

Date of submission: 09/11/07
Project title: Combined ERP and
fMRI studies of declarative memory:
Assessing the impact of
neuropsychological and genetic
measures of individual difference.

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SINAPSE PhD Project Proposal Template for PhDs starting in 2008

SINAPSE Centre (i.e. primary university to which this studentship will be attached*):

Stirling

First supervisor: contact details

Name: Prof D I Donaldson
Department: Psychology
Address: University of Stirling, Stirling FK9 4LA

Email: did1@stir.ac.uk

phone: 01786 467657

Second supervisor: contact details

Name: Prof S Lawrie
Department: Psychiatry
Address: The University of Edinburgh, Royal Edinburgh Hospital, Edinburgh, EH10 5HF.

Email: s.lawrie@ed.ac.uk

phone: 0131537-6671

Speciality of first supervisor:

Psychology

Speciality of second supervisor:

Psychiatry

PROJECT

Title:

Combined ERP and fMRI studies of declarative memory: Assessing the impact of neuropsychological and genetic measures of individual difference.

Planned start date (year of intake):

Oct 2008

Likely background of suitable student (eg. Neuroscience, MR Physics, Chemistry, Psychology) and essential skills required prior to starting this PhD:

Psychology; Neuroscience; Imaging; Biology

Ideally the student would have some experience in either ERPs or fMRI.

*usually this would be the university in which the first supervisor is based.

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Summary of proposed project (approximately 200 words):

Studies of declarative memory (conscious memory) have become heavily dependent on evidence from neuroimaging, including ERPs and fMRI; relatively little attempt has been made to conduct parallel studies with these two methods. That is the aim of the current proposal.

One aspect of memory that has become increasingly of interest is the investigation of individual differences; this is important for imaging in particular because the imaging methods rely upon the averaging of data across participants. To the extent that individual differences exist, the current findings largely ignore them. The current proposal aims to investigate them.

Two main types of individual differences will be investigated; neuropsychological and genetic. Prof Donaldson has expertise in using neuropsychological tests to assess participants, allowing different population profiles to be examined/correlations between test scores and imaging data to be carried out. Prof Lawrie has expertise in the use of genetic, clinical and neurobiological techniques to assess individual differences in brain imaging patterns, cognition and behaviour; ongoing studies in Edinburgh suggest that genetic profiles can be identified that are linked to different patterns of memory performance and different underlying brain activity. The aim of the current proposal is to combine these different approaches whilst investigating memory.

The applicants have expertise in the imaging methods, and believe that there is scope for combining them – at first using parallel studies; ultimately by simultaneous multi-modal imaging. The current proposal is intended to investigate and develop multi-modal imaging possibilities; memory provides an ideal topic for this because there is a solid base of current single method data for reference.

Key references (up to five):

1. M.D. Rugg and A.P. Yonelinas (2003) Human recognition memory: A cognitive neuroscience perspective, *Trends Cognitive Science*.
2. A. Meyer-Lindenberg and D. Weinberger (2006) Intermediate Phenotypes And Genetic Mechanisms Of Psychiatric Disorders. *Nature Reviews Neuroscience*.
3. L.G. Nilsson, L. Nyberg and L. Backman (2002) Genetic Variation in Memory Functioning. *Neuroscience and Biobehavioural Review*.
4. M. F. Egan et al. (2003) The BDNF val⁶⁶met Polymorphism Affects Activity-Dependent Secretion of BDNF and Human Memory and Hippocampal Function. *Cell*.
5. R. Cabeza and L. Nyberg (2000) Imaging Cognition II: An Empirical Review of 275 PET and fMRI Studies, *Journal of Cognitive Neuroscience*.

In what way does this PhD proposal meet the SINAPSE criteria as described in the call for proposals? (50 words)

The proposal ties together researchers in two of the SINAPSE centres, and uses two different imaging modalities; it provides an opportunity for collaboration within the network, and an investigation of true cross-modal imaging. The student should lay the groundwork for future combined imaging studies.

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Please state the name of the local SINAPSE Centre Lead with whom you have discussed this project (Leads are listed on the Call for Proposals):

David Donaldson