.

Matthews, W.J., & Dylman, A.S. (2014). The language of magnitude comparison. *Journal of Experimental Psychology: General*, 143, 510-520.

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, 211(4481), 453-458.

AL: Risk and motor decision making.

Supervisor: [Dr George Farmer](#), [Dr William Matthews](#).

Places: 2 - 4

Abstract:

Human decision making is often studied in choices between gambles, such as ‘a 50% chance of £10 or a 20% chance of £25.’ This research has unearthed a

number of biases and irrationalities in human decision making (Tversky & Kahneman, 1981; Tversky & Kahneman, 1992). More recently however, researchers have started to represent gambles as motor lotteries. In these decisions, a person has to rapidly hit a touch-screen showing configurations of gain and penalty zones. These experiments show that people typically aim for the point on the screen that maximises their reward, suggesting that when making these kinds of decisions people are not subject to the biases and sub-optimal performance found using more traditional paradigms (Trommershäuser et al 2006; 2008; Zhang et al 2015). A novel hypothesis that students could test with these paradigms, is whether a person's ability on these motor tasks can be used to predict their attitude to risk. Do people who are good at making these rapid pointing movements make riskier decisions than those that have poorer performance? Students may also develop their own hypotheses in this area.

Students will normally work in pairs, as this facilitates large-scale data collection. Different versions of the project are possible, so two pairs could be accommodated.

References:

- Trommershäuser, J., Landy, M. S., & Maloney, L. T. (2006). Humans rapidly estimate expected gain in movement planning. *Psychological Science*, 17(11), 981-988.
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AM: The eyes as a window on time: Using eye-tracking to predict judgments of duration.

Supervisor: [Dr William Matthews](#).

Places: 1 - 4

Abstract:

How long have you spent reading this sentence? We routinely judge time, yet our duration judgments are influenced by all manner of non-temporal information. For example, the apparent duration of visual experiences depend on an object's size, brightness, and motion (Eagleman & Pariyadath, 2009; Matthews & Meck, 2014). These effects provide fundamental insights into the basis for temporal judgments, and have practical implications -- for example, the credibility of eyewitness testimony depends on the witness' judgment of how long they saw the alleged perpetrator. This project will take a novel approach by using eye-tracking to explore the relationship between the fixations that a person makes when viewing a scene and their subsequent judgment of how long they saw it for. Saccadic eye movements lead to brief compression of subjective time (Morrone, Ross, & Burr, 2005), but dividing an experience into multiple segments expands its apparent

duration (e.g., Matthews, 2013) – so there are conflicting predictions about how time judgments will be related to the number of fixations. The project will use eye-tracking equipment and relatively sophisticated statistical analyses – including the potential for fitting bespoke mathematical models – and might particularly suit students who are technically/mathematically minded.

Students might work in pairs, although there would be scope for working along. Different versions of the project are possible, so two students or pairs could be accommodated.

References:

Eagleman, D. M., & Pariyadath, V. (2009). Is subjective duration a signature of coding efficiency? *Philosophical Transactions of the Royal Society B*, 364, 1841-1851.

Matthews, W.J. (2013). How does sequence structure affect the judgment of time? Exploring a weighted sum of segments model. *Cognitive Psychology*, 66, 259-282.

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AN: Breaking a habit.

Supervisor: [George Vousden](#), [Dr Amy Milton](#).

Places: 1 - 2

Abstract:

After extensive training, responding in both humans and animals becomes habitual. This habitual responding is reliant on distinct brain regions to those used early in training and likely forms an important contribution to neuropsychiatric disorders including obsessive-compulsive disorder, drug addiction and binge eating. Work from this lab and others has previously demonstrated that memories underlying responding early in training can be disrupted via blockade of a process termed memory reconsolidation. Less clear, however, is whether memories underlying habitual responding can be disrupted in a similar manner. If disruptions of memory reconsolidation are to form aspects of therapeutic interventions for psychological disorders, it is the memories underlying maladaptive habits that must be targeted.

This study will extensively train rats to lever press for a food reward in a manner that has previously shown to promote the formation of habitual reward seeking (Murray et al., 2012). After this extended training animals will undergo a reactivation session, where the memory for the lever press-reward association will be retrieved, under the presence of a NMDA receptor antagonist, a manipulation that has previously been shown to result in the blockade of memory reconsolidation (Flavell & Lee, 2013). If reconsolidation has been disrupted, animals undergoing NMDA receptor antagonism should subsequently show decreased reward seeking.

This project will provide extensive experience of animal handling, familiarity with tests of food seeking and, through reading related to the project and the results

themselves, an understanding of memory reconsolidation and the conditions of when it does and does not occur. All students would be required to undergo screening by Occupational Health and security checks before starting on the project.

References:

Flavell, C.R. & Lee, J.L.C. (2013) Reconsolidation and extinction of an appetitive pavlovian memory. *Neurobiology of Learning and Memory*, 104, 25-31.

Murray, J.E., Belin, D. & Everitt, B.J. (2012) Double Dissociation of the Dorsomedial and Dorsolateral Striatal Control Over the Acquisition and Performance of Cocaine Seeking. *Neuropsychopharmacology*.

AO: Cell signalling engaged by the amygdala at fear memory retrieval.

Supervisor: [Dr Emma Cahill](#), [Dr Amy Milton](#).

Places: 1 - 2

Abstract:

Potent emotional experiences, such as a frightful incident, induce biochemical signalling in the brain so that long-lasting memories of past experience can be stored and recalled in the future. In post-traumatic stress disorder (PTSD), fearful memories are triggered uncontrollably by reminders of the original event, despite the absence of any real threat. Insufficient pharmacological treatments exist for these symptoms, but a current therapeutic goal is to target the neurochemical substrates of memory processing and induce selective amnesia of fear memory.

Memories cannot influence behaviour if they cannot be retrieved. Memory retrieval has distinct molecular and cellular mechanisms from other stages of memory processing. Cellular signalling is an orchestra of complex interactions between neurotransmitter receptors and their effectors. One well-studied transcription factor that is induced downstream of calcium and activated by fear memory retrieval in the amygdala is zif268 (Hall et al., 2001, Besnard et al., 2014). Hippocampal Zif268 has been shown to play a specific role in fear memory reconsolidation (Lee et al., 2004) in a dose dependant manner (Besnard et al., 2013).

However how zif268 becomes induced is unclear. Some evidence points towards an upstream role for the ERK signalling cascade (Besnard et al., 2013). ERK itself can be activated by calcium influx via NMDA- type glutamate receptors (NMDAR). The amygdala is enriched with receptors known to positively couple to ERK activation in other brain areas, such as NMDAR (Delaney et al., 2013). One subunit in particular, GluN2A, has been shown to exclusively regulate reconsolidation (Milton et al., 2013). Therefore, it may be hypothesised that GluN2A-NMDAR signalling induces zif268 expression via pERK at memory retrieval.

We have some preliminary evidence from Western Blotting that activated ERK accumulates in the cytoplasm at memory retrieval and that this may be due to activation of GluN2A containing NMDARs. The proposed project will extend our previous work by assessing whether expression of zif268, as measured by Western Blot, is activated downstream of GluN2A containing receptors.

Amygdala samples from animals who have undergone cued fear-conditioning and were sacrificed after retrieval, or in absence of a retrieval trial or after only being exposed to the testing context (but no fear cue) will be analysed. The rats will be infused with an antagonist to GluN2A-NMDARs before memory retrieval and tissue collected 90 minutes later. This project thus combines some behavioural analysis (fear memories) and immunoblotting techniques (brain slicing/anatomy/tissue preparation/image analysis). Students choosing this project would be required to undergo screening by Occupational Health, and security checks before starting on the project.

References:

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AP: Optimising alcohol intake in rats.

Supervisor: [Dr Amy Milton](#).

Places: 1 - 2

Abstract:

Studies of the self-administration of alcohol in outbred rodent models have been limited by the aversive taste of alcohol, which limits the volumes voluntarily consumed by the animals. Alcohol self-administration in outbred rodents can be accomplished, and is usually achieved by exposing the animals to an extended habituation procedure known as ‘fading’. However, although fading is widely used, its disadvantages include the fact that animals have to be encouraged to drink through the use of water restriction and the inclusion of sweeteners in the consumed solutions.

A recent paper (Augier et al., 2014) has suggested an alternative procedure to encourage rats to drink alcohol, which does not require water restriction, sweeteners or extended pretraining. However, to date this approach has only been tested in Wistar rats, and not been validated in the Lister Hooded rats that are commonly used in drug addiction studies. This project would therefore compare the levels of alcohol consumption in Lister Hooded rats produced by Augier procedure to those produced by the standard saccharin fading procedure. Furthermore, the impact of alcohol-associated cues on the self-administration behaviour of the animals trained using both procedures will be also be assessed.

Students choosing this project would gain experience of rat handling and rodent models of alcohol self-administration. All students would be required to undergo screening by Occupational Health and security checks before starting on the project.

References:

Augier E, Flanigan M, Dulman RS, Pincus A, Schank JR, Rice KC, Kejun C, Heilig M & Tapocik JD (2014) Wistar rats acquire and maintain self-administration of 20% ethanol without water deprivation, saccharin/sucrose fading, or extended access

training. *Psychopharmacology* 231(23): 4561-68.

Milton AL, Schramm MJ, Wawrzynski JR, Gore F, Oikonomou-Mpegeti F, Wang NQ, Samuel D, Economidou D & Everitt BJ (2012) Antagonism at NMDA receptors, but not β -adrenergic receptors, disrupts the reconsolidation of pavlovian conditioned approach and instrumental transfer for ethanol-associated conditioned stimuli. *Psychopharmacology* 219(3): 751-61.

AQ: A genetic polymorphism of human vision.

Supervisor: [Prof John Mollon](#), Marina Danilova.

Places: 1 - 2

Abstract:

Variations in colour perception may arise from variations in the wavelength sensitivities of retinal cones. Such variations are rather well understood. Recently discovered, however, is a second way in which people differ: the relative numbers of long-wave (L) and middle-wave (M) cones vary dramatically. Some estimates suggest that L:M ratios range from 1:1 to 15:1 between people with nominally normal colour perception. Recently, a whole-genome association study from the Cambridge vision lab identified a single-nucleotide polymorphism (SNP) on chromosome 1 that is associated with L:M ratio (Lawrance-Owen et al, J. Optical Soc. Amer, 2014). The SNP lies close to the gene encoding the nuclear transcription factor Retinoid X Receptor γ , which is a likely candidate to control the differentiation of long- and middle-wave cones during retinal development. It was already known – in mice – to control the differentiation of short-wave cones from middle-wave cones (mice have only two types of cone).

The variation in L:M ratio can be measured psychophysically. It affects the relative luminosity of long- and middle-wavelength lights and so can be estimated by 'counterphase modulation photometry', in which red and green LEDs, modulated in opposite phase and optically mixed, are varied reciprocally in depth of modulation to find the point of minimum flicker. Additionally, Danilova has developed an estimate that depends on the spatial resolution for stimuli designed to modulate a single class of cones.

Since in mice the Retinoid X Receptor γ also controls the differentiation of short-wave (S) cones, we ask whether people show variations in the numbers of their S-cones that are correlated with their L:M ratio. The measurements would be psychophysical ones, of sensitivity and spatial resolution for stimuli that isolate the S-cones.

This project might suit a student attending the Part II Vision lectures, possibly someone reading Part II Physiology and Psychology. The exact project will depend on the outcome of a research project in the lab this summer.

References:

Danilova, Chan and Mollon (2013) Can spatial resolution reveal individual differences in the L:M cone ratio? *Vision Research*, 78, 26 [an earlier Part II project on this topic]

AR: Crowding in Cyrillic.

Supervisor: [Prof John Mollon](#), Marina Danilova.

Places: 1 - 2

Abstract:

This is a project that may attract a student who reads Russian and who would like to learn some computer programming.

The cyrillic alphabet was introduced by followers of Saints Cyril and Methodius in the 10th century, but was simplified first by Peter the Great in 1708 and then by the Bolshevik authorities in 1918. Owing to the similarity of upper- and lower-case characters and the paucity of strokes above and below the line, modern printed Russian text is dominated by single dominant spatial frequencies in both the vertical and the horizontal directions.

In the case of Roman characters, it is known that a given character presented in the parafovea is more difficult to identify if it is surrounded by other characters. This powerful effect is called 'crowding' (For a demonstration, see Mather's Foundations of Sensation and Perception, 2nd Ed, p 283.) Is crowding particularly strong for cyrillic, owing to the dominant horizontal spatial frequency component? Do particular combinations of target and flanking characters lead to very strong crowding? Are errors non-random? Could performance be improved by varying the separation of the vertical strokes in different characters or the separation between characters? Are some Cyrillic fonts less susceptible to crowding? There seems to have been little experimental work on crowding in cyrillic and so there are several different possibilities for a project. It should be fairly easy in Cambridge to find Russian speakers to act as subjects. For a student with a mathematical interest, there are also interesting possibilities in a comparative Fourier analysis of cyrillic and latin texts.

To take on this project, a student should be ready to learn how to manipulate characters in MatLab and to write simple experimental programs. This is not too difficult, and we can provide instruction in MatLab. The Part II lectures on Visual Cognition and on Vision provide relevant background.

References:

Majaj, Pelli et al (2002) The role of spatial frequency channels in letter identification. Vision Research, 42, 1165 (useful background)

Wilkins, A. et al (2007) Stripes within words affect reading. Perception, 36, 1788-1803 [a discussion, in terms of roman orthography, of a phenomenon that we suggest is especially strong in cyrillic.]

AS: Complementary colours.

Supervisor: [Prof John Mollon](#).

Places: 1 - 2

Abstract:

In an engaging paper in the Philosophical Transactions for 1794, Benjamin Thompson described the coloured shadows that are seen when a sheet of white paper is illuminated by two different sources (say, candlelight and daylight). A rod mounted on the paper casts two shadows, which appear of opposite hues. The

two shadows are complementaries in the strict physical sense: if the light reflected from the two shadows is combined, it necessarily reconstructs the white light from the unshadowed regions. As an aside from his main theme, Thompson remarks on how beautiful are the pairs of colours produced in this way. The principle that complementary pairs are especially attractive has been often repeated and is a commonplace among art teachers in many countries. However, there has been rather little empirical investigation of Thompson's claim. The proposed project would investigate the claim systematically, using ratings of attractiveness for different colours.

The generation of the colour stimuli would need some care. Calibration equipment is available. Complementary pairs could be generated very acceptably by Benjamin Thompson's method if known filters were used to produce the different illuminants (Some simple modelling work would be needed to find pairs that kept the white point constant). One sub-project could be to generate a range of pairs straddling the white point on different axes of colour space. Casual observation suggests that one axis (the 'tritan' axis, along which only the signal of the short-wave cones is being modulated) is peculiarly unattractive.

With Benjamin Thompson's method it is difficult to generate pairs that are not complementary. Another subproject could use polarisers to generate suitable non-complementary pairs. A more conventional method would be to program a calibrated display. But that would be less fun.

This project would recommend itself to a student who is taking the Part II Vision Course and who would like to learn a little colorimetry.

AT: π_2 : a mysterious sub-system of colour vision.

Supervisor: [Prof John Mollon](#), Sarah Regan.

Places: 1 - 2

Abstract:

Fundamental work on colour perception was performed in the middle of the twentieth century by W. S. Stiles, Director of Photometry at the National Physical Laboratory. Using psychophysical methods to isolate individual neural channels (he called them ' π mechanisms'), he obtained rather accurate estimates of the spectral sensitivities of the three types of cone in the retina. However, a complication was that he identified three different channels all most sensitive to short-wave (violet light) but with rather different sensitivities at long wavelengths. The most mysterious of these was π_2 , which exhibited a strange inflexion in its sensitivity to wavelengths in the yellow region of the spectrum.

Today we know much about the cones and about the neural channels in the retina that extract colour information from the cones. The work of Denis Dacey has shown that there is more than one type of ganglion cell that draws input from short-wave cones; and some ganglion cells actually contain a non-traditional light-sensitive pigment called 'melanopsin'. It is a good time to re-examine the curious and long-neglected channel called π_2 .

The proposed project will use a computer-controlled optical system to present dim flashes of one wavelength against backgrounds of other wavelengths, much as in

Stiles' original work. But we shall design analytical experiments to try to identify the nature of π_2 . For example, can one cancel the threshold-raising effect of a long-wave field by adding a field of complementary wavelength (this would be a reversal of Weber's law and the signature of a colour-opponent channel)? This is the type of psychophysical research where systematic measurements are made on a small number of observers.

Basic programs for experiments on π_2 have been written by Sarah Regan, but there will be the opportunity to learn programming in Matlab. This project would suit a student who is attending the Part II Vision lectures and who likes working with technical equipment, such as optics and electronics.

References:

Barlow and Mollon (1989) *The Senses*, CUP, ch 9, esp § 9.3. [Introduction to the basic concepts]

Marriott (1962) in H. Davson *The Eye*, vol 2, ch 17. [A more advanced treatment of the psychophysics that may recommend itself to students with some background in the physical sciences]

Dacey, D. (2004) in Gazzaniga *The cognitive neurosciences*, pp 281-301 [modern understanding of chromatic neural channels in the retina]

AV: Personality and place: Individual differences in environmental preferences.

Supervisor: [Dr Jason Rentfrow](#).

Places: 1 - 3

Abstract:

Increasing evidence from research in my lab has revealed that there are meaningful personality differences across regions of the UK and US. For example, people who live in cities tend to be more open-minded and less trusting of others whereas people who live in more rural areas tend to be more traditional and friendly. What drives these regional differences? One hypothesis is that people are drawn to environments that fit with their personalities. For instance, open-minded people might find the hustle and bustle of urban life exciting and stimulating, which could shed light on why many city dwellers are high in openness. This project will investigate links between personality and environmental preferences to get an idea of whether personality is related to preferences for particular types of environments. Data collection will be primarily web-based and thus requires comfort and familiarity working with web-survey tools. Students will gain valuable experience in survey design, Internet-based research methods, and data analysis.

AW: Virtual spaces of video and computer games: motivations, individual differences, and applications.

Supervisor: [Jessica Schallack](#) and [Dr Jason Rentfrow](#).

Places: 1 - 2

Abstract:

The virtual worlds of video and computer games are inhabited by about 1.2 billion people, but we know little about why people turn to virtual worlds, how individuals act and interact within these worlds, or how factors like stress and personality are

related to game behaviour. We hope to gain a better understanding of the general motivations and patterns of game behaviour through internet-based survey and API data collection.

We are particularly interested in the use of virtual spaces as substitutes or enhancements for real spaces. A recently completed exploratory study used an online survey and web API to investigate the relationships between video game play style, genre preferences, personality, and stress. We found that stressed individuals preferred games featuring immersion and exploration rather than achievement, indicating potential applications of virtual spaces as interventions in stressful environments. If a causal relationship can be established, virtual spaces may be useful in situations of crowding or lack of privacy, decreased mobility, lack of sensory stimulation, or social isolation.

In collaboration with the Autism Research Centre, we are conducting an ongoing study of gaming behavior among children and adults with autism spectrum conditions. The study will examine the relationships between Autism Spectrum Quotient (AQ), Empathizing Quotient (EQ), and Systemizing Quotient (SQ) with specific preferences and aptitudes for different types of games, particularly the virtual exploration and building-block game "Minecraft" which seems especially popular among children with ASC. We will explore parent and child perceptions of the effects of Minecraft and gaming in general as a first step towards assessing the positive and negative effects of gaming among individuals with ASC. Students interested in this project will gain experience in survey design, writing code for gathering online behavioural data, and data analysis.

AX: Using mobile technology to understand university adjustment in students from non-academic backgrounds.

Supervisor: [Sandrine Mueller](#) and [Dr Jason Rentfrow](#).

Places: 1 - 2

Abstract:

Successful adaptation to major life changes is crucial, but represents a struggle for many, which can have devastating consequences for an individual's work, emotional and social life, as well as physical and mental health. Our project focuses on students' adjustment to university life. A third-year student joining this project will be able to investigate adjustment to university in students from non-academic backgrounds. The main objective is to explore whether university adjustment and stress levels differ in students from non-academic backgrounds in comparison to their peers whose parents went to university. During Michaelmas term, participating first-year students will use a smartphone application to report on their psychological states. The collected data will test if students from non-academic backgrounds differ in their adaptation to university, mood and stress trajectories over their first months at university. Students interested in working on this project should be comfortable with statistics and also with using R, an open-source application for statistical analyses. Students will gain valuable experience analyzing complex datasets and also benefit from working in an interdisciplinary environment with psychologists and computer scientists.

AY: Wake me up before you Go- Go – Memory retention after sleep deprivation.

Supervisor: [Dr Michael Hornberger \(Clinical Neuroscience\)](#), [Prof Trevor Robbins \(Psychology\)](#), [Prof Barbara Sahakian \(Psychiatry\)](#) Places: 2 - 3

Abstract:

Background:

Episodic memory is known to be critically dependent on good sleep and regular sleep phases. During aging and in dementia sleep changes and can get disrupted. Currently we do not know what impact these sleep changes have on episodic memory performance in elderly and dementia patients. The proposed project will start to address this question by investigating the effects of sleep disruption on standard neuropsychological memory tests, which are commonly used in clinical populations, in the healthy young. Importantly, this project builds on last year's project which investigated how healthy young and elderly compared on these neuropsychological memory tests. Our findings showed that elderly performed significantly lower than young participants on particular delayed recall of information. The new study will now explore whether sleep disruption in the young can impair their memory similar to the elderly. Based on these findings we can then develop future experiments which investigate in more detail how sleep disruption in the elderly and dementia potentially has a detrimental effect on their memory.

Methods:

The project will consist of 3 phases: 1) Systematic literature review on memory performance after sleep disruption; 2) Testing healthy young adults either sleep-deprived or not on a selection of neuropsychological memory tests employing verbal and visual testing material; 3) Conducting statistical analysis to establish impact of sleep deprivation on neuropsychological memory tests.

Outcome:

The project outcome will be a critical first step in establishing the effects of sleep disruption on neuropsychological memory tests in the healthy young. In turn, establishing such benchmark sleep-disrupted neuropsychological data will not only inform our knowledge of environmental factors that impact on testing performance but also will create the basis for future investigations into more specific sleep phase changes in aging and dementia.

The project is suitable for two students working in collaboration. Ethical approval is likely to be needed for this project. Some computerised testing will be necessary. Programming skills could be useful but probably not necessary.

References:

General : Strickgold R (2005) Sleep-dependent memory consolidation Nature 437, 1272-1278

Specific: Rauchs G et al (2004) Consolidation of strictly episodic memories mainly requires rapid eye movement sleep. Sleep 27 395-401.

AZ: Relationship between personality traits and social cognition performance.

Supervisor: [Dr George Savulich](#), [Prof Barbara Sahakian](#) and [Prof](#) Places: 2 –

Abstract:

Introduction. Individuals within the broad autistic spectrum consistently display deficits in social cognition (Sasson, Nowlin & Pinkham, 2013), such as theory of mind (Baron-Cohen, 2000; Baron-Cohen, Leslie & Frith, 1985) and emotion recognition (Harms, Martin & Wallace, 2010). Normal variation in autistic traits is therefore thought to influence how individuals process, understand and make use of social information.

As degrees of autistic traits differ throughout the population, it has been found to be more prevalent in certain groups. For example, previous research has found that individuals working in the 'hard' sciences show significantly higher levels of autistic traits than those working in the arts (Baron-Cohen et al., 1997). Using a subset of tests from the newly developed EMOTICOM battery, the aim of the current research is to investigate whether this normal variation in autistic traits differentiates performance on tests of social cognition. Participants will be compared based on whether they study a (hard) Science or Arts subject, as these two groups have an expected difference in sub-clinical autistic traits. Participants will complete tasks from the EMOTICOM battery that are intended to detect psychological constructs relevant to autism – emotional recognition, theory of mind and social cognition.

Participants. 50 healthy male volunteers will be recruited, comprising two groups (hard Sciences/Arts). The eligibility criteria for both groups are: aged over 18; fluency in English; undergraduate/graduate student at the University of Cambridge; and no psychiatric or neurological illnesses.

Method. Participants will first complete the ten-item Autism Quotient, followed by three tasks of social cognition taken from the newly developed EMOTICOM battery. On the 4AFC Eyes task, participants will be briefly shown a picture of the eye region, and asked to identify the emotion of the person; on the Theory of Mind task, participants will be presented with drawn pictures of ambiguous situations, and asked to reveal information in the picture to make sense of the scene; and on the Social Urn task, participants are asked to make decisions about the ratio of red and blue marbles in a bucket based on both social and sample information.

Student requirements. A minimum of two students will be required. Students will be expected to recruit and test participants and will be supervised to extract and analyse data. This study will take place in testing rooms at the Department of Psychiatry Herchel Smith Building for Brain and Mind Sciences, Level 4 of Addenbrooke's Hospital and/or the Behavioural and Clinical Neuroscience Institute (dependent on room availability and/or the location that is most convenient to participants).

Ethical approval. Psychology Research Ethics has been obtained (Pre.2014.126)

References:

Baron-Cohen, S. (2000). Theory of mind and Autism: A fifteen year review. In Baron-Cohen, S., Tager-Flusberg, H., & Cohen, D.J. (Eds), Understanding Others

Minds: Perspectives From Developmental Cognitive Neuroscience. (pp. 3-20).
 New York, NY: Oxford University Press
 Baron-Cohen, S., Leslie, A.M., & Frith, U. (1985). Does the autistic child have a
 “theory of mind”? *Cognition*, 21(1), 37-46
 Harms, M.B., Martin, A., & Wallace, G.L. (2010). Facial emotion recognition in
 Autism Spectrum Disorders: A review of behavioural and neuroimaging studies.
Neuropsychology Review, 20(3), 290-322
 Sasson, N.J., Nowlin, R.B., & Pinkham, A.E. (2013). Social cognition, social skill
 and the broad autism phenotype. *Autism*, 17(6), 655-667

BA: Social Cognition in Nonclinical Paranoia.

Supervisor: [Dr George Savulich](#), [Prof Barbara Sahakian](#) and [Prof Trevor Robbins](#). Places: 2 – N/A

Abstract:

Introduction. Cognitive models of psychosis implicate social cognitive and emotional processes in the formation and maintenance of symptoms. Paranoid thinking is a key characteristic of psychosis but also presents in 10-15% of the general population. In this study, we aim to investigate the relationship between varying levels of trait paranoia in the healthy population (low versus high), the CANTAB Emotion Recognition task (ERT), a newly developed task battery of social cognition (EMOTICOM) and a new measure of expectation of sensory stimuli (Expectation-Detection task). Trait measures of paranoia/psychosis-like symptoms, anxiety, depression, self-esteem, cognitive flexibility and attributional style will also be collected for correlational and regression analyses to determine their association with and prediction of outcome measures of social cognition (e.g. cooperation, fairness sensitivity). This study has the potential to inform if differences in social cognitive and emotional processes occur across a continuum of paranoid thinking. Such differences may be important in the cause and maintenance of paranoid symptoms in clinical samples.

Participants. Healthy participants (n = 70) will be selectively recruited to have a wide range of scores on the Green et al. Paranoid Thoughts Scale (GPTS; Green et al., 2008; see Savulich, Freeman, Shergill, & Yiend, 2015 for an example of this recruitment method) to ensure comparison of low (mean score around 33) and high (mean score around 90) levels of trait paranoia. Inclusion criteria will be fluency in English, not currently taking any psychiatric medication or receiving psychological treatment and not having a past or current psychiatric diagnosis. Participants will be recruited through advertisement (e.g. bulletins) throughout the University of Cambridge and college websites. Participants will be matched for age, gender and IQ.

Hypotheses and Method. Social cognition comprises emotion perception, theory of mind and attributional style, and biases in these processes may underlie paranoid beliefs in individuals with higher levels of trait paranoia. We hypothesize that individuals with higher levels of trait paranoia will demonstrate a particular profile on specific measures from the EMOTICOM tests of ‘Theory of Mind’ and moral judgement, Ultimatum Game and Prisoner’s Dilemma, together with a novel Expectation-Detection task.

This study has the potential to inform if biases in social cognition at an attenuated level underlie paranoid thinking in the general population. Modifying such biases

may be important targets for psychological therapies in populations with high levels of paranoia, such as psychotic illnesses.

Student requirements: A minimum of two students will be required. Students will be expected to recruit and test participants and will be supervised to extract and analyse data. This study will take place in testing rooms at the Department of Psychiatry Herchel Smith Building for Brain and Mind Sciences, Level 4 of Addenbrooke's Hospital and the Behavioural and Clinical Neuroscience Institute (dependent on room availability and/or the location that is most convenient to participants).

Ethical approval: Psychology Research Ethics has been obtained (Pre.2015.046)

References:

Savulich, G., Freeman, D., Shergill, S., & Yiend, J. (2015). Interpretation biases in paranoia. *Behavior Therapy*, 46, 110-124.
Savulich, G., Shergill, S., & Yiend, J. (2012). Biased cognition in psychosis. *Journal of Experimental Psychopathology*, 3, 514-536.

BB: How habits become compulsions? Exploring habit learning in obsessive-compulsive disorder.

Supervisor: [Dr Paula Banca](#), [Prof Trevor Robbins](#).

Places: 1 - 2

Abstract:

Healthy humans are able to adjust their behaviours in order to successfully respond to a dynamic environment. This ability to shift between different behavioural strategies is governed by a parallel and flexible engagement of two distinct neurobiological systems: the goal directed system, which supports behaviours that are intentional and sensitive to goal value and the habitual system, which underlies more automatic stimulus-driven actions (Dickinson, 1985). It has been recently proposed that compulsions, a core symptom of Obsessive-Compulsive Disorder (OCD), result from a disruption in the balance between these two interactive neural systems favouring the habitual system (Banca et al., 2015; Gillan et al., 2011). Because these maladaptive actions seem to be immune to their detrimental consequences, OCD has been characterized as a disorder of maladaptive habit learning. However, habits by definition are not compulsions. With some cognitive effort, humans are able to liberate themselves from automatic actions (habits). The same mechanism doesn't apply to compulsions, which persist despite numerous attempts to suppress them and despite their negative consequences. Therefore, a dysfunction in habit learning per se does not provide a comprehensive explanation for this severe psychiatric illness. The goal of the present project is to understand the transition from habits to compulsions. One hypothesis for the behavioural mechanism underlying this transition is that a habitual action, with repetition, inadvertently acquires the rewarding properties of its outcome. At this point, the outcome is no longer relevant and the action becomes itself the 'reward', which contributes to compulsive-like, even maladaptive behaviours. We will test this hypothesis by developing a novel paradigm aiming to capture to what extent humans are able to shift back to a goal directed system after habits are established.

The project is suitable for 1 or 2 students, who will be learning to perform cognitive testing. Students are expected to contribute to the experimental design, recruitment, data collection and analysis. The project will use a computer based task and human participants.

Students will experience all the essential phases of a behavioural study: planning, implementation (including recruitment), data collection and analysis. They will actively participate in the design of the study and discussion of the results. This will allow them to develop critical thinking, which is an essential skill in research.

The supervisors are available to answer questions about the project and advise any students selecting it.

References:

Dickinson, A. (1985). Actions and habits: the development of behavioural autonomy. *Phil. Trans. R. Soc. Lond. B*, 308, 67-78. Doi: 10.1098/rstb.1985.0010

Banca, P., Voon, V., Vestergaard, M. D., Philippiak, G., Almeida, I., Pocinho, F., Relvas, J., Castelo-Branco, M. (2015). Imbalance in habitual versus goal directed neural systems during symptom provocation in obsessive-compulsive disorder. *Brain*, 138, 798-811. Doi: 10.1093/brain/awu379

Gillan, C. M., Papmeyer, M., Morein-Zamir, S., Sahakian, B. J., Fineberg, N. A., Robbins, T. W., de Wit, S. (2011). Disruption in the balance between goal-directed behavior and habit learning in obsessive-compulsive disorder. *Am J Psychiatry*, 168, 718-726. Doi: 10.1176/appi.ajp.2011.10071062.

BC: Exploring relationships between video game play and cognitive abilities.

Supervisor: [Dr. Richard Mills](#) and [Prof. John Rust](#).

Places: 1 - 3

Abstract:

There are now many studies which report a link between the playing of digital games and various abilities. For example, people who play action video games have been shown to score more highly on tasks requiring creativity (Jackson et al., 2012), visual short-term memory and executive control (Boot et al., 2008), exogenous attention control (Cain et al., 2014) and a range of other abilities (see Bavelier et al., 2012). These studies generally rely on participants self-reporting whether they play video games and use this information to construct two groups (video game players and non-video game players) which can be contrasted. This approach could be improved upon by a more sensitive measure of participants' game-playing activities or expertise (Latham et al., 2013).

This project aims to extend our knowledge of the abilities which are required or enhanced by playing digital games, paying particular attention to the game-play activity itself. The project could utilise either a correlational or experimental design.

A correlational design would involve determining participants' level of skill or expertise in relation to a game or games. Participants' skill level in a game, and/or improvement over time, would then be correlated with scores on tests which measure potentially related abilities. Ventura et al. (2013) conducted a study along

these lines and found that the speed with which participants could complete an item-collection task within a 3D environment was positively correlated with three measures of spatial ability and math SAT scores.

An experimental design would involve selecting games to be used in treatment conditions, administering tests which measure certain abilities before and after treatment, and observing whether the treatment conditions affect scores on the tests. Shute et al. (2015) recently published details of a study which found that playing Portal 2 improved participants' scores on tests of problem solving, spatial skill and persistence - significantly more than playing Luminosity for the same duration.

References:

Bavelier, D., Green, C. S., Pouget, A., & Schrater, P. (2012). Brain plasticity through the life span: learning to learn and action video games. *Annual review of neuroscience*, 35, 391-416.

Boot, W. R., Kramer, A. F., Simons, D. J., Fabiani, M., & Gratton, G. (2008). The effects of video game playing on attention, memory, and executive control. *Acta psychologica*, 129(3), 387-398.

Cain, M. S., Prinzmetal, W., Shimamura, A. P., & Landau, A. N. (2014). Improved control of exogenous attention in action video game players. *Frontiers in psychology*, 5.

Jackson, L. A., Witt, E. A., Games, A. I., Fitzgerald, H. E., von Eye, A., & Zhao, Y. (2012). Information technology use and creativity: Findings from the Children and Technology Project. *Computers in human behavior*, 28(2), 370-376.

Shute, V. J., Ventura, M., & Ke, F. (2015). The power of play: The effects of Portal 2 and Lumosity on cognitive and noncognitive skills. *Computers & Education*, 80, 58-67.

Ventura, M., Shute, V., Wright, T., & Zhao, W. (2013). An investigation of the validity of the virtual spatial navigation assessment. *Frontiers in psychology*, 4.

BD: The effect of on-line ratings on recipients' motivation to contribute content and attitudes towards other users.

Supervisor: [Dr. Richard Mills](#) and [Prof. John Rust](#).

Places: 1 - 3

Abstract:

Quantitative feedback is an increasingly common feature of Social Media, used to rank, sort and personalise users' contributions. Such feedback can be collected in a variety of forms including uni-directional (e.g. Facebook 'Likes') and bi-directional (e.g. up/down voting on Social News posts and comments, helpful/unhelpful rating of user reviews) ratings.

There is now a considerable body of research which considers the utility of these ratings and system-wide dynamics (e.g. Mills & Fish, 2015, Muchnik, Aral & Taylor, 2013; Gilbert, 2013; Anderson et al., 2012). However, there is very little research

on how users perceive and react to quantitative feedback on their own contributions. Early research in this field suggested that users learned from feedback to submit better content with practice (e.g. Halavais, 2009). In contrast, a recent study (Cheng et al., 2014) analysed user commenting behaviour from a range of news sites and reported a “spiral of negativity” in response to negative quantitative feedback. Recipients of ‘negative feedback’ subsequently increased their submission rate but their submissions decreased in quality, and these same recipients were more likely to rate other users’ content negatively - thus spreading the detrimental effects further within the communities.

This project aims to study the effects of quantitative feedback on recipients experimentally, by recruiting participants to contribute on a custom-made platform where aspects of their interaction can be controlled. As such, some web development skills are essential for this project. Students who are interested in this project should discuss it with the supervisor before selecting it.

References:

- Anderson, A., Huttenlocher, D., Kleinberg, J., & Leskovec, J. (2012). Discovering value from community activity on focused question answering sites: a case study of stack overflow. In Proceedings of the 18th ACM SIGKDD international conference on Knowledge discovery and data mining (pp. 850-858). ACM.
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- Gilbert, E. (2013). Widespread underprovision on reddit. In Proceedings of the 2013 conference on Computer supported cooperative work(pp. 803-808). ACM.
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- Mills, R. A. & Fish, A. (2015). A Computational Study of How and Why reddit.com was an Effective Platform in the Campaign Against SOPA, In Proceedings of HCI International 2015, Los Angeles
- Muchnik, L., Aral, S., & Taylor, S. J. (2013). Social influence bias: A randomized experiment. *Science*, 341(6146), 647-651.

BE: Emotional Responses in Performance Contexts.

Supervisor: [Dr Simone Schnall](#).

Places: 1 - 2

Abstract:

When people are outperformed by others, this can elicit a series of different emotional reactions. For example, people can respond with positive praise, feeling admiration and inspiration (e.g., Schindler, Zink, Windrich, & Menninghaus, 2013; Thrash & Elliot, 2003). On the other hand, they can also construe the situation as threatening and accordingly feel negative emotions, such as envy and competitiveness (e.g., Malhotra, 2010; Van de Ven, Zeelenberg, & Pieters, 2009). Whether people have one or the other reaction —or perhaps a mix of both— has been a topic of interest for researchers for years (e.g., Buunk, Collins, Taylor, Van Yperen, & Dakof, 1990; Tesser, 1988). Recent work in our laboratory suggest that important factors that determine whether people respond with praise or threat include the nature of the domain of outperformance and the manner in which

people construe the event. In particular, skilful domains elicit more threat than virtuous domains, and abstract processing diminishes threat-related responses. The present research project will further elaborate on this line of work.

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BF: Valuable Consumption: Morality in the Food Domain.

Supervisor: [Thea Schei](#), [Dr Simone Schnall](#).

Places: 1 - 2

Abstract:

People tend to adapt their behaviour to reach a moral equilibrium (Monin & Miler, 2001; Sachdeva, Illiev & Medin, 2009). After an 'immoral' act, they attempt to compensate by behaving 'morally' to re-establish their moral self-image. This behaviour – named 'moral cleansing' often consist of increased helping (e.g. de Hooze, Zeelenberg & Breugelman, 2007) or self-punishing behaviours (e.g. Bastian, Jetten & Fasoli, 2011). In our previous work, we have found that moral compensation also extends to the eating domain, and after recalling an overeating memory, women become more both more self-punishing and prosocial (Schei, Sheikh & Schnall, in prep). In our research guilt has played a key role in motivating compensation in the overeating group. This implies that women experience a loss of moral status or value after overeating and aim to compensate for this loss by carrying out behaviour that traditionally is seen to contain moral value. Together with research showing that people form their perceptions of others and themselves as 'good' if they maintain their diet, but 'bad' if they indulge themselves (e.g. Sheikh, Botindari & White, 2013; Steim & Nemeroff, 1995), this work strongly suggests that eating behaviour is moralised.

We will explore the ways in which this moralisation affects people's relationship with food: from the way they appraise food products to the way they perceive and compensate for their consumption.

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BG: Moral Identity and Theory of Mind Judgments.

Supervisor: [Matthew Johnson](#), [Dr Simone Schnall](#).

Places: 2 - 2

Abstract:

Our Theory of Mind (ToM) capacities, with which we infer others' mental states, are some of the most important components of our moral reasoning machinery. For example, the ways in which we perceive the minds of others can have tremendous influence on the types of rights that we ascribe to them, and on how we treat them (Gray et al., 2011; Osofsky, Bandura, & Zimbardo, 2005). Additionally, moral identity refers to the extent to which one takes moral (i.e. prosocial, non-self-interested) action to be central to one's self-concept (Aquino & Reed, 2002). Moral identity research typically centers around studying how one's moral identity (or being primed with concepts related to moral identity) influences one's performance of moral actions (Aquino et al., 2009) or experience of moral emotions (Stets & Carter, 2011), and there has been very little work done exploring how moral identity and theory of mind judgments influence each other. Indeed, the previous work done in this area has, so far, only explored how participants perceive the experience of happiness of good and bad moral agents (Phillips, Misenheimer, & Knobe, 2011).

In the planned research, we will explore how moral identity and theory of mind judgments influence each other. We will investigate how the moral identity of both the participant, and of the 3rd parties that they are observing, affects how participants perceive the minds of these 3rd parties (e.g. whether or not participants engage in dehumanization, etc. of the target individuals [Gray, Gray, & Wegner, 2007]). Additionally, we will also explore whether exposing participants to various other minds (moral exemplars, villains, etc.) will affect participants' own sense of moral identity and willingness to engage in moral action.

References:

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BH: Counteracting Feelings of Contamination related to Obsessive-Compulsive Traits and Behaviours.

Supervisor: [Dr Philippe Gilchrist](#), [Dr Simone Schnall](#).

Places: 1 - 2

Abstract:

An extensive body of research has demonstrated a link between physical purity and moral purity (Chapman & Anderson, 2013; Schnall, Benton, & Harvey, 2008; Schnall, Haidt, Clore, & Jordan, 2008). The concept of mental contamination provides a clear example, implicated in recently developing theories of obsessive-compulsive disorder (e.g., Rachman, 2006). Mental contamination includes a feeling of dirtiness or danger resulting from direct or indirect contact with impure sources (Rachman, 2006, p. 19). In particular, challenges to one's perceived moral value have been associated with mental contamination, and obsessive-compulsive behaviours and beliefs (e.g., Abramovitz, Doron, Sar-El, & Altenburger, 2013; Doron, Sar-El, & Mikulincer, 2012; D'Olimpio & Mancini, 2014). However, the clinical literature also suggests that cleansing and checking activities do not actually relieve the anxiety, but instead, exacerbate and maintain it. Thus, a more effective way of dealing with moral self-threat might be an affirmation of core values of the self (Cohen & Sherman, 2014).

This research aims to experimentally investigate the role self-affirmation and cleansing behaviour in feelings of mental contamination.

References:

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BI: The Role of Perceived Moral Value in Pain Perception.

Supervisor: [Dr Philippe Gilchrist](#), [Dr Simone Schnall](#).

Places: 1 - 2

Abstract:

Meaning is central to acute pain and possibly to a variety of adverse (e.g., vasovagal) reactions in medical settings. Related research has focused on cognitive appraisal including, for example, catastrophizing, positive appraisal, and control (Benedetti, Thoen, Blanchard, Vighetti, & Arduino, 2013; Gilchrist, McGovern, Bekkouche, Bacon, & Ditto, 2015; Salomons, Johnstone, Backonja, & Davidson, 2004; Sullivan et al., 2001). While much research has focused on primary (e.g., catastrophizing) and secondary (e.g., perceived-control) appraisal processes, little is known about the association between meaning and acute pain as affected by the social context. For example, the effects of (moral) disgust, appraisals of value or meaning to such events are not as well understood. This study aims to better understand the effects of these variables on pain-related distress, and pain behaviour.

References:

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BJ: Are mathematicians special?

Supervisor: [Dr Dénes Szűcs](#)

Places: 1 - 4

Abstract:

Recently, we have established that poor numerical skill in children with

developmental dyscalculia is related to poor visuo-spatial memory whereas mathematically gifted children have very good visual memory. While the connection of working memory performance and mathematical skill is increasingly recognized in children not much is known about this relationship in adults. In order to learn more about the above relation, this project will compare visuo-spatial memory in university students with outstanding (Cambridge mathematics PhD students), good (engineering students) and average (non-maths related subjects) mathematical expertise.

References:

Morsanyi K, Devine A, Nobes A, **Szűcs D** (2013), The link between logic, mathematics and imagination. Evidence from children with developmental dyscalculia and mathematically gifted children. *Developmental Science*. 16(4), 542-553.

BK: Gender differences in mathematics anxiety in university students.

Supervisor: [Dr Dénes Szűcs](#)

Places: 2 - 4

Abstract:

Mathematics anxiety (MA), a state of discomfort associated with performing mathematical tasks, is thought to affect a notable proportion of the school age and adult population. MA warrants serious attention because it can lead to the development of negative attitudes towards mathematics and drop-out from elective mathematics classes and avoiding mathematics-related careers.

Some research has indicated that MA negatively affects mathematics performance and that girls may report higher levels of MA than boys. On the other hand some research has indicated that boys' mathematics performance is more negatively affected by MA than girls' performance is. Recently we have examined this question while controlling for test anxiety (TA) a construct related to MA but which is typically not controlled for in MA studies.

In a British secondary school sample we found that no gender differences emerged for mathematics performance but levels of MA and TA were higher for girls than for boys. Girls and boys showed a positive correlation between MA and TA and a negative correlation between MA and mathematics performance. TA was also negatively correlated with mathematics performance, but this relationship was stronger for girls than for boys. When controlling for TA, the negative correlation between MA and performance remained for girls only. Regression analyses revealed that MA was a significant predictor of performance for girls but not for boys.

The research project would investigate whether our secondary school findings are also valid in a sample of Cambridge University undergraduate students. Each student researcher will be required to test at least 30 participants with 2-3 questionnaires.

References:

Devine A, Fawcett K, Szűcs D, Dowker A (2012), [Gender differences in mathematics anxiety and the relation to mathematics performance while controlling](#)

[for test anxiety](#). *Behavioral and Brain Functions*. 8:33.

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BL: Executive functions and mathematical skill.

Supervisor: [Dr Dénes Szűcs](#)

Places: 1 - 4

Abstract:

Recently, we have established that poor numerical skill in children with developmental dyscalculia is related to poor visuo-spatial memory and weak inhibitory function. These data suggest a strong relation between mathematical skill and executive functioning.

While the connection of executive functioning and mathematical skill is increasingly recognized in children not much is known about this relationship in adults. In order to learn more about the above relation, this project will determine whether several computerized executive function measures are related to mathematical skill in normal university students.

References:

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BM: Understanding the meaning of simple noun-noun phrases.

Supervisor: [Dr Barry Devereux](#), [Dr Billi Randall](#), [Prof Lorraine Tyler](#).

Places: 1 - 1

Abstract:

Every day, we hear simple, two-word phrases such as “traffic light”, “penguin movie”, and “volcano science”. Some of these phrases are very common (e.g. “traffic light”), and others may be novel ones which we have never heard before (e.g. “garden controversy”). We can usually understand such phrases quickly and easily (a “traffic light” is a light for controlling traffic; a “garden controversy” is a controversy about a garden). How do we do this?

One of the things that make these noun-noun compounds interesting is that, in spite of their simplicity, there is a huge variety of ways – possibly infinitely many ways – in which two nouns can be combined. We know that a “penguin movie” refers to a movie about penguins, not a movie by penguins (which would be the correct way to interpret the compounds “penguin journey” and “Hollywood movie”), or a movie for penguins (which would be the correct way to interpret “penguin enclosure” and “family movie”). How do we know that a “penguin movie” is a movie

about penguins, and not a movie for penguins? Somehow, we rapidly activate relevant information about the two constituent concepts and use that information to come up with the correct or most plausible interpretation.

The goal of this project is to investigate how different kinds of information influence the interpretation of noun-noun compounds. For example, one possibility (Gagné and Shoben, 1997; Gagné et al., 2005) is that the first noun is particularly important, placing constraints on how the subsequent noun should be integrated (e.g. “mountain” prefers a located at relation, as in “mountain stream”, “mountain cabin”, etc). Another possibility (Maguire and Cater, 2005) is that the meaning of the second noun can also drive the interpretation process (e.g. “controversy” suggests an about relationship, regardless of what the first noun is). To determine how different kinds of information about the two constituent words influence the interpretation process, you will conduct a behavioural experiment where people listen to noun-noun phrases, and will analyse the reaction time data using statistical information on the relational links used in noun-noun compounds (e.g. Butnariu et al., 2009).

The results of the study will provide important insights into how conceptual and relational knowledge is accessed and integrated when we hear words in combination.

References:

Butnariu C, Kim SN, Nakov P, Ó Séaghdha D, Szpakowicz S, Veale T (2009) SemEval-2010 task 9: The interpretation of noun compounds using paraphrasing verbs and prepositions. SemEval Workshop 2010, pp 100–105. Association for Computational Linguistics. <http://dl.acm.org/citation.cfm?id=1621987>.
Gagné CL, Shoben EJ (1997) Influence of thematic relations on the comprehension of modifier-noun combinations. J Exp Psychol Learn Mem Cogn 23:71–87.
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BN: What comes next? The role of prediction in continuous language comprehension: An electro-magnetoencephalography (E/MEG) experiment.

Supervisor: [Ms. Ece Kocagoncu](#), [Dr. Billi Randall](#), [Prof Lorraine Tyler](#). Places: 1 - 2

Abstract:

Speech and language are abilities so complex yet they come so naturally to humans. Whilst listening to speech, we identify a continuous stream of sound as familiar sequences, such as words and phrases. As we recognize these sequences of sounds, we simultaneously analyze the structure and meaning of the sentence, and integrate all linguistic information accumulated as the speech unfolds. Considering the many different processes that take place, it is surprising

that it takes us only a few hundred milliseconds to complete them. The trick our brains use to be this efficient is prediction (Bar, 2007; Cooper, 2006; DeLong, Urbach, & Kutas, 2005; Federmeier, 2007).

As we listen to speech, our brains form hypotheses about the sound, syntactic structure, and word most likely to follow. There are mixed views (Bubic, von Cramon, & Schubotz, 2010) on the network of brain structures involved in linguistic prediction, and the mechanisms that take place. Here we ask which cortical regions are responsible for making predictions in the domain of language and what happens when they fail?

With the current project, we aim to investigate the spatiotemporal dynamics of syntactic and semantic prediction in continuous speech comprehension using an existing electro-magnetoencephalography (E/MEG) data set. The E/MEG data was recorded whilst participants listened to continuous sentences. The central phrases of the sentences (see below) were manipulated to have either high or low predictability values in syntax and semantics.

Syntactic predictability	Semantic predictability	Sentence
High	High	The naughty child climbed the tree at the bottom of the garden.
High	Low	The naughty child climbed the bank to get his football back.
Low	High	The naughty child climbed on the top of the kitchen cupboard.
Low	Low	The naughty child climbed on the back of his grandmother's chair.

Through this project we will 1) discover the network of brain regions involved in prediction making and evaluating the outcome of predictions; 2) we will identify and segregate the cognitive processes that take place; 3) investigate how the strength of connectivity changes within the network in response to changes in linguistic predictability.

One major aim of this project will be to test contrasting models of prediction in language processing. To do this, you will define variables that measure linguistic predictability from large corpora, and use these measures in analyses of E/MEG data. You will be introduced to several methods of signal processing of neuroimaging data. You will learn to pre-process E/MEG data, test theoretical models and apply multivariate pattern analysis methods.

Students will be guided throughout their project, and will be helped to use MATLAB and SPM to analyze the data. However students are expected to have some prior experience using MATLAB, a basic level understanding of computing concepts, and statistical knowledge.

References:

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BO: Neural bases of emotionality, emotion regulation and impulsivity in patients with bulimia nervosa.

Supervisor: [Dr Laura Vuillier](#).

Places: 1 - 2

Abstract:

Intro

Eating disorder is a disorder that affects about 2.5% of the UK population and the DSM-IV defines three types of eating disorder: Anorexia nervosa, bulimia nervosa and binge eating disorder. Most of the research has been conducted on patients with anorexia nervosa, although bulimia nervosa (BN) is more common in the population (around 40%). Current research suggests that individual with BN have problems regulating their emotions. However, a new area of research proposes that the deficit might in fact lie in emotionality (intensity with which they process emotions). However, questionnaires or interview cannot differentiate between high emotionality and emotion dysregulation. The use of event related potentials (ERPs) however allows the analysis of the brain mechanisms involved at each stage of emotion processing and regulation and could help understand where the deficits take place. Skin conductance would also help differentiate the initial emotional reaction from the regulation of the emotions. Moreover, patients with BN are also thought to suffer from impulsivity and this would also be examined in this project. We suggest that impulsivity might be particularly present in emotional vs. neutral contexts. Questionnaires will also be examined. Depending on the time it takes to recruit participants, it is possible that NO EEG data will be collected with patients with BN and only questionnaires could be analysed in the time frame of the third year project.

Methods

Methodology: Event related potentials (ERPs), skin conductance and questionnaires

Patients with BN and control participants

Task: IAPS pictures will be presented and the participants will be asked to respond to Go stimuli while ignoring Nogo stimuli.

Student involvement

If the time allows, both students will be required to collect and analyse the data. Depending on their CRB check and their involvement, they might be able to test

participants with BN.

Each student will have to determine a research question and both will have access to all the data to answer it. They will be expected to collaborate during data collection (sharing the work) and might want to collaborate to learn how to analyse EEG data. I will most likely analyse the EEG data in Matlab myself and give the student the excel file to analyse in SPSS. I can give my Matlab scripts to the students if they want to learn Matlab but will not have the time to train them.

I very much hope that the recruitment will be easy but if this proves harder, the students might not be able to test any participant with BN.

BP: Seeing in depth: from 3D movies to neurochemistry and deep networks.

Supervisor: [Dr Andrew Welchman](#).

Places: 1 - 2

Abstract:

3D movies and 'magic eye' pictures reveal the glory of human stereoscopic vision. Based only on very subtle differences in the images registered by the two eyes, the human brain is able to extract and interpret complex 3D structures, supporting object recognition and the control of action. This project will probe the fundamental processes that support 3D vision – examining how stereo signals are extracted, and how experience can shape the way we use disparity signals. The project will be based around a core of psychophysical experiments in the lab using a specialised 3D display device. Suitably interested students would have the potential to develop the work in a range of directions, including performing simulations using neural networks or assisting with work that tests for the neurochemical basis of stereoscopic judgments using MRI spectroscopy measurements.

References:

Goncalves NR, Ban H, Sánchez-Panchuelo RM, Francis ST, Schluppeck D, Welchman AE. (2015) 7 tesla fMRI reveals systematic functional organization for binocular disparity in dorsal visual cortex. J Neurosci. 2015 Feb 18;35(7):3056-72. doi: 10.1523/JNEUROSCI.3047-14.2015.

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BQ: The quick and the dead: when reaction beats intention.

Supervisor: [Dr Andrew Welchman](#).

Places: 1 - 2

Abstract:

Everyday behaviour involves a trade-off between planned actions and reaction to environmental events. Evidence from neurophysiology, neurology and functional

brain imaging suggests different neural bases for the control of different movement types. We have developed a behavioural paradigm (Welchman et al, 2010) to test movement dynamics for intentional versus reaction movements arm movements. We have demonstrated that there is a 'reactive advantage' in movement execution, whereby the same action is executed faster in reaction to an opponent ("the gunslinger effect"). In this project we will extend this finding, testing how choice of movement or variable rewards and penalties affect the extent to which reactive movements are made more quickly.

References:

Welchman, A. E., Stanley, J., Schomers, M. R., Miall, R. C., & Bühlhoff, H. H. (2010). The quick and the dead: when reaction beats intention. *Proceedings of the Royal Society: Biological Sciences*, 277(1688), 1667–1674. doi:10.1098/rspb.2009.2123

Adam, R., Bays, P. M., & Husain, M. (2012). Rapid decision-making under risk. *Cognitive Neuroscience*, 3(1), 52–61. doi:10.1080/17588928.2011.613988

Pinto, Y., Otten, M., Cohen, M. A., Wolfe, J. M., & Horowitz, T. S. (2011). The boundary conditions for Bohr's law: when is reacting faster than acting? *Attention, Perception, & Psychophysics*, 73(2), 613–620. doi:10.3758/s13414-010-0057-7

BR: Seeing shiny objects: how does the brain overcome the paradox of reflections?

Supervisor: [Dr Andrew Welchman](#).

Places: 1 - 2

Abstract:

Many objects encountered in everyday life reflect their surroundings: waxy fruit, brass door handles, chrome bumpers and much consumer electronics. When we view such objects we readily appreciate that an object's surface is glossy. Yet, such objects pose the brain with a difficult challenge – how does it pull out the principal characteristics of a particular object where much of the light information actually relates to other nearby objects? Estimating gloss is computationally difficult: requiring the brain to disentangle the properties of the surface, from the 3D shape and the position of the illumination. In this project we will ask how the brain is able to estimate gloss, with a particular emphasis on the role played by binocular signals. In particular, we will test the role of disparity signals in changing the apparent appearance of a surface. Can we make a matte surface look glossy by simply changing some low-level information?

References:

Murphy, A. A., Welchman, A. E., Blake, A. & Fleming, R. W. Specular reflections and the estimation of shape from binocular disparity. *Proceedings of the National Academy of Sciences* (2013). doi:10.1073/pnas.1212417110

Fleming, R. W., Dror, R. O. & Adelson, E. H. Real-world illumination and the perception of surface reflectance properties. *Journal of Vision* 3, 347–368 (2003).

Kim, J., Marlow, P. J. & Anderson, B. L. The dark side of gloss. *Nat Neurosci* 15, 1590–1595 (2012).

Doerschner, K. et al. Visual Motion and the Perception of Surface Material. Curr Biol (2011). doi:10.1016/j.cub.2011.10.036

Social Mistrust and Children's Wellbeing

Supervisor: [Dr Keri Wong](#).

Working with two thousand 8 to 14 year olds from the UK and Hong Kong, we have recently published a new questionnaire designed to investigate early signs of paranoia in middle childhood (the Social Mistrust Scale; Wong, Freeman & Hughes, Brit J. Psychiatry, 2014.) In previous years, students have helped validate the questionnaire and subsequently went on to present their findings at conferences (British Psychological Society - Education Section).

The aims of the projects (below) are to extend this line of work to i) examine the causes of mistrust in children in relation to indicators of wellbeing and to ii) fine tune qualitative assessments of mistrust. Students interested in gaining hands-on research experience working with young children and knowledge of developing pre-clinical assessments (with the possibility of presenting their work at conferences) are invited to work with Dr. Wong on the following projects:

BS: How mistrust affects children's mental health.

Supervisor: [Dr Keri Wong](#).

Places: 1 - 3

Abstract:

Previously, our studies have shown that mistrustful children have a greater tendency to suffer concurrent emotional and behavioural problems. The key question remains, however: what causes children to mistrust others? To address this question, key variables of bullying, hostile attribution bias, self-esteem, insomnia, grit (wellbeing) and social mistrust will be assessed. This project will involve (a) submitting an ethics proposal, (b) liaising with 6 primary/secondary schools in the Cambridgeshire area that already have links with the study; (c) working with 10-/11-year-olds to complete questionnaires in classrooms; (d) conducting analyses with the help of Dr Wong. DBS clearance is required for this project.

Skills gained: SPSS, formulating an ethics proposal, liaising with schools, communication and organisational skills

BT: Qualitative markers for social mistrust in UK & Hong Kong children.

Supervisor: [Dr Keri Wong](#).

Places: 1 - 2

Abstract:

This study addresses a two-part question: Do mistrustful children answer benign interview questions differently compared to trusting children? If so, are there unique linguistic markers that can be used to identify mistrust from trusting children? Students will (a) submit an ethics proposal, (b) revise and apply an existing coding scheme to already collected interview transcripts of mistrustful and trusting children (n = 122) using the qualitative analysis software, Atlas.ti. Shorter research projects

will involve (a) submitting an ethics proposal and (b) working with Dr Wong in obtaining inter-rater reliability of the qualitative coding scheme.

Skills gained: Atlas.ti (qualitative analysis program), formulating an ethics proposal, reliability testing, coding procedure.

Interested students may discuss additional research questions with Dr Wong.

BU: Title Orientation Tuning of Templates for Rejection

Supervisor: [Dr Greg Davis](#), Jennifer Daffron.

Places: 1 - 2

Abstract:

It is well established that, in human visual search, top down ‘templates’ can bias attention toward target objects in a scene by specifying those objects’ features. A more controversial proposal suggests that observers may also specify top-down ‘templates for rejection’ (TFR; Woodman & Luck, 2007) to bias attention away from objects known to be irrelevant nontargets. While such templates would seem to have adaptive value, and likely play a key role in behavioural inhibition, there is no compelling evidence of their existence. Arguments against their existence have drawn on evidence from dual working-memory / search tasks. Even the operation of storing particular objects or features in working memory, something that would be necessary to establish a template for rejection, biases attention toward rather than away from such features even if irrelevant to a search task. Furthermore, it has proven very difficult to ascertain whether observers reject known nontargets from search using TFRs or, alternatively, seek out nontargets using conventional target templates and then exclude them from search. The proposed experiment is designed to distinguish these two accounts by examining the breadth of orientation tuning for TFRs versus target templates. Recent findings in our lab lead us to suppose that they will differ, providing evidence for TFRs and against alternative accounts.

References:

Moher, J., & Egeth, H. E. (2012). The ignoring paradox: Cueing distractor features leads first to selection, then to inhibition of to-be-ignored items. *Attention, Perception, & Psychophysics*, 74(8), 1590-1605.

Woodman G.F. & Luck S.J. (2007). Do the contents of visual working memory automatically influence attentional selection during visual search? *Journal of Experimental Psychology: Human Perception and Performance*. 33, 363–377.

BV: Revealing the mode of action of semantic templates for rejection: conventional versus ‘search and destroy’ models.

Supervisor: [Dr Greg Davis](#), Jennifer Daffron.

Places: 2 - 2

Abstract:

Recent work in our lab (Daffron & Davis, submitted) has provided the first evidence that observers can ignore categories of objects in natural scenes by specifying those objects’ semantic properties in top-down ‘templates for rejection’ (TFRs; Woodman & Luck, 2007). Whether specifying visual or semantic properties, the existence of TFRs is controversial bias attention away from known classes of

nontarget, is controversial, and their mode of action, difficult to ascertain. Some authors have argued that claimed evidence for TFRs in previous work can be explained by assuming that observers do not try to ignore nontargets as instructed; instead, they may deliberately seek out nontargets using conventional search templates and hence exclude them efficiently from subsequent search. Moher and Egeth (2012) have recently provided evidence for such ‘search and destroy’ explanation in simple displays comprising 4 alphanumeric characters. However, it is unclear whether (i) that pattern of results reflected insufficient preparation time to establish inhibition in those experiments and (ii) whether the same pattern would hold in more complex, naturalistic displays that characterize ‘real world’ search. The proposed experiment will combine a basic search task with small probe stimuli presented intermittently at target and nontarget locations to reveal patterns of attention guidance when ignoring categories of object in natural scenes. If the same patterns of findings arise as in Moher and Egeth’s experiments, this would undermine evidence for templates for rejection in our experiments. If, instead, no preferential attention to nontargets is evident, this would constitute evidence for the action of TFRs.

References:

Moher, J., & Egeth, H. E. (2012). The ignoring paradox: Cueing distractor features leads first to selection, then to inhibition of to-be-ignored items. *Attention, Perception, & Psychophysics*, 74(8), 1590-1605.

Woodman G.F & Luck S.J. (2007). Do the contents of visual working memory automatically influence attentional selection during visual search? *Journal of Experimental Psychology: Human Perception and Performance*. 33, 363–377.

BW: Neural ‘noise’ and autistic traits in the neurotypical population.

Supervisor: [Dr Greg Davis](#), [Dr Kate Plaisted-Grant](#).

Places: 2 - 2

Abstract:

Neural noise - ‘random’ variation in neural signaling of indeterminate origin and complex spatial/temporal structure – confers both costs and benefits upon a network’s information processing (see e.g., McDonnell & Ward, 2011). Previous work has suggested that the brains of individuals with autism may be characterised by elevated levels of neural noise (Baron-Cohen & Belmonte, 2005; Simmons et al. (2009). In contrast, Davis & Plaisted-Grant (2014) have recently described an alternative view, in which key aspects of autism reflect low, not high, neural noise.

Manning and colleagues have recently used an equivalent noise paradigm to estimate levels of additive neural noise and sampling in children with autism and controls. They concluded that sampling, not noise, differed between the two groups. However, we take issue with their conclusion. First, the sampling term in their observer models was indistinguishable from stimulus-related or ‘multiplicative’ noise and is therefore consistent with low noise in the autism group. Second, that study’s use of external noise that was temporally- and spatially- matched to the signal likely biased their finding toward sampling differences (Remy & Allard, 2011). The current project will employ external noise stimuli that are spatially and temporally extended. We shall explore whether indexed neural noise correlates across neurotypical observers with levels of autistic traits measured using the

Autistic Quotient. High noise accounts predict that this correlation should be positive, our own view, that it should be negative.

References:

- Baron-Cohen, S., & Belmonte, M. K. (2005). Autism: a window onto the development of the social and the analytic brain. *Annu. Rev. Neurosci.*, 28, 109-126.
- Davis, G., & Plaisted-Grant, K. (2014). Low endogenous neural noise in autism. *Autism*, 1362361314552198.
- Manning, C., et al. (2015). Enhanced Integration of Motion Information in Children With Autism. *The Journal of Neuroscience*, 35(18), 6979-6986.
- Simmons, D. R., Robertson, A. E., McKay, L. S., Toal, E., McAleer, P., & Pollick, F. E. (2009). Vision in autism spectrum disorders. *Vision Research*, 49(22), 2705-2739.

BX: Prosocial behaviour across the human lifespan.

Supervisor: [Dr Claire O'Callaghan](#).

Places: 1 - 1

Abstract:

Prosocial behaviours, such as fairness, altruism and empathy, are essential to adaptive human functioning.^{1,2} These behaviours can be compromised in a number of psychiatric and neurological conditions.³ Improving our understanding of these social behaviours is an important step toward developing treatments to address social dysfunction in many conditions.

Fortunately these complex social behaviours aren't restricted to humans – they are prevalent throughout the animal world.⁴ This has enabled researchers to develop a cross-species understanding of social behaviour.^{5,6} Establishing testable models of prosociality, which can be translated across humans and animals, therefore holds great potential to inform our understanding of its underlying brain mechanisms and identify therapeutic targets.

We have developed a novel computerised task to assess prosocial behaviour in humans and rodents. The goal of this Part II project is explore the novel prosocial task in humans. The student will administer the task, alongside other measures of social cognition, in healthy younger and older adults. The student will gain experience with human neuropsychological testing in the area of social cognition across the lifespan. Throughout the project the student will also be exposed to the development of the animal aspect of the task, in order to gain an understanding of the broader translational implications of their project. The end result should be a rich dataset that will allow the students to explore human prosocial behaviour, and to consider how these techniques could be applied in diseases that affect social functioning.

References:

- 1) Kurzban et al. The Evolution of Altruism in Humans. *Annual Review of Psychology*. 2015;66:575-99.
- 2) Fehr E, Fischbacher U. The nature of human altruism. *Nature*. 2003;425(6960):785-91.
- 3) Gonzalez-Liencre et al. Towards a neuroscience of empathy: Ontogeny,

phylogeny, brain mechanisms, context and psychopathology. *Neuroscience & Biobehavioral Reviews*. 2013;37(8):1537-48

- 4) Brosnan SF, de Waal FB. Evolution of responses to (un) fairness. *Science*. 2014;346(6207):1251776.
- 5) Panksepp J, Panksepp JB. Toward a cross-species understanding of empathy. *Trends in Neurosciences*. 2013;36(8):489-96.
- 6) Mogil JS. The surprising empathic abilities of rodents. *Trends in cognitive sciences*. 2012;16(3):143-4.

BY: Development of a concurrent positive-negative reinforcement task for rodents.

Supervisor: [Dr Johan Alsiö](#), Benjamin Phillips, Dr Chris Heath, [Dr Lisa Saksida](#). Places: 2 - 2

Abstract:

Is your behaviour shaped by the positive rewards associated with success or the negative outcomes of failure? Are you driven by the proverbial carrot or by the stick? Whereas this certainly varies across situations in the healthy population, mood disorders (e.g. major depressive disorder) and certain neurological conditions (such as Parkinson's disease) are linked to impaired reinforcement learning and responsiveness to positive and negative feedback. Depressed patients thus display elevated sensitivity to negative feedback and a blunted response to positive feedback, an effect reversed by medication targeting the serotonin system, whereas dopaminergic medication in the treatment of Parkinson's disease make patients more likely to learn from positive than negative outcomes in the experimental setting.

This project aims to establish a novel touchscreen task for rats and mice, in which animals concurrently learn to discriminate visual stimuli based on positive (reward) and negative (loss of reward) outcomes. We will then explore the pharmacological basis of the 'carrot-and-stick' strategies using drugs acting on either the serotonin or the dopamine systems.

An occupational health screening is required, due to animal work.

References:

- Cools et al. *Neuropsychopharmacology* 2008 **33**: 2291-2299
Frank et al. *Science* 2004 **306**: 1940-1943.
Nilsson et al. *Neurosci Biobehav Rev*. 2015 **56**: 1-14

BZ: Development of a probabilistic serial visual reversal learning task for rodents.

Supervisor: [Dr Johan Alsiö](#), Benjamin Phillips, Dr Chris Heath, [Prof Trevor Robbins](#). Places: 2 - 2

Abstract:

Mood disorders including major depressive disorder and generalised anxiety disorder are associated with altered learning or responsivity to positive and negative events; depressed patients thus display elevated sensitivity to negative feedback and a blunted response to positive feedback. One way to investigate the

neural basis and psychopharmacology of these phenomena in the experimental setting is by using probabilistic reversal learning (PRL) tasks. In PRL, subjects learn to choose a frequently rewarded response option A (80% of trials; non-rewarded 20% of trials) over a less frequently rewarded response option B (20% of trials; non-rewarded 80% of trials). Optimum performance requires subjects to form a “response set”: choose A over B even though A sometimes gives negative feedback and B sometimes gives positive feedback. By changing the rule and asking the subject to shift between response sets (reversals), experimenters can separate learning from negative (lose-shift behaviour) and positive feedback (win-stay behaviour).

We are taking a translational approach to develop rodent tests of cognition which will allow us to understand the underpinning mechanisms of altered reinforcement learning in psychiatric disorders. Previous work from the Department established that increased serotonin tone improves performance on a spatial PRL task for rats (Bari et al. 2010). This project aims to establish and validate a visually-guided touchscreen PRL task for rats and mice in order to evaluate the neural basis and neuropharmacology of responsiveness to negative and positive feedback. To validate the procedure, we will challenge the animals with drugs acting on either the serotonin or the dopamine systems.

An occupational health screening is required, due to animal work.

References:

Alsiö et al. *Psychopharmacology* 2015 (In press).
Bari et al. *Neuropsychopharmacology* 2010 **35**: 1290-1301.
Cools et al. *Neuropsychopharmacology* 2008 **33**: 2291-2299

CA: Singing from the same song sheet: Synchrony and emotional convergence in choir singers

Supervisor: [Gabriela Pavarini](#), [Prof. Ian Cross](#)

Places: 1 - 1

Abstract:

Previous research has shown that acting in time with others, such as in dancing, rowing or drumming, fosters affiliation and leads to a sense of ‘oneness’ with the group (Hove & Risen, 2009, Tarr, Launay & Dunbar, 2014). Extensive ethnographic research has also documented a range of collective feelings during synchronous activities, from feelings of happiness and elation in joint dancing during Carnival celebrations in Brazil to collective pain during fire-walking or initiation rites (Michaels & Wulf, 2011, Whitehouse & Laidlaw, 2004). However, the question of whether behavioural synchrony leads to emotional convergence among group members has rarely been discussed in the psychological literature. This project aims to contribute to fill this gap by investigating this question in the context of choral singing, a real life example of synchronous action. Participants will be recruited from different College choirs and will take part in the study in small groups. Groups will be asked to sing together in different conditions (unison, multiple voices, multiple lyrics, solo/sequentially). Emotion measures will be obtained during and after each song. We expect to find greater emotional convergence among group members when they complete the activity in synchrony compared to asymmetrically (e.g. multiple voices) or independently. We hope this research will add to the emerging field of collective

emotions (see von Scheve & Salmela, 2014) by outlining some of the ways in which joint action leads to shared affective profiles.

References:

- Hove, M. J. & Risen, J. L. (2009). It's All in the Timing: Interpersonal Synchrony Increases Affiliation. *Social Cognition*, 27, 949-960.
- Michaels, A., & Wulf, C. (2011), *Emotions in Rituals*. London: Routledge.
- Tarr, B., Launay, J., & Dunbar, R. (2014). Music and social bonding: "Self-other" merging and neurohormonal mechanisms. *Frontiers in Psychology*, 5, 1096-2005.
- von Scheve, C. & Salmela, M. (2014). *Collective emotions*. Oxford: Oxford University Press.
- Whitehouse, H. & Laidlaw, J. (2004). *Ritual and memory: Toward a comparative Anthropology of Religion*. Walnut Creek: AltaMira Press.

CB: Exploring the impact of a residential stay at the Croft Children's Unit on Family Functioning and Relationships

Supervisor: Dr Tina Gutbrod (tina.gutbrod@cpft.nhs.uk), Prof Claire Hughes **Places:** 1 - 2

Abstract:

This study aims to further our current knowledge and understanding of the impact on families of staying in a residential inpatient unit on their a) family functioning; b) relationships; and c) understanding their children's behaviour (reason for referral). An additional aim would be to review how families experience family therapy in the context of being referred to an inpatient psychiatric unit.

The Croft Child and Family Unit is a 10 bedded unit, located in Cambridge, providing day and in-patient psychiatric services (NHS) for children aged 0 – 12 years and their families. Usually children are admitted with at least one parent/ carer and sometimes with other family members as well depending on family circumstances and clinical need. This unit is the only service of this kind in the region. The Croft provides assessment and treatment for children with complex developmental or psychiatric disorders and children presenting with severe emotional and behavioural problems, e.g. autism, ocd, separation anxiety, attachment disorder, eating disorder. The duration of a residential admission at the Croft is usually for 6 to 8 weeks. During the day the children attend a unit school in the morning, and in the afternoon they engage in various groups, such as social skills, art and recreation groups which are run by unit staff. Parents participate in weekly behavioural management groups, family therapy sessions, and multi-family groups.

Note: A criminal records bureau check will be required.

Methods

Parents of children admitted to the Croft will be given the SCORE (family functioning questionnaire) in the first week of their admission, alongside other questionnaires assessing contact with wider family, as well as their experience of attending family therapy at the Croft. It may be decided to administer these questionnaires as part of a brief semi-structured interview on the unit. They will be asked to fill in the SCORE and battery of questionnaires again at the end of their admission, and once again around 6 months after their child is discharged from the Croft.

Data Analysis

Given that the number of clinical cases admitted to the Croft is relatively small (30 per year), it is expected that student projects will represent a small “pilot” sample, which will be analysed with both quantitative and qualitative methods.

Quantitative Data Analysis (SPSS): Paired-sample t-tests were used to determine the change between pre- and post-test scores of the family functioning measures. Descriptive statistics will highlight clinical group differences in family functioning and relationship measures.

Qualitative Data Analysis: Interpretative Phenomenological Analysis (IPA) will be used to analyse the subjective experiences of parents with regards to family therapy and their experiences at the Croft.

Student Responsibilities

Students will collect shared data, but will then be able to focus individually on different research questions and separately conduct appropriate data analysis.

Given the highly sensitive process of interviewing parents of children admitted to a psychiatric ward, students need to demonstrate a) good social skills, b) ability to deal with vulnerable adults, c) have good interviewing skills, particularly when dealing with sensitive topics, e.g. child protection issues, child mental health, etc., and d) independent research skills. Students with an interest/knowledge in clinical child psychology will benefit from this clinically stimulating environment.

References:

- Anderson, R.J., Huff, N.L., and Hodgson, J.L. (2008). Medical family therapy in an inpatient psychiatric setting: a qualitative study. *Families, Systems and Health*, 26(2), 164-180.
- Epstein, N.B., Bishop, D., Ryan, C., Miller, I.W., & Keitner, G.I. (1993). The McMaster model view of healthy family functioning. In Froma Walsh (Ed.), *Normal family processes* (pp. 138-160). New York: The Guilford Press.
- Green, J., Jacobs, B., Beecham, J., Dunn, G., Kroll, L., Tobias, C. & Briskman, J. (2007) Inpatient treatment in child and adolescent psychiatry – a prospective study of health gain and costs. *Journal of Child Psychology and Psychiatry*, 48, 1259-1267.
- Hafner, R.J., Mackenzie, L.A., & Costain, W. (1990). Family therapy in a psychiatric hospital: A case-controlled evaluation. *Australian and New Zealand Journal of Family Therapy*, 11(1), 21-25.
- Gross, V. & Golding, J. (2008). Dynamics and dilemmas in working with families in inpatient CAMH services. *Clinical Child Psychology and Psychiatry*, 13(3), 449-461.
- Rivett, M., Tomsett, J., Lumsdon, P., & Holmes, P. (1997). ‘Strangers in a familiar place’: the evolution of a family therapy clinic within an in-patient adolescent unit. *Journal of Family Therapy*, 19, 43-57.
- Stratton, P, Bland, J., Janes, E & Lask, J. (2010) Developing a practicable outcome measure for systemic family therapy: The SCORE. *Journal of Family Therapy*. 32, 232-258
- Stratton, P., Lask, J., Bland, J., Nowotny, E., Evans, C., Singh, R., Janes, E. and Peppiatt, A. (2014), Detecting therapeutic improvement early in therapy: validation of the SCORE-15 index of family functioning and change. *Journal of Family Therapy*, 36: 3–19

Ethical approval

Before any research can be conducted students must first gain ethical approval. The Department of Psychology Ethics Committee can approve projects which pose little or no ethical issues. It meets once per term and during the summer, electronic applications must be submitted three days in advance of when the Committee meets in order to be reviewed. More information on the remit and application process of the Ethics Committee can be found here:

http://www.psychol.cam.ac.uk/ethics_committee

Projects which are not suitable to be reviewed by the Department of Psychology Ethics Committee should instead gain ethical approval by the School of Biological Sciences Psychology Research Ethics Committee. The Committee typically requires 6-8 weeks to process an application, sometimes as long as 12 weeks:

<http://www.bio.cam.ac.uk/psyres>

For projects involving experimental animals you are not allowed to perform scientific procedures, but you will have these performed for you where necessary by scientists with the necessary Home Office licenses. You will, however, be required to attend a very short induction course and be screened by Occupational Health for possible allergens etc. These requirements are not time-consuming.

Students should discuss with their supervisors what ethical issues their research may have and whether approval has already been granted, and submit an application to the relevant Committee as soon as possible where necessary.

Plagiarism

Concerns about plagiarism are taken very seriously and students should ensure that they are familiar with [the Faculty of Biology's guidance](#).

Cases of suspected plagiarism may be submitted to the Turnitin UK text-matching program, as may a random sample of dissertations/reports. Cases of suspected unfair practice including plagiarism, potential data fabrication, or collusion will be investigated by the Chair of Part II Exams on a case-by-case basis. This investigatory meeting may involve examiners, supervisors, College Tutors or the University Proctors. Following the investigatory meeting, the Chair may recommend that penalties be applied to the final mark. All penalties to be applied will be agreed at the final Examiners' meeting. Students should read the [University's Statement on Plagiarism](#).

When submitting dissertations/reports, students will sign a cover sheet detailing their work. The form will also confirm that students have read the guidance on plagiarism, they understand what plagiarism is, and that they consent for their work to be submitted to Turnitin that checks for originality. Further information can be found on the survey linked to above, and from the Teaching Administrator.

Word limit

For PBS students, dissertations must be at least 6,000 words long and cannot exceed 10,000 words. For NST Part II students, the word limit is 5,000 words with no minimum requirement.

There is no leeway. Students exceeding the word limit will be penalised, or if the word-count for dissertations is inferior to 6,000 words.

The word limit must be written on the coversheet for your dissertation/report at submission and checks will be carried out. At the final Examiners' meeting, the Examiners will discuss all over-length work and agree a penalty scale. As a general rule, any content that the Examiners must read in order to assess your work should be included in the main body and not in an appendix; overuse of appendices may be penalised if it impairs the understanding of your work.

The following table details how the word count is calculated, as there are differences between dissertations and reports:

	PBS 7: Research Dissertation	NST Part II Research Project
Contents	Included in word count	Included in word count
Captions	Included in word count	Included in word count
Foot/endnotes	Included in word count	Excluded from word count
Tables, graphs	Included, see below for details	Excluded from word count
Bibliography	Excluded from word count	Excluded from word count
Appendixes	Excluded from word count	Excluded from word count

For PBS students, the word count for your dissertations will include tables according to their content: Numerical tables, graphs or figures (for example, reports of statistical data) will be counted at a fixed rate of 150 words per table. Non-numerical tables, graphs or figures (for example, comparison tables showing attributes of various groups) will be counted per-word, and all content of the table will be counted.

Layout

- Font: Use 12-point font and double-spacing for the text and 11-point font and single spacing for footnotes, lengthy inset quotations, notes, and bibliographies.
- Margins: Allow an ample margin on both sides of the page.
- Pagination: Print on one side only, and number the pages serially from 1.
- Abbreviations: At the first mention give the full name and its acronym or abbreviation in brackets. It is often useful to include a list of the acronyms and abbreviations you use.
- A table of contents is useful, as are sections and perhaps even separate chapters (these do not have to start on a separate page).
- Acknowledgements: Any statement of acknowledgements should appear between the contents page and before the start of the examinable text.
- Word-count: This includes all preliminary matter (e.g., title, acknowledgements), footnotes and endnotes, but not the bibliography. You do

not need to include consent/debriefing forms in your word count. Students are expected to keep to the word-count as much as possible and penalties will be applied to over-limit work.

- All work should be proofread; examiners will penalise work with many grammatical or typographical errors.
- The student's name or any other identifying information should be excluded from the text. Students should ensure their details are censored from consent forms and debrief sheets included in the appendix. Any identifiable information found in a submitted text will be censored by hand, which will affect the professional presentation of the dissertation.

Examples of layout, from highly marked dissertations submitted for the defunct PPS Tripos, and reports from previous years of NST Part II, can be found on the relevant Moodle sites.

References and bibliographies

Some word processing programmes (e.g., Endnote for later versions of Microsoft Word) format references automatically from a bibliographical database in a variety of accepted conventions – these can be extremely useful, particularly if you update your database each time you read new material. Be consistent throughout in the convention you adopt (e.g., 'author-date' citations in the text, with a bibliography at the end of the work).

Make sure that your referencing is complete: for journal articles etc. the author, the title of the article, the name of the journal, the volume number, the year and the pages (and where page numbering starts with each issue, the issue number also); for books and book sections the editor(s) as well as the author(s), the title of the book, the place of publication, the publisher, and the year. Examiners often follow up a selection of references and will be irritated if they cannot find what they are looking for. If you use sources other than books or journal articles, make sure to say what these are. For sources obtained from the web etc., give the access address. Print the titles of books and journals in underlined normal type or italics; the titles of articles etc. in normal type inside quotation marks.

Submission

1. **Two** hard copies of the dissertation must be submitted to the Teaching Secretary Ms Louise White, on the first floor of the Department of Psychology main building on the Downing Site, by **12.00 noon on Thursday 28th April**.
2. A coversheet provided must be completed when hard copies are submitted, which must include the word count.
3. An electronic copy (**not** in PDF format) of the dissertation/report must also be sent to Ms Louise White, at law23@cam.ac.uk.

Penalties for late work

All work must be submitted by 12.00 noon on the advertised deadline. **Both the hard copies and electronic copy must be received by 12.00 noon in order for the work to be considered as “submitted”.** For students on the NST Tripos, the details of penalties for late submission are described in the [NST Exam Regulations](#). For students on the PBS Tripos, the penalty will be confirmed in advance of the deadline for submission of dissertations. Students who have good reason to request an extension (e.g., serious health problem, major family difficulty) should contact their College as soon as possible, as all requests must be sent from the Director of Studies or the College’s Senior Tutor to the Chair of Part II Examinations at least 48 hours in advance of the deadline date. All requests must be accompanied by appropriate evidence.

You should ensure that you allow appropriate time to print and present your work before the deadline. Problems with computers or printing facilities will not be accepted as reasons for late submission, and all work must be bound (stapled or in a hole-punched binder).

Assessment

Dissertations/reports are marked by academics sharing the field of research you have explored. Your supervisor will complete a questionnaire which will alert assessors to any considerations they need to make when marking your work, for instance if any difficulties outside your control were encountered.

PBS 7: Research Dissertation is worth 25% of the overall class for that year, the same as for all other papers PBS Part IIB students take. The Part II Research Project mark is scaled so as to be worth 20% of the overall year for NST/MVST students.

Both dissertations and reports are marked using the following marking criteria:

Marking criteria

Class	Content Argumentation	Research/ Presentation	Subdivision
80+	The dissertation is an original contribution to its field; the argument presented is sophisticated and highly challenging, yet written with clarity and precision; could provide the basis of an article to be submitted to an academic journal.	Shows clear evidence of exhaustive background research undertaken, with critical and analytical assessment of the major contributions; presentation and referencing are immaculate.	
70-79	Contains originality of argumentation, an interpretative and considered approach, and demonstrates comprehensive knowledge of the field; very well structured with clear expression and judicious illustration; should be challenging.	Demonstrates extensive use of available research resources; scientific literature handled judiciously and analytically; polished presentation and referencing.	Upper - Uniformly original and sophisticated. Lower - Well-crafted and very resourceful.
60-69	A good, sound argument containing competent discussion of the topic while demonstrating satisfactory overall knowledge of the field; should show clarity and organization with appropriate selection of material.	Competent use has been made of available text books; account is taken of journal articles, although perhaps not uniformly; satisfactory presentation and referencing.	Upper - Ideas should show increasing cogency and resourcefulness Lower - Restricted to a relatively narrow set of routine ideas.
50-59	Average level of argumentation containing basic ideas, although generally limited to straightforward narrative treatment (e.g. synopsis); limited knowledge of the field; adequate structure, but often not well developed; illustration not always to the point.	Use of scientific literature is limited to provision of ideas, often substituting for first-hand knowledge of journal articles; while use of text books and review articles is acknowledged, they are not dealt with critically or analytically; presentation and referencing will often have inconsistencies.	Upper - A number of ideas of interest are discernible. Lower - Marked tendency towards padding; paucity of own ideas.
40-49	Very basic approach; does not have a consistent thesis; ideas are unstructured or tacked together; often irrelevant and undirected argumentation; little apt illustration; nevertheless, should show some knowledge of the scientific literature.	Little or inappropriate use of scientific literature has been made; while not showing evidence of outright plagiarism, ideas will often be heavily dependent on the work of others; possibly sloppy presentation and severely inconsistent referencing.	Upper - A valid but commonplace underlying argument is discernible. Lower - Direction-less and / or padded.
0-39	Fails to demonstrate competent knowledge or understanding of the scientific literature.	The use of scientific literature, even if acknowledged, is unscholarly; presentation will show extreme carelessness.	Upper - Allowance for Ordinary (i.e., there is some valid

			argumentation). Lower - Outright fail.
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Further information

For any queries regarding choosing a project or what is expected of you, contact either your Director of Studies/Coordinating Supervisor or the Course Organiser Dr William Matthews (contact details at the beginning of this guide).

Useful links:

Department of Psychology Library
www.library.psychol.cam.ac.uk

PBS Tripos Part IIB Moodle Site
www.vle.cam.ac.uk/course/view.php?id=83931

NST Part II Moodle Site
www.vle.cam.ac.uk/course/view.php?id=68321

PBS Tripos Part IIB webpage
www.pbs.tripos.cam.ac.uk/current/year3