

Date of submission: 9/11/07  
Project title: Investigating the validity  
and reliability of ERP measures of  
memory: A multi-centre comparison.

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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:** Dr Kevin Allan  
**Department:** Psychology  
**Address:** William Guild Building, University of Aberdeen, Aberdeen, AB24 2UB

**Email:** k.allan@abdn.ac.uk

**phone:** 01224 273932

**Speciality of first supervisor:**

Cognitive Neuroscience

**Speciality of second supervisor:**

Cognitive Neuroscience

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### PROJECT

**Title:**

Investigating the validity and reliability of ERP measures of memory: A multi-centre comparison.

**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; Imaging;**

**Ideally the student would have a Psychology or Biomedical degree with a substantial Neuroscience-related component, combined with experience of electrophysiological recording techniques.**

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

**Summary of proposed project (approximately 200 words):**

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Once completed and approved by local SINAPSE lead, please return to  
Mrs Moira Henderson – mhenders@staffmail.ed.ac.uk

High-temporal resolution and cost-effectiveness have made ERP methods a mainstay of cognitive neuroscience. ERPs have had a huge impact. For example, providing support for dual process theories of episodic memory (i.e., memory for one's personal past), providing neural evidence for the existence of unconscious memory processes (e.g., priming) and elucidating the nature of semantic memory (i.e., knowledge about the world). In short, ERPs are thought to provide 'bio-markers' for a variety of memory functions. The aim of the current proposal is to assess the validity and reliability of these measures.

There are approximately 80 ERP labs in the UK, and more than a dozen in Scotland. Each SINAPSE centre has ERP capability, but the reliability and validity of ERP measures across the centres has never been systematically assessed. Although each ERP lab uses similar methods, there are notable differences in amplifier systems, data recording protocols, data processing methods and in analysis techniques. This proposal will therefore involve a set of ERP memory experiments, conducted in an identical fashion, in two different centres, to investigate the practicalities and consequences of across-centre ERP work in terms of the reliability and validity of the data obtained. The studies will investigate memory, and will be designed to help elucidate ongoing issues within the ERP memory field, whilst providing the basis for a careful examination of the ERP measures themselves.

The ERP labs in Stirling (Prof Donaldson) and Aberdeen (Dr Allan) are ideally suited for carrying out studies of this kind; the two labs each have two separate amplifier systems, with one system being common across the centres. The Aberdeen and Stirling labs also have common as well as different data processing and analysis software. We will use standard ERP memory paradigms in both labs, and compare data from individual subjects recorded in each centre, using each set of equipment, and analysed with different software packages. A major gain from the project will be the development of standardisation protocols that can be generalised for all SINAPSE-related ERP centres. The project will also generate across centre guidelines for measures of data quality.

**Key references (up to five):**

1. MD Rugg, EL Wilding (2000) Retrieval processing and episodic memory, *Trends in Cognitive Sciences*.
2. D Friedman, R Johnson (2000) Event related potential (ERP) studies of memory encoding and retrieval: A selective review. *Microscopy Research and Techniques*.
3. F DI Nocera, F Ferlazzo, V Borghi (2001) G Theory and the reliability of psychophysiological measures: A tutorial. *Psychophysiology*.
4. J Kayser, CE Tenke, GE Bruder (2003) Evaluating the quality of ERP measures across recording systems. *International Journal of Psychophysiology*.
5. KB Walhovd, AM Fjell (2002) One-year test-retest reliability of auditory ERPs in young and old adults. *International Journal of Psychophysiology*.

**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 aims to assess the ease which data can be collected and compared across these centres. The project will provide basic information about the reliability and validity of ERP measures; in addition, a key aim will be to explicitly compare the data collection process with different systems and to develop protocols that make data sharing, and therefore cross centre studies, easier.

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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