

Poster presentation

Open Access

## Emotion selectively impairs associative memory

Christopher R Madan\*<sup>1</sup>, Christine SM Lau<sup>1</sup>, Jeremy B Caplan<sup>1,3</sup> and Esther Fujiwara<sup>2,3</sup>

Address: <sup>1</sup>Department of Psychology, University of Alberta, Edmonton, AB, Canada T6G 2E9, <sup>2</sup>Department of Psychiatry, University of Alberta, Edmonton, AB, Canada T6G 2E9 and <sup>3</sup>Centre for Neuroscience, University of Alberta, Edmonton, AB, Canada T6G 2E9

Email: Christopher R Madan\* - [cmadan@ualberta.ca](mailto:cmadan@ualberta.ca)

\* Corresponding author

from Eighteenth Annual Computational Neuroscience Meeting: CNS\*2009  
Berlin, Germany. 18–23 July 2009

Published: 13 July 2009

BMC Neuroscience 2009, **10**(Suppl 1):P341 doi:10.1186/1471-2202-10-S1-P341

This abstract is available from: <http://www.biomedcentral.com/1471-2202/10/S1/P341>

© 2009 Madan et al; licensee BioMed Central Ltd.

### Introduction

One neural mechanism suggested for the emotional enhancement of memory (EEM) in human behavior is amygdala modulation of hippocampal learning [1]. However, there are several pathways within the hippocampus, supporting different types of memory, e.g., item memory or associative memory. In emotional learning, the amygdala could modulate hippocampal function as a whole, affecting multiple types of hippocampal-dependent learning. Alternatively, amygdala modulation may affect specific pathways, selectively enhancing only some types of hippocampal-dependent learning. Episodic memory for items is hippocampal-dependent, but so is memory for item-item associations; these may rely on different hippocampal pathways. Nearly all human emotional memory studies test memory for items only. Apart from EEM for single items, we tested here whether associative memory, a hippocampal-dependent memory function, is particularly enhanced by emotion.

### Methods

We conducted a verbal paired-associate learning paradigm using different types of word pairs. A  $2 \times 2 \times 2$  factorial design was used, manipulating emotionality of individual words, pairings of emotional and neutral words, and forward-versus backward-direction of recall probes (e.g., PAIN-WHISTLE, forward probe = PAIN-\_\_\_\_, backward probe = \_\_\_\_-WHISTLE). Participants learned pure pairs, in which both words were of the same type (EMOTIONAL-EMOTIONAL or NEUTRAL-NEU-

TRAL), along with mixed pairs, in which word-types differed (EMOTIONAL-NEUTRAL or NEUTRAL-EMOTIONAL). Participants studied and then were tested with cued recall on 8 sets of 8 words pairs. To estimate separate EEM effects on item versus association memory within the cued recall behavioral data, we fit the data with a simple probabilistic model that had free parameters reflecting enhancement levels for probability of retrieving associations as a function of pair type and retrieving items as a function of target-word type.

### Results and discussion

Results and best-fitting model parameters suggested that, emotionality had two opposing types of action on memory retrieval: an enhancement of memory for target items with a concurrent impairment of memory for associations between items. This pattern corroborates previous research which found emotionality impaired incidental association learning between peripheral neutral objects and central emotional scenes, despite enhanced memory for the emotional scenes themselves [2]. In our study, no information was peripheral and association learning was intentional. Thus, impairment in declarative associative memory by emotion may be a rather universal mechanism.

These findings suggest that the amygdala can modulate specific pathways within the hippocampus, exerting a selective influence on learning.

## References

1. Cahill L, McGaugh JM: **Mechanisms of emotional arousal and lasting declarative memory.** *Trends Neurosci* 1998, **21**:294-299.
2. Touryan SR, Marian DE, Shimamura AP: **Effect of negative emotional pictures on associative memory for peripheral information.** *Memory* 2007, **15**:154-166.

Publish with **BioMed Central** and every scientist can read your work free of charge

*"BioMed Central will be the most significant development for disseminating the results of biomedical research in our lifetime."*

Sir Paul Nurse, Cancer Research UK

Your research papers will be:

- available free of charge to the entire biomedical community
- peer reviewed and published immediately upon acceptance
- cited in PubMed and archived on PubMed Central
- yours — you keep the copyright

Submit your manuscript here:  
[http://www.biomedcentral.com/info/publishing\\_adv.asp](http://www.biomedcentral.com/info/publishing_adv.asp)

