AJP

Volume 125 • Number 1 • Spring 2012

The American Journal of Psychology

125th Anniversary Volume

Edited by Robert W. Proctor *Purdue University*
Book Reviews Dominic W. Massaro *University of California, Santa Cruz*
Obituaries and History of Psychology Alfred H. Fuchs *Bowdoin College*

Affective Orientation Influences Memory for Emotional and Neutral Words

SETH N. GREENBERG and JULIAN TOKAREV
Carleton College

ZACHARY ESTES
University of Warwick

Memory is better for emotional words than for neutral words, but the conditions contributing to emotional memory improvement are not entirely understood. Elsewhere, it has been observed that retrieval of a word is easier when its attributes are congruent with a property assessed during an earlier judgment task. The present study examined whether affective assessment of a word matters to its remembrance. Two experiments were run, one in which only valence assessment was performed, and another in which valence assessment was combined with a running recognition for list words. In both experiments, some participants judged whether each word in a randomized list was negative (negative monitoring), and others judged whether each was positive (positive monitoring). We then tested their explicit memory for the words via both free recall and delayed recognition. Both experiments revealed an affective congruence effect, such that negative words were more likely to be recalled and recognized after negative monitoring, whereas positive words likewise benefited from positive monitoring. Memory for neutral words was better after negative monitoring than positive monitoring. Thus, memory for both emotional and neutral words is contingent on one's affective orientation during encoding.

Memory for emotional words is better than that for neutral words (Buchanan, 2007; Murphy & Isaacowitz, 2008). For instance, negative words such as *coffin* are more likely to be recalled (Hertel & Parks, 2002; Rubin & Friendly, 1986) and recognized (Kensinger & Corkin, 2003) than neutral words such as *cotton*. Emotional words are also recognized faster than neutral words in a lexical decision task (Kousta, Vinson, & Vigliocco, 2009; Zeelenberg, Wagenmakers, & Rotteveel, 2006) and are judged to be more memorable than neutral words (Magnusson et al., 2006; Zimmerman & Kelly, 2010).

Such findings indicate the potency of affective cues across a variety of paradigms whereupon affective attributes improve memory performance. Additionally, results suggest that one valence might affect memory performance differently than another (Estes & Adelman, 2008; Estes & Verges, 2008). Presumably, then, encoding of a word for its emotional valence ought to be useful for its later retrieval, and what is more, this presumed memory improvement might be valence-specific. The goal of the present study was to assess whether focusing on a word's affective valence affects a word's recall and recognition and whether the valence of focus matters at retrieval.

The roots for such work lie in the earlier work of Craik and Tulving (1975) that tested assumptions about levels of processing. The paradigm, in which

American Journal of Psychology
Spring 2012, Vol. 125, No. 1 pp. 71–80 •

participants are encouraged to focus on some attribute of a word, demonstrated that attending to certain dimensions during encoding (e.g., meaning or pleasantness) in comparison to others (e.g., orthographic properties) improves memory performance on a subsequent memory test of those list items. More recently, Nairne, Thompson, and Pandeirada (2007) found an intriguing effect that evaluating words for their survival merit (in a grasslands scenario) eventuated in superior recall and that survival merit was superior to other word attributes. Several replications of this pattern have also been observed (e.g., Nairne, Pandeirada, & Thompson, 2008). Surprisingly, however, given the apparent advantage of affective properties across a variety of memory tasks, tests of an encoding focus on either a word's positive or negative affective valence have not been performed.

Butler, Kang, and Roediger (2009) explained that the advantage accrued by words during an initial encoding is fostered by congruity of a word with the attended attribute. Simply put, a word in a list that merits a "yes," indicative that the target attribute is present, is better retrieved than a word that does not compel a positive response (Schulman, 1974). Thus, if during the orienting task participants tag an item as possessing the attribute, they are more likely to recall or recognize that word from the list even when they have no idea that recall or recognition of inspected words will later be required. Schulman postulated that congruous encodings are remembered better than incongruous because the former items entice a more elaborate and integrative encoding. Craik and Tulving suggested that the words that engender a "yes" response are more coherent. Butler et al. (2009) indicated that these understandings are widely accepted accounts of how congruency works. Additionally, such encoding allows for the reinstatement of a context that helps the retrieval process. Specifically, Hadley and MacKay (2006) demonstrated a memory improvement for emotional words, as compared with neutral, in a task that allowed emotional words to be emotionally bound to encoding context. Ramponi, Handelsman, and Barnard (2010) provided additional support to Hadley and MacKay's priority binding theory for explicit but not implicit tasks.

Presumably, then, encouraging attention toward affective valence ought to improve later retrieval by triggering a more elaborate encoding and instantiating an episodic context for emotional words at the time of retrieval in accord with priority binding. Less clear is whether encouraging a particular valence focus during encoding is more likely to improve retrieval of all affectively charged words that are congruent with the targeted valence. It could be argued that any valence assessment would benefit emotional words, regardless of the particular valence, simply because such an analysis requires a somewhat sophisticated assessment of words that are highly arousing, and they would all be bound by the initial episodic context, aiding retrieval. Alternatively, regardless of arousal level, only the words congruent with the targeted valence might enjoy sufficient processing to benefit retrieval, as posited by the congruity notion of Schulman (1974). Finally, the study affords an opportunity to assess whether possible congruency effects are equal for positive and negative words.

The mechanism underlying the congruency effect fits nicely with the notion of transfer-appropriate processing, whereby the processing that occurs during encoding is hypothesized to affect subsequent memory for the encoded stimuli (Roediger & McDermott, 1993). We know that perceptual and conceptual encoding manifest in different performance levels depending on the requirements of the task that later makes use of the earlier encoded material. However, this distinction between perceptual and conceptual encoding may be too broad to influence emotional memory (Watkins, Martin, & Stern, 2000). Watkins and colleagues presented negative and positive words under perceptual and conceptual encoding conditions and measured implicit memory via word stem completion, perceptual identification, free association, and word retrieval. They found little effect of encoding condition on implicit memory for emotional words. Perhaps more pertinent for emotional words is affective encoding: Given that memory for emotional words evokes affective information, this retrieval condition is best matched by an encoding condition that also entails affective evaluation.

In an early test of this hypothesis, Cacioppo, Petty, and Morris (1985) had participants judge whether each word in a list of emotional and neutral words was good. Unlike perceptual and conceptual encoding, this affective encoding increased free recall of emotional words, with better recall of positive words than negative words. However, the positive memory improvement also occurred in their perceptual and conceptual encoding conditions, so the impact of affective encoding was inconclusive. More recently, Ramponi and colleagues (2010) presented emotional and neutral word pairs and had participants judge which word in each pair was either longer (perceptual encoding) or more pleasant (affective encoding). In a subsequent test of intentional (explicit) memory, participants recalled more emotional words than neutral words, and they recalled more words after affective encoding than after perceptual encoding. A test of incidental memory, which was comparable to the implicit memory tests of Watkins et al., yielded no effect of either word emotionality or encoding condition.

In sum, the limited available evidence suggests that affective encoding may further improve explicit memory for emotional words relative to neutral words. However, prior studies (i.e., Cacioppo et al., 1985; Ramponi et al., 2010) did not contrast positive and negative encoding conditions, nor did they contrast memory for positive and negative words. For instance, Ramponi et al. included a positive encoding condition (i.e., which is more pleasant?) but not a negative encoding condition, and they did not differentiate positive targets from negative targets (i.e., they were grouped together as "emotional" words). So although these prior studies suggested that affective encoding may improve explicit memory, they did not reveal whether positive and negative encoding conditions both facilitate memory, nor did they specify whether such affective encoding improves memory for both positive and negative words. These issues are theoretically important for unconfounding the potential effects of arousal and valence on memory (Kensinger & Corkin, 2004; Lewis, Critchley, Rotshtein, & Dolan, 2007). That is, given that positive and negative affect are both more arousing than neutral affect, it remains unclear whether the memory improvement observed by Cacioppo et al. and Ramponi et al. is attributable to positive valence in particular or to high arousal more generally. If these effects were due to arousal, then positive encoding should improve memory for both positive words and negative words, because both are highly arousing. Alternatively, if the effects are valence-specific, then positive encoding should improve memory only for positive words, and negative encoding should improve memory only for negative words.

We therefore examined whether affective encoding influences free recall and recognition of negative, neutral, and positive words. To directly manipulate participants' affective encoding, we instructed participants in one group to judge whether each word in a randomized list was negative (negative monitoring) and in another group whether each was positive (positive monitoring). Subsequently, we tested for explicit memory via both free recall and recognition. We predicted an affective congruence effect, whereby monitoring for a particular valence (positive vs. negative) would lead to better relative performance for words congruent with the monitoring. Such an effect would be compatible with findings of mood-congruent memory, whereby people are more likely to remember stimuli congruent with their moods (Blaney, 1986; Jermann, Van der Linden, Laurencon, & Schmitt, 2009; Mayer, McCormick, & Strong, 1995). Rather than manipulating mood, though, in the present study we directly controlled encoding.

We tested for an affective congruence effect in two experiments that differed in encoding tasks. In Experiment 1, participants simply monitored a list of affective and neutral words, indicating whether each was positive or negative (between participants). Because participants were not forewarned of subsequent free recall and delayed recognition memory tests, any effect observed on those memory measures would be attributable to incidental learning during encoding.

To further test for an affective congruence effect under more intentional learning conditions, Experiment 2 exactly replicated this procedure but added a task that required participants to monitor lists for repeated words, thereby encouraging more explicit memorization of each word. Would such an accompanying task, involving additional word monitoring, affect any potential encoding advantage associated with a specific focus on the affective nature of examined words? Presumably, monitoring for repetition would focus even more attention on each word regardless of whether it conformed to the particular valence judgment. This effort could thus mask any benefit derived from affective encoding associated with valence judgments. Alternatively, the extra resources applied to monitoring might improve overall performance but leave the relative impact of affective encoding unaffected. Thus, the latter manipulation provided a test of the robustness of affective encoding. In order to allow a direct comparison of performance across experiments, with and without monitoring, stimulus lists across the two experiments were matched. Thus, the set of repeated words used to engage participants in word monitoring in Experiment 2 were also included on the lists in Experiment 1, ensuring that overall list composition was identical in both experiments. To foreshadow our results, despite their different encoding tasks, both experiments yielded the same pattern of results.

EXPERIMENT 1

METHOD

Participants

Participants were Carleton College undergraduates at least 18 years of age, and they participated voluntarily. Forty undergraduates participated in each experiment, and none participated in both experiments.

Stimuli

Stimuli that appeared at encoding and judgment included 30 probe words (10 negative, 10 neutral, 10 positive) that also appeared on a subsequent recognition test and 18 filler words that appeared only at encoding. Of these 18 filler words, there were 4 words of each valence (12 words) that appeared twice each, yielding 24 additional words for the list. These filler words were matched using the same criteria as probe words. Finally, 6 additional neutral filler words that appeared only once each filled out the encoding and judgment list, yielding a list of 60 words. In addition, 30 foil words (10 of each valence), which did not appear on the encoding and judgment list, were distributed randomly throughout a subsequent recognition test list, along with the 30 probe words, also randomly distributed. All words were five letters in length, and all were sampled from the Affective Norms for English Words (Bradley & Lang, 1999), where valence and arousal respectively, are rated on a scale from 1 (*extremely negative; extremely calming*) to 9 (*extremely positive; extremely exciting*). Stimulus properties are summarized in Table 1.

A 3 (word set: probe, filler, foil) × 3 (word valence: negative, neutral, positive) MANOVA with valence ratings, arousal ratings, and word frequency (log transformed from the Usenet database; Lund & Burgess, 1996) yielded no main effect of word set and no interaction in any of the three measures (all $ps > .30$). Thus the probes, fillers, and foils were indistinguishable on these criteria. A significant main

TABLE 1. Lexical Properties of Stimulus Words, Experiments 1 and 2

		Lexical property					
		Valence		Arousal		Frequency	
Set	**Valence**	***M***	***SD***	***M***	***SD***	***M***	***SD***
Probes	Negative	2.40	0.56	5.52	0.75	8.36	1.50
	Neutral	4.80	0.28	4.42	1.03	8.86	0.92
	Positive	7.57	0.45	5.60	0.68	8.39	1.60
Fillers	Negative	2.46	0.50	5.62	1.40	9.25	0.99
	Neutral	5.05	0.25	4.57	0.81	8.84	1.50
	Positive	7.78	0.73	5.72	0.53	9.28	1.80
Foils	Negative	2.27	0.49	5.74	1.04	7.93	1.76
	Neutral	4.96	0.42	4.01	0.77	8.78	1.89
	Positive	7.47	0.53	5.44	0.75	9.72	1.46

Note. *Probes were presented at encoding and tested for free recall and recognition (*N *= 30). Fillers appeared at encoding but were not tested (*N *= 18). Foils were not presented at encoding but appeared as new items during the recognition test (*N *= 30). Valence and arousal ratings are from the Affective Norms for English Words (Bradley & Lang, 1999), where the valence scale ranged from 1 (*extremely negative*) to 9 (*extremely positive*) and the arousal scale ranged from 1 (*calming*) to 9 (*exciting*). Frequency is the number of occurrences (log transformed) in the Usenet database (see Lund & Burgess, 1996).*

effect of word valence occurred in valence ratings, $F(2, 69) = 652.14$, $p < .001$, and arousal ratings, $F(2, 69) = 18.68$, $p < .001$. We subsequently excluded the neutral words in a 3 (word set: probe, filler, foil) × 2 (word valence: negative, positive) MANOVA on valence and arousal ratings. As expected, word valence exerted a significant main effect on valence ratings, $F(1, 42) = 986.34$, $p < .001$, but not arousal ratings, $p = .88$. Thus, the neutral words were as frequent as but less arousing than the emotional words, and the negative words and positive words differed in valence but were matched on arousal and frequency.

Design

Both experiments had a 2 (affective orientation: negative monitoring, positive monitoring; between participant) × 3 (word valence: negative, neutral, positive; within participant) mixed design with free recall and recognition accuracy as dependent measures.

Procedure

ENCODING

Participants were randomly assigned to an affective orientation group ($n = 20$ in each group), and were tested in groups of 1 to 12 in a quiet classroom. General instructions were given orally to the entire group, and then depending on their assigned affective orientation, participants received written instructions to judge each word for negative affect (negative monitoring condition) or positive affect (positive monitoring condition). Participants were instructed to indicate each word that fit their assigned affective orientation by marking a numbered list on an assessment sheet in their response packet. Note that participants did not indicate the valence of each word. Rather, they provided a mark only for words of their designated affective orientation, abstaining for all other words.

The encoding list consisted of 60 trials: 30 probes (10 of each valence), 12 fillers (4 of each valence) that were presented twice each, and 6 neutral fillers that appeared once each. The 60 encoding trials appeared in one of two random intermixed orders, with no more than three items of the same valence appearing consecutively. Each word was projected individually onto a large screen for 1,000 ms, followed by a 500-ms interstimulus interval. Thus, each word was exposed for an equal period of time, ensuring equal opportunity for judging each word's valence. As each word was presented, participants evaluated and indicated whether it fit their assigned affective orientation. Participants were not informed that any memory task would follow.

FREE RECALL

Immediately after completion of the encoding task, participants were given 3 min to write as many of the presented words as they could recall onto a blank sheet of paper. The 3-min recall period was determined in pilot testing to be the point at which most participants ceased to recall additional words.

RECOGNITION

After recall, participants performed a distractor task consisting of long multiplication problems for 2 min. Finally, participants completed an old–new recognition test with 60 words: 30 probe words (10 of each valence) and 30 foil words (10 of each valence). As in the encoding list, the 60 recognition trials appeared in one of two random intermixed orders, with no more than three items of the same valence appearing consecutively. Participants were instructed to indicate for each word whether it had appeared on the earlier (encoding) list by marking a numbered list in the response packet.

EXPERIMENT 2

Experiment 2 was nearly identical to Experiment 1. Recall that the encoding list included 12 filler words that appeared twice each. In addition to indicating each word that fit their assigned affective orientation, during encoding in Experiment 2 participants were instructed to also indicate each word that had appeared previously in the list. Participants indicated a word repetition by providing an additional mark on a numbered list that was adjacent to the affective response list. Note that these filler words did not appear in the recognition test. To allow participants to complete both the valence and repetition monitoring tasks, the interstimulus interval was extended to 1,750 ms.

RESULTS

Outlying participants, whose mean recall or recognition score was more than 2.5 standard deviations below the group mean, were excluded from all analyses. Two participants from Experiment 1 (one participant from each orientation group) and two participants from Experiment 2 (both from the negative orientation group) were eliminated. We will report performance on the valence monitoring and repetition monitoring tasks before reporting results of the recall and recognition scores.

Valence Monitoring

To assess performance on the valence monitoring task, we analyzed the raw number (out of 10) of probe words in each word valence condition that were judged consistent with a participant's designated valence. A 2 (affective orientation: negative, positive) × 3 (word valence: negative, neutral, positive) mixed ANOVA yielded a main effect of word valence, $F(2, 76) = 28.72$, $p < .001$, such that neutral probes were rarely identified as either positive or negative ($M = 1.25$). However, when neutral words were incorrectly categorized, they favored a negative (84 times) over a positive (15 times) assignment. In contrast, positive probes were frequently identified as positive ($M = 7.90$) and rarely identified as negative ($M = 0.30$), whereas negative probes were frequently identified as negative ($M = 8.40$) and rarely identified as positive ($M = 0.55$), thus producing an interaction of orientation and valence, $F(2, 76) = 141.79$, $p < .001$. A more circumspect analysis including only the positive and negative probes also yielded a significant interaction, $F(1, 38) = 154.43$, $p < .001$, with no main effects. Thus, participants in both affective orientation conditions successfully monitored their designated valence.

Repetition Monitoring

To assess performance on the repetition monitoring task, we analyzed the raw number (out of 12) of filler words that were correctly judged to be repeated (false alarms were negligible). Participants in the negative monitoring and positive monitoring conditions were equally and highly likely to correctly identify repeated words (overall $M = 11.3$, $SE = 0.24$, $p > .50$). Thus, participants in both affective orientation conditions successfully monitored the word repetitions.

Comparison of Experiments

We examined whether the repetition monitoring task, which was absent in Experiment 1 and present in Experiment 2, affected recall or recognition. A 2 (experiment: 1, 2) × 2 (affective orientation: negative, positive) × 3 (word valence: negative, neutral, positive) mixed MANOVA revealed significant main effects of experiment on both recall, $F(1, 72) = 16.86$, $p < .001$, and recognition, $F(1, 72) = 6.08$, $p < .05$. Unsurprisingly, the repetition monitoring task of Experiment 2 improved both overall recall scores ($M = 2.37$, Experiment 1 vs. $M = 3.17$, Experiment 2) and overall recognition scores ($M = 6.59$, Experiment 1 vs. $M = 7.52$, Experiment 2). More importantly, the experiment factor did not interact significantly with any other factors. This lack of interaction indicates that the inclusion of the repetition monitoring task in Experiment 2 did not fundamentally alter the pattern of results obtained in Experiment 1. For simplicity of exposition, subsequent analyses pool across experiments.

Recall

Mean recall scores (out of 10), collapsed across Experiments 1 and 2, appear in Figure 1a. Two main results are apparent. First, the affective congruence effect that we predicted was indeed observed (i.e., negative words were more likely to be recalled after negative monitoring, whereas positive words benefited after positive monitoring). Second, neutral words were more likely to be recalled after negative monitoring than positive monitoring.

We first submitted the recall scores to a 2 (orientation: negative, positive) × 3 (word valence: negative, neutral, positive) mixed ANOVA, which confirmed a significant interaction, $F(2, 148) = 12.58$, $p < .001$. This critical interaction was significant separately in both Experiment 1, $F(2, 72) = 9.54$, $p < .001$, and Experiment 2, $F(2, 72) = 4.62$, $p < .05$. We then tested more directly for the affective congruence effect by excluding the neutral words in a 2 (orientation: negative, positive) × 2 (word valence: negative, positive) mixed ANOVA. The interaction was again significant, $F(1, 74) = 16.08$, $p < .001$, thus indicating that participants' orientation during encoding affected subsequent recall. Specifically, recall of negative words was higher after negative monitoring than positive monitoring, $t(74) = 3.15$, $p < .01$, whereas recall of positive words was higher after positive monitoring than negative monitoring, $t(74) = 2.92$, $p < .01$. The main effect of word valence was also significant, $F(1, 74) = 7.96$, $p < .01$, with overall higher recall of negative words than positive words. The main effect of orientation did not approach significance ($p = .73$). However, neutral words were more likely to be recalled under negative orientation than under positive orientation, $t(74) = 3.12$, $p < .01$.

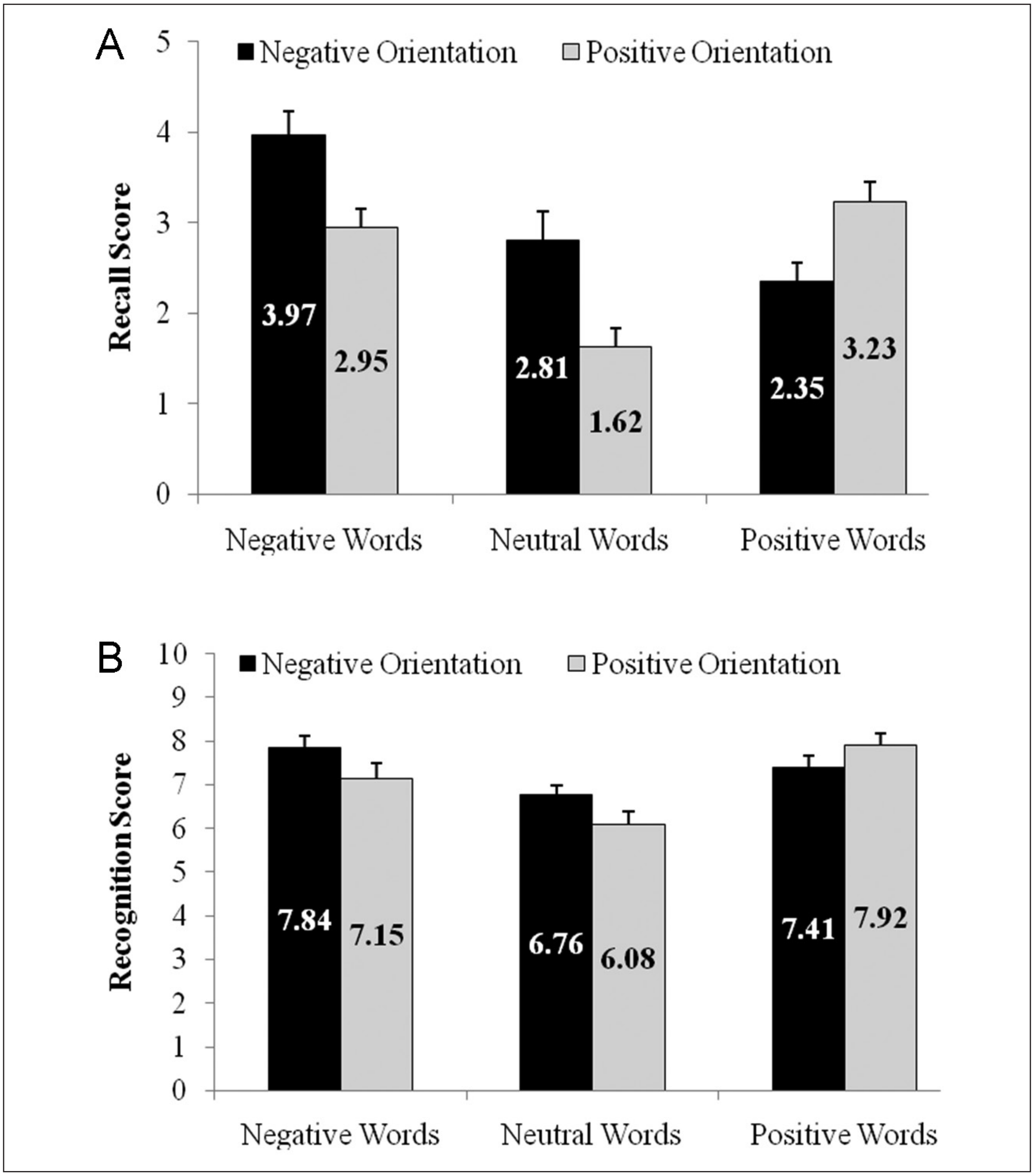

FIGURE 1. (a) Recall and (b) recognition of probe words (*M* + *SE*) as a function of affective orientation and word valence, pooled across Experiments 1 and 2

In addition to the probe words analyzed earlier, both experiments also included 12 filler words that were matched with the probe words for arousal, valence, and frequency (see Table 1). These fillers appeared twice each during the encoding phase, in order to provide an opportunity for participants to monitor repeated words in Experiment 2. Given that these fillers were repeated, it was inappropriate to include them in our primary analysis, which focused on the probe words. Nevertheless, given their similarity of selection to the probe words, a separate analysis appeared potentially useful. In fact, results from the filler item analyses paralleled that of probe item analyses. An initial analysis that included neutral fillers, across both experiments, revealed an effect of valence, $F(2, 152) = 19.53$, $p < .01$, and more importantly an interaction of valence with orientation, $F(2, 152) = 9.99$, $p < .01$. The focus of the next analysis was narrowed to just positive and negative filler words in order to provide a direct test of affective congruence between the fillers. Thus a 2 (orientation: negative, positive) × 2 (valence: negative, positive) mixed-factor ANOVA was performed combining data across experiments. The only significant pattern was the interaction of orientation and valence, $F(1, 76) = 12.96$, $p < .01$. With a negative orientation, the mean recall for negative foils was 2.13, whereas positive foils yielded a mean of 1.35. In contrast, for positive oriented participants a mean of 1.60 negative fillers were recalled, compared with 1.98 positive fillers (in all cases performance is out of a possible 4 fillers that could be recalled). Thus, despite fillers appearing twice each, congruency between encoding orientation and word valence still influenced performance (i.e., repetition did not obscure the affective congruency effect).

Recognition

False alarm scores (out of 10) were analyzed via a 2 (orientation) × 3 (word valence) mixed ANOVA, which revealed a main effect of word valence, $F(2, 148) = 19.60$, $p < .001$. Positive foils, $M = 0.68$, $SE = 0.10$, were less likely to be falsely recognized than neutral foils, $M = 1.60$, $SE = 0.13$, $t(75) = 6.02$, $p < .001$, and negative foils, $M = 1.37$, $SE = 0.14$, $t(75) = 4.75$, $p < .001$, which did not differ from one another ($p = .15$). Neither the main effect of orientation ($p = .23$) nor its interaction with word valence ($p = .52$) approached significance.

Mean recognition scores (i.e., hits – false alarms; maximum = 10), collapsed across Experiments 1 and 2, are illustrated in Figure 1b. Although the effect was less pronounced than in the recall scores (Figure 1a), the recognition scores (Figure 1b) also exhibited an affective congruence effect. An initial 2 (orientation: negative, positive) × 3 (word valence: negative, neutral, positive) mixed ANOVA confirmed a significant interaction, $F(2, 148) = 5.16$, $p < .01$. This critical interaction was significant separately in both Experiment 1, $F(2, 72) = 4.50$, $p < .05$, and Experiment 2, $F(2, 72) = 3.20$, $p < .05$. A subsequent 2 (orientation: negative, positive) × 2 (word valence: negative, positive) mixed ANOVA again revealed the congruence effect as another significant interaction, $F(1, 74) = 7.35$, $p < .01$. Participants recognized negative words more accurately after negative monitoring and positive words more accurately after positive monitoring. However, these simple effects were nonsignificant (both ps > .10). Unlike the recall scores, the recognition scores exhibited no effect of word valence, $p = .45$. Nor did orientation exhibit a significant effect on either the recognition of negative and positive words ($p = .81$) or the recognition of neutral words ($p = .09$).

DISCUSSION

By manipulating affective orientation (i.e., negative monitoring and positive monitoring) and measuring explicit memory (i.e., free recall and recognition), the present study provided a direct test of how affective encoding influences memory for emotional words. Across two experiments, participants evaluated each word for a targeted affective valence. Regardless of whether they simply assessed valence or additionally had to keep track of a word's earlier appearance in the list, participants' affective orientation during encoding influenced both their recall and recognition of emotional words. Specifically, negative words were more likely to be recalled and recognized after negative monitoring, whereas positive words were more likely to be recalled and recognized after positive monitoring. This affective congruence effect is the first demonstration of its kind. Unlike prior studies that contrasted perceptual and conceptual encoding (e.g., Watkins et al., 2000), this study used affective encoding to present positive evidence that encoding conditions indeed affect memory for emotional words. Furthermore, informing earlier inquiries of affective encoding (e.g., Cacioppo et al., 1985; Ramponi et al., 2010), this study yielded three new observations. First, whereas the prior studies demonstrated only that positive encoding influences memory, the present study additionally revealed that negative encoding also influences memory. Second, whereas the prior studies did not differentiate between positive and negative target words, the present study additionally indicated that affective encoding improves memory for both positive and negative words. Finally, and most importantly, the present study determined that memory for emotional words is contingent on the valence one monitors during encoding. This is the first study to demonstrate such an affective congruence effect. Moreover, the influence of affective encoding apparently was strong enough to register with words that repeat in a list, where repetition could conceivably overcome any advantage gained by such encoding. That is, the affective congruence effect persisted despite the monitoring of all words for repetition, where there also was the potential to mask the impact of affective focus.

The affective congruence effect supports a more general congruity theory of memory (Butler et al., 2009; Schulman, 1974). In this theory, memory is better for words that are in some way congruent with the encoding task. In the present experiments, negative monitoring elicits an affirmative encoding of negative words, and hence it specifically improves memory for those negative words. Under such negative monitoring, positive and neutral words do not elicit affirmative encoding and are therefore less likely to be recalled. Likewise, positive monitoring induces affirmative encoding and better memory specifically for positive words (and not for negative or neutral words). This effect is also broadly consistent with priority binding theory (Hadley & MacKay, 2006), which hypothesizes that emotional words are better remembered because their binding with the episodic context (i.e., the experimental setting) is prioritized over that of neutral words. Thus, in a mixed list of emotional and neutral words like that of the present study, contextual memory is better for emotional words than for neutral words. Although this theory does not naturally predict the valence specificity observed in the present experiments, it could potentially account for this effect by positing that the instructions to encode for either negative or positive words prioritize the words of that given valence over other words. That is, negative monitoring would simply prioritize contextual memory for negative words above positive words, and vice versa under positive monitoring.

The affective congruence effect was more pronounced in recall than in recognition. In fact, the interaction of affective orientation and word valence explained 18% of the variance in recall scores but only 9% of the variance in recognition scores (partial η^2). This differential effect size manifested as an interesting result that was observed in recall but not in recognition: Neutral words were more likely to be recalled after negative monitoring than after positive monitoring. This suggests that negative monitoring might facilitate memory not only for negative words but also for neutral words. Perhaps the latter result reflects the tendency to regard neutral words more negatively when miscast by encoders. Because affective orientation exerted only a marginal effect on the recognition of neutral words, however, this observation is more suggestive than conclusive. Overall, the pattern suggests that emotional words do not equally benefit from any type of affective assessment during encoding an episode, but rather benefit accrues only for items congruent with the targeted emotional valence.

Finally, as evident in Figure 1, both recall and recognition were better for emotional words than for neutral words. The general memory improvement for emotional stimuli is probably attributable to multiple factors, such as greater attentional engagement (Calvo & Lang, 2004), perceptual sensitivity (Zeelenberg et al., 2006), or neural consolidation (LaBar & Cabeza, 2006) of emotional stimuli. All possibilities are mediating what Schulman (1974) characterized as a more elaborated encoding for items congruent with a targeted encoding attribute. It is clear that affective discrimination between words engenders further analysis only for words seemingly fitting the target valence, and processing of words that do not match said valence is curtailed early on. Much like depth of meaning or survival value, affective valence is a salient quality that parses words easily during encoding and manifests in better retrieval for words congruent with the parsing value. The present study does not discriminate between these more proximal explanations, but it does clearly demonstrate that assessment of a word's affective valence enhances memory for words consonant with the affect under evaluation.

NOTES

Address correspondence about this article to Seth Greenberg, Department of Psychology, Olin Hall, Carleton College, Northfield, MN 55057 (e-mail: is sgreenbe@carleton.edu).

REFERENCES

Blaney, P. H. (1986). Affect and memory: A review. *Psychological Bulletin, 99,* 229–246.

Bradley, M. M., & Lang, P. J. (1999). *Affective Norms for English Words (ANEW): Instruction manual and affective*

ratings. Technical report C-1. Gainesville: The Center for Research in Psychophysiology, University of Florida.
Buchanan, T. W. (2007). Retrieval of emotional memories. *Psychological Bulletin, 133,* 761–779.
Butler, A. C., Kang, S. H. K., & Roediger, H. L. (2009). Congruity effects between materials and processing tasks in the survival processing paradigm. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 35,* 1477–1486.
Butler, T. W. (2007). Retrieval of emotional memories. *Psychology Bulletin, 133,* 761–779.
Cacioppo, J. T., Petty, R. E., & Morris, K. J. (1985). Semantic, evaluative, and self-referent processing: Memory, cognitive effort, and somatovisceral activity. *Psychophysiology, 22,* 371–384.
Calvo, M. G., & Lang, P. J. (2004). Gaze patterns when looking at emotional pictures: Motivationally biased attention. *Motivation and Emotion, 28,* 221–243.
Craik, F. I. M., & Tulving, E. (1975). Depth of processing and the retention of words in episodic memory. *Journal of Experimental Psychology: General, 104,* 268–294.
Estes, Z., & Adelman, J. S. (2008). Automatic vigilance for negative words in lexical decision and naming: Comment on Larsen, Mercer, and Balota (2006). *Emotion, 8,* 441–444.
Estes, Z., & Verges, M. (2008). Freeze or flee? Negative stimuli elicit selective responding. *Cognition, 108,* 557–565.
Hadley, C. B., & MacKay, D. G. (2006). Does emotion help or hinder immediate memory? Arousal versus priority-binding mechanisms. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 32,* 79–88.
Hertel, P. T., & Parks, C. (2002). Emotional episodes facilitate word recall. *Cognition & Emotion, 16,* 685–694.
Jermann, F., Van der Linden, M., Laurencon, M., & Schmitt, B. (2009). Recollective experience during recognition of emotional words in clinical depression. *Journal of Psychopathology and Behavioral Assessment, 31,* 27–35.
Kensinger, E. A., & Corkin, S. (2003). Memory enhancement for emotional words: Are emotional words more vividly remembered than neutral words? *Memory & Cognition, 31,* 1169–1180.
Kensinger, E. A., & Corkin, S. (2004). Two routes to emotional memory: Distinct neural processes for valence and arousal. *Proceedings of the National Academy of Sciences, 101,* 3310–3315.
Kousta, S.-T., Vinson, D. P., & Vigliocco, G. (2009). Emotion words, regardless of polarity, have a processing advantage over neutral words. *Cognition, 112,* 473–481.
LaBar, K. S., & Cabeza, R. (2006). Cognitive neuroscience of emotional memory. *Nature, 7,* 54–64.
Lewis, P. A., Critchley, H. D., Rotshtein, P., & Dolan, R. J. (2007). Neural correlates of processing valence and arousal in affective words. *Cerebral Cortex, 17,* 742–748.
Lund, K., & Burgess, C. (1996). Producing high-dimensional semantic spaces from lexical co-occurrence. *Behavior Research Methods, Instruments, & Computers, 28,* 203–208.
Magnusson, S., Andersson, J., Cornoldi, C., Da Beni, R., Endestad, T., Goodman, G. S., . . . Zimmer, H. (2006). What people believe about memory. *Memory, 14,* 595–613.
Mayer, J. D., McCormick, L. J., & Strong, S. E. (1995). Mood-congruent memory and natural mood: New evidence. *Personality and Social Psychology Bulletin, 21,* 736–746.
Murphy, N. A., & Isaacowitz, D. M. (2008). Preferences for emotional information in older and younger adults: A meta-analysis of memory and attention tasks. *Psychology and Aging, 23,* 263–286.
Nairne, J. S., Pandeirada, J. N. S., & Thompson, S. R. (2008). Adaptive memory: The comparative value of survival processing. *Psychological Science, 19,* 176–180.
Nairne, J. S., Thompson, S. R., & Pandeirada, J. N. S. (2007). Adaptive memory: Survival processing enhances retention. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 33,* 263–273.
Ramponi, C., Handelsman, G., & Barnard, P. J. (2010). The memory enhancement effect of emotion is absent in conceptual implicit memory. *Emotion, 10,* 294–299.
Roediger, H. L. III, & McDermott, K. B. (1993). Implicit memory in normal human subjects. In F. Boller & J. Grafman (Eds.), *Handbook of neuropsychology* (pp. 63–131). Amsterdam, the Netherlands: Elsevier.
Rubin, D. C., & Friendly, M. (1986). Predicting which words get recalled: Measures of free recall, availability, goodness, emotionality, and pronounceability for 925 nouns. *Memory & Cognition, 14,* 79–94.
Schulman, A. I. (1974). Memory for words recently classified. *Memory & Cognition, 2,* 47–52.
Watkins, P. C., Martin, C. K., & Stern, L. D. (2000). Unconscious memory bias in depression: Perceptual and conceptual processes. *Journal of Abnormal Psychology, 109,* 282–289.
Zeelenberg, R., Wagenmakers, E.-J., & Rotteveel, M. (2006). The impact of emotion on perception: Bias or enhanced processing? *Psychological Science, 17,* 287–291.
Zimmerman, C. A., & Kelly, C. M. (2010). "I'll remember this!" Effects of emotionality on memory predictions versus memory performance. *Journal of Memory and Language, 62,* 240–253.