



Experience-related eye movements reflect declarative memory for emotional and neutral pictures

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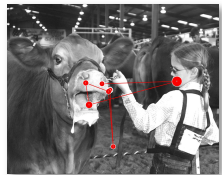
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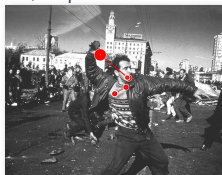
Hamann Cognitive Neuroscience Lab

Introduction

- Eye movements have been used to probe how attention is allocated during the encoding and retrieval of declarative memories
- Recollective experience is the subjective feeling-of-knowing (Tulving, 1985)
 - Remember** – Memory for an experience **with** recollection of the episodic context
 - Know/Familiar** – Memory for an experience **with no** recollection of the episodic context
- Emotion enhances recollection for previously seen items (Hamann, 2001)
- Easterbrook Hypothesis - Increased arousal is related to narrower and focused attention and enhanced recollection of the stimulus (Easterbrook, 1959)
- Sharot et al (2008) found that attention was narrowly focused for subsequently recollected items relative to familiar items, independent of emotional arousal



Neutral – Dispersed Attention



Negative – Narrow Attention

Interpretation

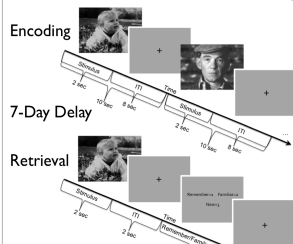
- Encoding** = Attention capture by salient features (narrow fixations) → Cognitive Elaboration → ↑ **recollection** of the episodic context → “Remember” Response at **Retrieval**
- Encoding emotional stimulus** = Attention capture by salient features → Attn. maintained on salient emotional features (decreased cue utilization; Easterbrook)
- Retrieval** = Search for features in picture which match features in memory

Features **remembered** = less search → narrow fixations
Features **forgotten** = more search → dispersed fixations

Hypotheses

- Visual attention will be more narrowly focused for correct “remember” responses than for correct “familiar” responses, for positive, negative, and neutral stimuli, but this difference will be more exaggerated for emotional items.
 - During encoding: Attention captured by emotional features, elaborated, and more deeply encoded into memory.
 - During retrieval: Attention captured by remembered emotional features, bringing to mind the episodic context.
- Visual attention will be more narrowly focused for emotional stimuli than to neutral stimuli.

Methods

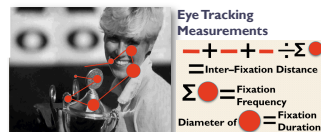


Participants

- 20 participants (10 female)
- Ages 19-30, $M = 21.4 \pm 3.5$

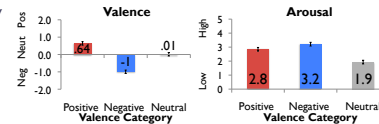
Procedure

- Study and Test design with 1-week delay
- Incidental Encoding of Pictures
- Remember/Know Recognition Test
- Valence and Arousal Ratings
- Valence: 1-5 Likert Scale (1=Negative, 3=Neutral, 5=Positive)
- Arousal: 1-5 Likert Scale (1=Calm & 5=Aroused)



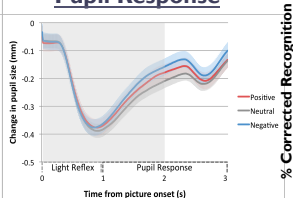
Stimuli

- 270 grayscale IAPS and other images
- During encoding:
 - 60 Positive, 60 Negative, 60 Neutral (180 Total)
- During retrieval:
 - 90 Positive, 90 Negative, 90 Neutral (180 Old/90 New)
- Arousal matched for Positive ($M = 2.9$) and Negative ($M = 3.2$) stimuli
- Across the set of stimuli, pictures equated on:
 - Visual complexity
 - Social content
 - Luminance qualities



Results

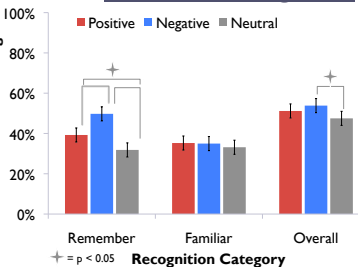
Pupil Response



Pupil Response. Shaded gray region is the stimulus presentation period. Error bars = SEM.

- Larger pupil dilation for emotional items (positive and negative) relative to neutral items
- Thus, emotional pictures were physiologically arousing

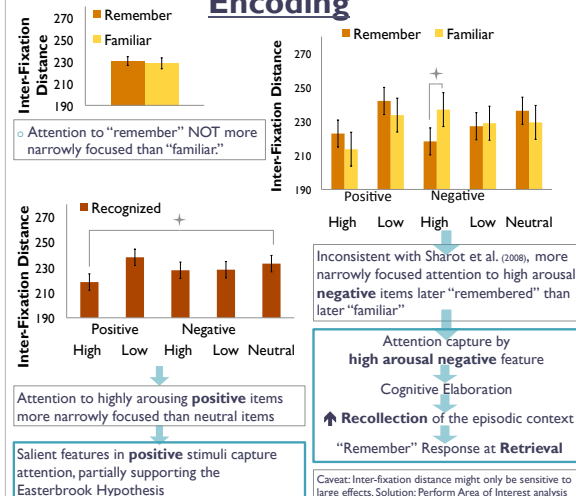
Corrected Recognition



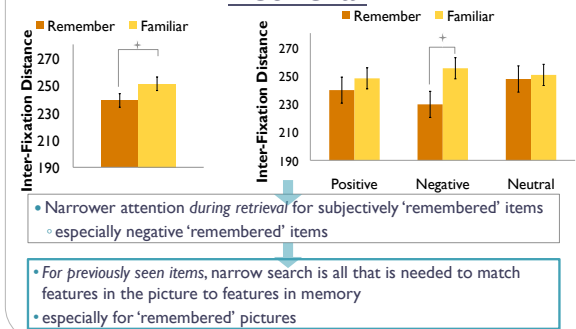
Corrected recognition. Hits – FA for each response type. Familiar corrected for non-independence: $F = \Phi_{hit}(1 - R_{hit}) / K_{fa}(1 - R_{fa})$. Error bars = SEM.

Eye-Tracking Results

Encoding



Retrieval



References

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