

The Influence of Emotional Context Changes and Rumination on Memory for Prior Remembering

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Introduction

Remembering the act of previously retrieving a memory is its own cognitive process. It may be impacted by the context in which each retrieval occurs. Individual differences and mood state may also play a role.

The impairing influence of context changes on memory for prior remembering (MPR) has been theorized to explain the clinical phenomenon identified by Schooler (2001) of spontaneously discovered memories of abuse. Arnold and Lindsay (2002) tested this proposed cognitive mechanism with a cued-recall paradigm involving words paired with semantically-related context cues. Using this paradigm, memory researchers have consistently found that changes in semantic context between first and second retrieval impair MPR (Arnold & Lindsay, 2002; Leppanen & Lyle, 2018). Recent research has begun to examine emotion as a type of contextual cue which may impact MPR (Leppanen et al., 2020).

Mood state (depression) and individual differences (rumination) have also been studied in relation to memory (Hertel & Rude, 1991; Johnson et al., 2009). These findings suggest that depression and rumination divert cognitive resources away from task-relevant goals and may enhance focus on negative material (Hasher & Zacks, 1988). We were interested in the relation of MPR, emotional context, and the cognitive cost of rumination.

Methods

Sample

Data from 16 undergraduates from Wesleyan University were included as a pilot sample. Participants were recruited from an introductory psychology course in exchange for course credit. Participants provided informed consent prior to beginning the experiment.

Measures

- Depression and Anxiety: **Personality Assessment Inventory (PAI)**; Morey, 1991) depression and anxiety subscales
- Trait Rumination: **Ruminative Response Scale (RRS)**; Nolen-Hoeksema & Morrow, 1991; adapted by Treynor et al., 2003)
 - Reflective pondering (RP) subscale**: adaptive rumination, geared toward problem-solving
 - Brooding (BR) subscale**: passive and maladaptive rumination, prolongs negative mood

Procedure

Our prior remembering task follows a within-subjects, 2 (emotion: neutral or negative) x 2 (context: same or changed) factorial design. Target words were paired with negative and neutral context images to manipulate emotional context. All context images were pretested for arousal and valence.

Participants were presented with 102 image – word pairs and instructed to learn the target words. Participants were then tested for their memory for target words in a first cued-recall test (Test 1), in which some context images remained the same and others were changed. There was a short break between Test 1 and the second cued-recall test (Test 2), during which participants completed a word search.

In Test 2, context images were the same as the initial image, and, after typing in the target word, participants were also asked whether they had remembered retrieving the target word during Test 1. All target words were rated in terms of arousal and valence during all three phases as a manipulation check for emotional context. At the end, participants completed a post-experiment questionnaire and were debriefed on the experiment.

Research Design

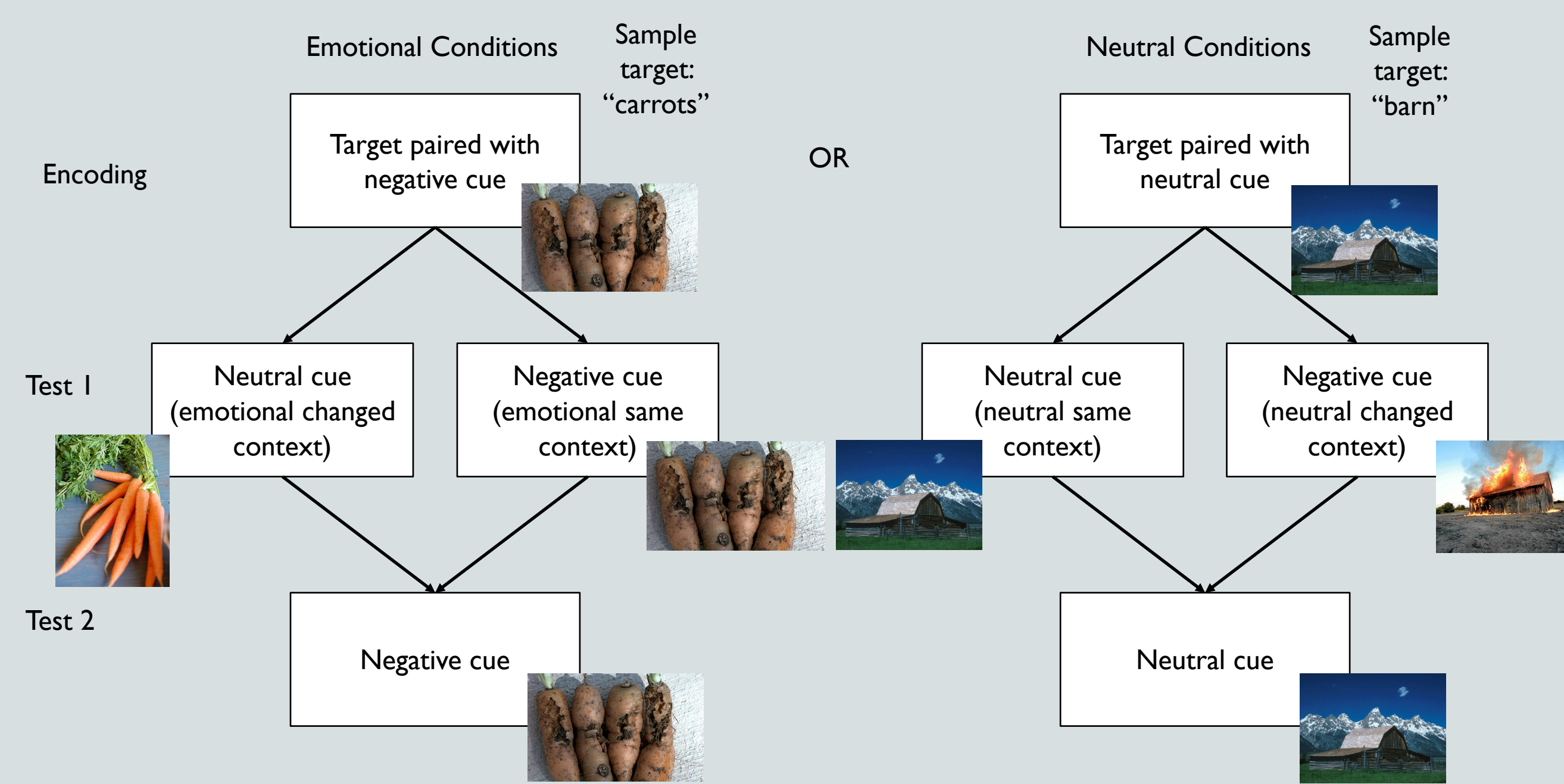


Figure 1: Conceptual Representation of the 2x2 Factorial Model

Hypotheses

- In accordance with previous research, changing the retrieval context across cued-recall tests will impair memory for prior remembering.
- Prior remembering errors will be highest for targets in the emotional condition initially retrieved in a neutral context.
- Trait rumination will help explain the relationship between changes in emotional context and memory for prior remembering.

Results

Memory for Prior Remembering (MPR)

We conducted a repeated measures ANOVA to assess the impact of emotional context changes on MPR:

- Factor 1: Context on Test 1 (same or changed)
- Factor 2: Emotion type (negative or neutral)
- Dependent Measure: MPR (proportion of target words judged as previously retrieved for targets successfully recalled on both tests)

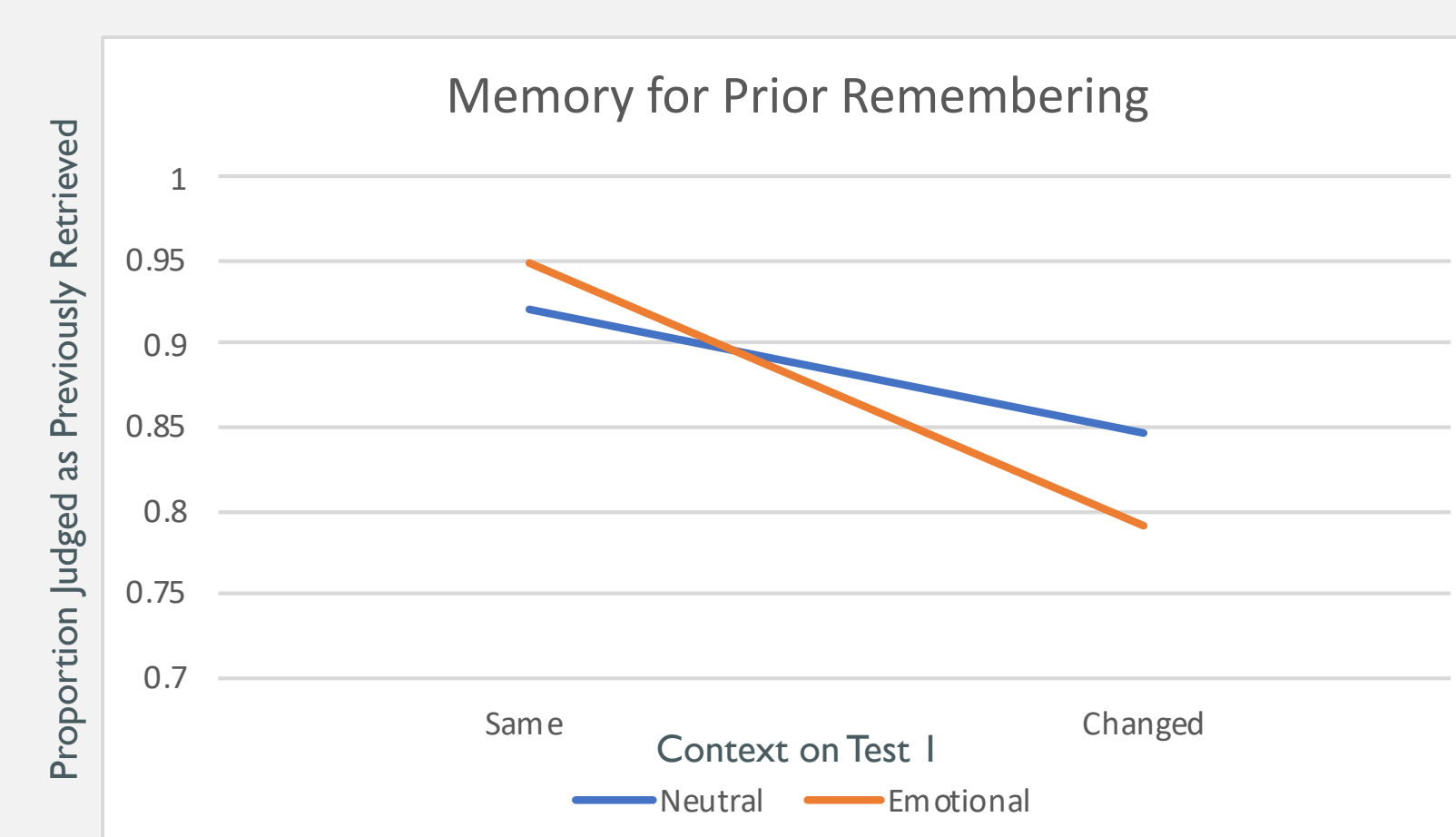


Figure 2: Effect of Context and Emotion on Memory for Prior Remembering

Context was found to significantly impact MPR ($F(1, 15)=17.95, p=.001$), where proportion of targets judged as being previously retrieved was greater in the same ($M=0.94$) than changed ($M=0.80$) condition, but the effect of emotion type was not found to be significant ($p>.05$). Further, the interaction between context and emotion type was found to have a marginally significant impact on MPR ($F(1,15)=3.89, p=.067$).

Treatment	Mean Square	df	F	p	η^2
Context on Test 1	.217	1, 15	17.954*	.001*	.545
Emotion Type	.004	1, 15	.680	.423	.043
Context on Test 1 x Emotion Type	.029	1, 15	3.888	.067	.206

Significant at the $p<.05$ level

Correlations with Clinical Measures

MPR Proportion		RRS-Reflective Pondering	RRS-Brooding	RRS Total	Total Anxiety PAI Score	Total Depression PAI Score
Neutral Same Context	Pearson Correlation	.401	.064	.189	-.369	-.247
	p	.156	.829	.517	.195	.395
Neutral Changed Context	Pearson Correlation	.253	.233	.266	-.138	.181
	p	.382	.422	.357	.637	.535
Emotional Same Context	Pearson Correlation	-.014	.119	.071	-.295	.031
	p	.962	.685	.810	.306	.917
Emotional Changed Context	Pearson Correlation	.571*	.121	.322	-.217	.010
	p	.033*	.681	.261	.456	.973

Significance at the $p<0.05$ level
N=14 for all correlations

Bivariate correlations revealed that only the RRS-RP scores significantly correlated with MPR ($r=.57, p=.033$), and this positive correlation was only observed with emotional condition targets that changed context.

		RRS-Reflective Pondering	RRS-Brooding	RRS Total
Test 1 Accuracy	Pearson Correlation	-.191	-.607*	-.574*
	p	.512	.021*	.032*
Neutral Same Test 1 Accuracy	Pearson Correlation	-.123	-.585*	-.506
	p	.674	.028*	.065
Neutral Changed Test 1 Accuracy	Pearson Correlation	-.330	-.517	-.532*
	p	.250	.058	.050*
Emotional Same Test 1 Accuracy	Pearson Correlation	-.036	-.335	-.375
	p	.902	.242	.186
Emotional Changed Test 1 Accuracy	Pearson Correlation	.027	-.475	-.373
	p	.926	.086	.188

Significance at the $p<.05$ level
N=14 for all correlations

Total RRS scores negatively correlated with cued-recall accuracy for neutral condition targets that changed context ($r=-.53, p=.05$), and RRS-BR scores negatively correlated with cued-recall accuracy for neutral, same-context targets ($r=-.59, p=.028$). Both total and brooding RRS scores negatively correlated with Test 1 accuracy overall ($r=-.61, p=.021$ and $r=-.57, p=.032$, respectively).

Discussion

- As expected, context changes significantly impaired MPR, replicating results of Arnold and Lindsay (2002), Leppanen and Lyle (2018), and Leppanen et al. (2020).
- Trends in data suggest MPR was more impaired for emotional targets that were initially retrieved in a neutral context.
- Rumination did not explain the relationship between emotional context changes and MPR except for the RRS-RP subscale, which positively correlated with MPR for emotional targets initially retrieved in neutral context.
- Rumination negatively correlated with Test 1 cued-recall accuracy in both neutral conditions, suggesting that rumination about negative images seen during encoding may have interfered with recall for neutral condition targets.
- Future studies will include larger sample with more statistical power to further explore impact of emotional context changes and rumination on MPR.
- Further research may also examine role of additional clinical measures implicated in trauma, such as shame and guilt, which have both been associated with memory impairment (Cavalera & Pepe, 2014).
- Assessing the influence of these transdiagnostic constructs on MPR will extend our understanding of the clinical application of prior remembering research (trauma-related prior remembering errors), paving the way for more informed and targeted interventions.

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