Mental health problems in children who struggle at school

The aim of this project is to understand the cognitive, behavioural, emotional and environmental factors that underpin co-occurring problems in mental health and learning in children. It will use a combination of existing data collected in the Centre for Attention Learning and Memory (CALM) and new data collected as part of the PhD. This project will investigate whether mental health problems and learning difficulties have common as well as distinct origins, and test whether the causes of learning difficulties can be distinguished for children who also have mental health problems

Project will be supervised by Dr Joni Holmes

Understanding neurodevelopmental disorders of presynaptic function

We are offering supervision of a PhD project investigating neurodevelopmental disorders arising from presynaptic gene mutations. It will build on recent evidence that mutations in genes influencing the synaptic vesicle cycle lead to movement disorders, intellectual disability and social-emotional difficulties. It is speculated that disturbance to synaptic vesicle kinetics alters plasticity, constraining the emergence of cognitive functions. The project will be patient-centred, involving behavioural characterisation of individuals with developmental cognitive impairments. A key element of the project will be the design and application of neurophysiological methods (EEG, MEG) to study parameters of synaptic function in impaired individuals. The project will involve collaboration with cellular neurophysiologists examining the impact of patient-specific mutations *in vitro* and in animal models. Applicants should have a strong interest in cognitive development and neurophysiological methods and an enthusiasm for acquiring knowledge about genetics and neurobiology.

Project will be supervised by Dr Kate Baker

Encoding of real-life events to memory

How do we encode events to memory? Do we encode each moment as we encounter it, or do we wait until the end of an event and save it to memory in its entirety? The goal of the project is two-fold: First, to identify what signals that one event is over and a new one has begun. And second, to reveal whether the event is encoded incrementally or as a whole chunk. This will be addressed by using functional magnetic resonance imaging, a non-invasive method allowing examination of brain activity in healthy people, to look at brain activity during encoding of films. The project will encompass all aspects of the research, from the very initial filming and experimental design through running the experiment and data analysis.

Project will be supervised by Professor Rik Henson

Brain dynamics of natural language processing

We invite applicants to conduct research towards a PhD on the neural processes that support natural language comprehension from connected speech and/or reading using EEG/MEG combined with eye-tracking. Continuous speech and text offer the opportunity to measure neural activity during ecological language processing while participants engage a large number of different processing levels ranging from perception of visual/auditory form to computation of higher-level meaning. There are significant methodological challenges involved with respect to co-registration of eye-movements and EEG/MEG, artefact correction, estimation of overlapping brain responses using parametric analysis methods (in reading) and aligning discrete cognitive or neural events to continuous signals (for speech). Research questions include the interplay between semantic prediction, meaning retrieval and eye-movement control in reading, or the relationship between form- and meaning processes in speech comprehension. Experimental work can focus on a single modality (text or speech comprehension) or draw comparisons between modalities.

Project will be supervised by Dr Olaf Hauk and Dr Matt Davis