Emotional arousal impairs association-memory: Roles of amygdala and hippocampus

Christopher R. Madan, Esther Fujiwara, Jeremy B. Caplan, Tobias Sommer

PII: S1053-8119(17)30384-1
DOI: http://dx.doi.org/10.1016/j.neuroimage.2017.04.065
Reference: YNIMG14006

To appear in: *NeuroImage*

Received date: 26 December 2016
Revised date: 25 April 2017
Accepted date: 27 April 2017

Cite this article as: Christopher R. Madan, Esther Fujiwara, Jeremy B. Capla and Tobias Sommer, Emotional arousal impairs association-memory: Roles o amygdala and hippocampus, *NeuroImage* http://dx.doi.org/10.1016/j.neuroimage.2017.04.065

Emotional arousal impairs association-memory: Roles of amygdala and hippocampus

Christopher R. Madan[a,b,c1], Esther Fujiwara[a,b1], Jeremy B. Caplan[a,b], Tobias Sommer[a*]

[a]University Medical Center Hamburg-Eppendorf, Hamburg, Germany
[b]University of Alberta, Edmonton, AB, Canada
[c]Boston College, Chestnut Hill, MA, USA

[*]**Correspondence to:** Tobias Sommer. Department of Systems Neuroscience, University Medical Center Hamburg-Eppendorf, Bldg. W34, Martinistr. 52, 20246 Hamburg, Germany. fon: 0049-40-7410-54763. fax: 0049-40-7410-59955. email: tsommer@uke.de

Abstract

Emotional arousal is well-known to enhance memory for individual items or events, whereas it can impair association memory. The neural mechanism of an association memory impairment by emotion is not known: In response to emotionally arousing information, amygdala activity may interfere with hippocampal associative encoding (e.g., via prefrontal cortex). Alternatively, emotional information may be harder to unitize, resulting in reduced availability of extra-hippocampal medial temporal lobe support for emotional than neutral association-memory. To test these opposing hypotheses, we compared neural processes underlying successful and unsuccessful encoding of emotional and neutral associations. Participants intentionally studied pairs of neutral and negative pictures (Experiments 1–3). We found reduced association-memory for negative pictures in all experiments, accompanied by item-memory increases in Experiment 2. High-resolution fMRI (Experiment 3) indicated that reductions in associative encoding of emotional information are localizable to an area in ventral-lateral amygdala, driven by attentional/salience effects in the central amygdala. Hippocampal activity was similar during both pair types, but a left hippocampal cluster related to successful encoding was observed only for negative pairs. Extra-hippocampal associative memory processes (e.g., unitization) were

[1] Both authors contributed equally.