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Affective Misattribution Following Memory Decisions does not Transfer to Interleaved Items

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by

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Dedicated to my parents and grandparents.

ABSTRACT

Affective Misattribution Following Memory Decisions does not Transfer to Interleaved Items

by

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The outcomes of memory search appear to have affective consequences. For instance, during recognition memory tests, concluding that a retrieval probe is from a prior study period (‘old’) leads to higher pleasantness ratings for the probe than concluding it is novel (‘new”). Grybinas, Kantner, and Dobbins (2019) explained this and related findings via a Confirmation of Search (COS) hypothesis that assumes that the affective consequences of successful versus failed episodic retrieval are misattributed to probes used to elicit memory search. While these affective misattributions clearly occur for the memory probes themselves (within-item misattribution), social psychological research has previously shown that affective misattributions can spread across items appearing close together in time (across-item misattribution). To investigate the scope of misattribution of search-related affective responses we interleaved recognition judgments (‘old’ vs ‘new’) and pleasantness ratings of items that were not judged for recognition, predicting that prior recognition conclusions would influence subsequent pleasantness ratings. Despite each experiment increasing the likelihood the affective response could transfer, all three showed no effect of recognition judgments on subsequent pleasantness

ratings suggesting that the affective response to memory conclusions is specific to the items that are the focus of search operations.

Chapter 1: Thesis Body

Affective Misattribution Following Memory Decisions does not Transfer to Interleaved Items

Outcomes of memory retrieval attempts influence affective judgments of memoranda. One hypothesis, referred to as the perceptual-fluency misattribution (PFM) account, is that implicit and explicit retrieval play somewhat opposing roles in eliciting positive affective responses (Bornstein & D'Agostino, 1989). Under the PFM account, item fluency, when unaccompanied by recall of the source of that fluency, is misinterpreted by the observer as positive affect. However, if explicit retrieval occurs, such that the observer realizes the item was previously encountered, then the perceived fluency of the probe is correctly ascribed to prior study and not misinterpreted as positive affect. In a series of four experiments, Grybinas, Kantner, and Dobbins (2019) contrasted the PFM with a Confirmation of Search (COS) hypothesis, which instead assumes that affective responses result from confirmation or disconfirmation of explicit retrieval searches. Under the COS model, subjects are assumed to use a directed memory search in an attempt to confirm a model of prior experiences (also known as retrieval descriptions; Norman & Bobrow, 1979). Critically, whether someone confirms or disconfirms this search has consequences for affective exp erience. In particular, recovering memory evidence matched to a retrieval description results in a small increase in positive affect, whereas failing to retrieve matching evidence results in a small drop in positive affect. Because recognition judgments require subjects to match test probes to the retrieval of a particular context (viz., the prior study session), an 'old' recognition response reflects a confirmation, whereas a 'new' response would be a disconfirmation. In addition to the effects of confirmation/disconfirmation, the accuracy of the search, also moderates the affective response, presumably because the decision processes that lead to accurate and inaccurate memory responding differ in degree of required effort. Indeed, in the context of impoverished recognition conditions (i.e., chance performance), Lee (2001) showed that affective ratings of previously exposed items increased when subjects had higher confidence in their memory decisions.

Overall, the findings of Grybinas, Kantner, and Dobbins (2019) favored the COS model for several reasons. For example, Experiments 1 and 2 of that report examined verbal item recognition accompanied by ratings of probe pleasantness either before or after each recognition judgment[1]. In both experiments, hits (correct 'old' decisions) yielded the most positive pleasantness ratings. This outcome is incompatible with the PFM assumption that observers discount fluency when episodic retrieval occurs. Instead, the fluency misattribution account suggests that misses (old items incorrectly classified as 'new') should be accompanied by fairly fluent processing that is not detected by observers, and thus be rated as more pleasant than hits, for which the origin of fluency was correctly detected. Nonetheless, misses were rated the least pleasant among all outcomes and reliably less pleasant than hits. As important however, these experiments demonstrated that items that were correctly judged 'new' (correct rejections) were judged less pleasant than baseline norms for the same materials. During both baseline norming and correct rejections during recognition, observers are evaluating the pleasantness of the materials for the first time within the experiment (i.e., they are both new items). Yet, when the evaluation was accompanied by a correct 'new' conclusion the rated pleasantness of words dropped below baseline, consistent with the COS prediction that disconfirmation of a candidate retrieval description yields a negative affective response. Thus, the COS model was able to explain both increases and decreases in rated pleasantness, relative to baseline norms, using the same mechanism.

To further test the model Grybinas, Kantner, and Dobbins (2019) considered source memory in Experiment 3. The important aspect of this design is that items from the two candidate sources (earlier pronounceability versus concrete/abstract ratings tasks) were both studied and hence presumably matched for fluency. Thus, under these conditions, any differences in rated pleasantness of the source probes would have to be attributed to the outcomes of memory search. Consistent with the COS model, confirming that an item originated from a queried source (e.g., pronounceability?) increased pleasantness of the probe (relative to baseline), while disconfirmation led to decreases in pleasantness. Replicating Experiment 1 and 2, whether or not subjects were correct in their source assessment also affected rated pleasantness, with correct memory judgments yielding higher rated probe pleasantness than incorrect judgments. Finally, when testing the COS model under cued-recall of A-B word pairs (Experiment 4), pleasantness ratings of the A-cue increased, if the cue led to successful recall of the B-associate (confirmation), however, if recall failed (disconfirmation), the A-cue decreased in rated pleasantness. Table 1 summarizes the effect sizes seen in Grybinas, Kantner, and Dobbins (2019) for the contrasts of confirmatory versus disconfirmatory memory conclusions, and correct versus incorrect memory conclusions. The former are clearly the more robust phenomenon, leading to large effects sizes in all four experiments.

Table 1

P-values and effect size statistics (partial eta squared and Cohen's d) for main effects of Response (confirmation v. disconfirmation) and Accuracy across four experiments. For Experiments 1 & 2 factors of Response were 'Old" v. 'New' to recognition items; Experiment 3 were 'Yes' v 'No' to source memory queries; Experiment 4 were Successful Recall v. No-recall in the context of paired-associate cued-recall.

Experiments 1 – 4	*Response* (Confirm v. Disconfirm)	*Accuracy* (Correct v. Incorrect)
1. Recognition memory (n = 26)	$p < .001$, $\eta_p^2 = .58$	$p = .16$, $\eta_p^2 = .07$
2. Motivated recognition (n = 152)	$p < .001$, $\eta_p^2 = .31$	$p < .001$, $\eta_p^2 = .11$
3. Source memory (n = 34)	$p < .001$, $\eta_p^2 = .43$	$p = .02$, $\eta_p^2 = .15$
4. Cued-recall (n = 35)	$p < .001$, $d = 1.19$	N/A

Importantly, researchers have heretofore focused on the affective ratings for items judged concurrently for memory (within-item misattribution). Because the items being judged for affect in the cited studies are themselves memoranda, it remains unclear whether the affect generated by the outcomes of memory search could generalize to items not tested for memory (across-item misattribution). To answer this question we adopted design elements from a social cognition paradigm - the affective misattribution procedure (AMP; Payne et al., 2005; Payne & Lundberg, 2014) – which indexes the projective transfer of affective responses. In a hypothetical AMP trial, a subject would be asked to judge some non-valanced stimulus (e.g., shapes) for pleasantness after being shown an emotionally positive prime (e.g., puppy) or negative prime (e.g., snake). The idea being that the positive affect generated from the puppy image would be misattributed to the shape and thus subjects would unwittingly endorse the shape with more positive affect. Snakes, in contrast, would lead to a misattribution that decreased the pleasantness assigned to the shape. Following the logic of the AMP, if the affect elicited by memory conclusions is indeed an "unattributed affect (Russel, 2003)" and thus "available to be attributed or misattributed to various sources (Payne et al., 2005 p. 278)", like the affect elicited from the primes, then we should see across-item misattributions (the present experiments) in the same direction observed when the observer rates the recognition memoranda for pleasantness (i.e., Table 1). If the COS effects are instead constrained to the stimulus that is the focus of memory search operations, then no across-item misattribution should be found.

In the current study I directly test whether the affective responses resulting from the outcomes of memory searches transfer to neighboring stimuli in the same manner as the automatically triggered, implicit, socio-emotive responses considered in the AMP paradigm. Rather than using valanced primes (e.g., puppy), this was accomplished by having subjects judge items for recognition and then rate interleaved non-memory items for pleasantness. To preview, the same memory search outcomes that yielded large effects on within-item pleasantness in Table 1, did not alter the rated pleasantness of non-retrieval probes that immediately followed, or were presented adjacent to, the memoranda (across-items). My findings suggest that affective response misattribution is confined to the probes used to initiate memory search and in the General Discussion I suggest several reasons this might be the case.

Experiment 1

The purpose of Experiment 1 was to establish if the affective response elicited from recognition memory conclusions are misattributed to the ratings of interleaved stimuli not tested for memory. If the affective misattribution transfers across-items, 'old' judgments will increase the rated pleasantness of interleaved items, while preceding ‘new’ judgments will decrease rated pleasantness (relative to normed ratings). The accuracy of the preceding recognition conclusions may also demonstrate an effect with errors decreasing rated pleasantness relative to correct recognition decisions. If the affective misattribution is constrained within-items, no effects of recognition responding on subsequent ratings will occur.

Method

Participants. Forty-three Washington University in St. Louis undergraduates participated in exchange for course credit. Informed consent was obtained in compliance with the Institutional Review Board of Washington University in St. Louis. Testing occurred in groups of one to four people using computer carousels.

Experiment 1 of Grybinas, Kantner, and Dobbins (2019) found confirmation/disconfirmation and accuracy based effects on pleasantness ratings using a sample of 26 participants in a similar repeated-measures design. Thus the design should be sufficiently powered.

Materials. Stimuli were randomly selected from a pool of 1,216 common nouns (e.g., fox) drawn from the MRC Psycholinguistic Database (Wilson, 1988) with an average of 7.09 letters, 2.34 syllables, and Kučera-Francis frequency of 8.85. All words were presented serially via Cambria 18pt font on a black background administered via computers running PsychoPy software (Peirce, 2007). For each participant, a subset of 150 words was randomly selected for normative rating. This subset was held out during the experiment proper, leaving 1066 words from which to randomly sample for the subsequent study-test cycles of each participant.

Design and Procedure. Subjects began by rating 150 randomly selected words for pleasantness. These were different words than those used for their subsequent recognition/MEE experiment, allowing us to establish the baseline rated pleasantness for each word outside the context of a recognition demand and add to the pleasantness norms there were initiated in Grybinas, Kantner, and Dobbins (2019). For all three subsequent study-test cycles, subjects studied 50 words and were tested on 100, yielding 300 tested stimuli overall (150 studied and 150 novel).

For the initial norming phase, participants rated serially presented words for pleasantness via a six-point scale (1 = very unpleasant, 2 = unpleasant, 3 = mildly unpleasant, 4 = mildly pleasant, 5 = pleasant, 6 = very pleasant) in a self-paced manner. After completion, the first study-test recognition phase began. Subjects were informed that the upcoming words would be tested for memory. For the study phases, participants reported the number of syllables for each study item using a (1, 2, 3, 4+) prompt. Syllable counting was chosen to promote an intermediate level of subsequent recognition performance. Following study, subjects were informed their memory would be tested for randomly intermixed studied and non-studied words, during which they should press the 'A' key if they believed the item was 'studied' and the 'L' key if they believed it 'non-studied'. They were also informed that immediately following each recognition judgment a "pleasantness?" prompt would appear with a different word that they should rate the on a visible six-point scale (same used above). Key assignments were chosen so that there was no natural mapping between memory classification and pleasantness keys. Recognition and pleasantness judgments were all self-paced.

Results and Discussion

Basic Recognition Performance. Subjects displayed moderate recognition performance responding correctly 70% of the time. A one-sample t-test on proportion 'old" response (40%) indicated a slightly conservative decision bias ($t(1, 42) = 7.02$, $p < .001$).

Baseline Pleasantness Ratings. Baseline rated pleasantness (3.52) was calculated from a master-file containing normed pleasantness ratings for each of the 1,216 words across a series of four experiments (Experiments 1-3 in Grybinas, Kantner, and Dobbins, 2019 and Experiment 1a from the present study).

Pleasantness Ratings and Preceding Recognition. Examining the effect of recognition outcomes on subsequent pleasantness ratings, we conducted a within-subjects 2x2 ANOVA with factors of Response ('Old" v. 'New') and Accuracy (Correct v. Incorrect). A main effect of Accuracy was found ($F(1, 42) = 5.86$, $\eta_p^2 = .12$, $p = .019$), but neither Response ($F(1, 42) = 1.09$, $p = .302$) nor the interaction between the two ($F(1, 42) = 4.58$, $p = .832$) reached significance. Partially consistent with COS model, it seems that the effort allocated to the memory decisions may yield an affective response that transfers across items (see *Figure 1)*. Inconsistent with the model, however, whether or not subjects confirmed ('old') or disconfirmed ('new') their search did not yield an effect on the subsequent pleasantness rating. This is surprising because it is clear in the prior data that the confirmatory/disconfirmatory effect is much larger than the accuracy effect in terms of the ratings of the eliciting memory probes. Thus, one might have anticipated this much larger effect would transfer to non-memory probes with the accuracy effect instead failing to transfer because of its modest effect size. Indeed, the failure of the a priori large effect to transfer, combined with the success of the more modest effect, provides an initial suggestion that effects of confirmation/disconfirmation and accuracy may not result from the same underlying mechanism.

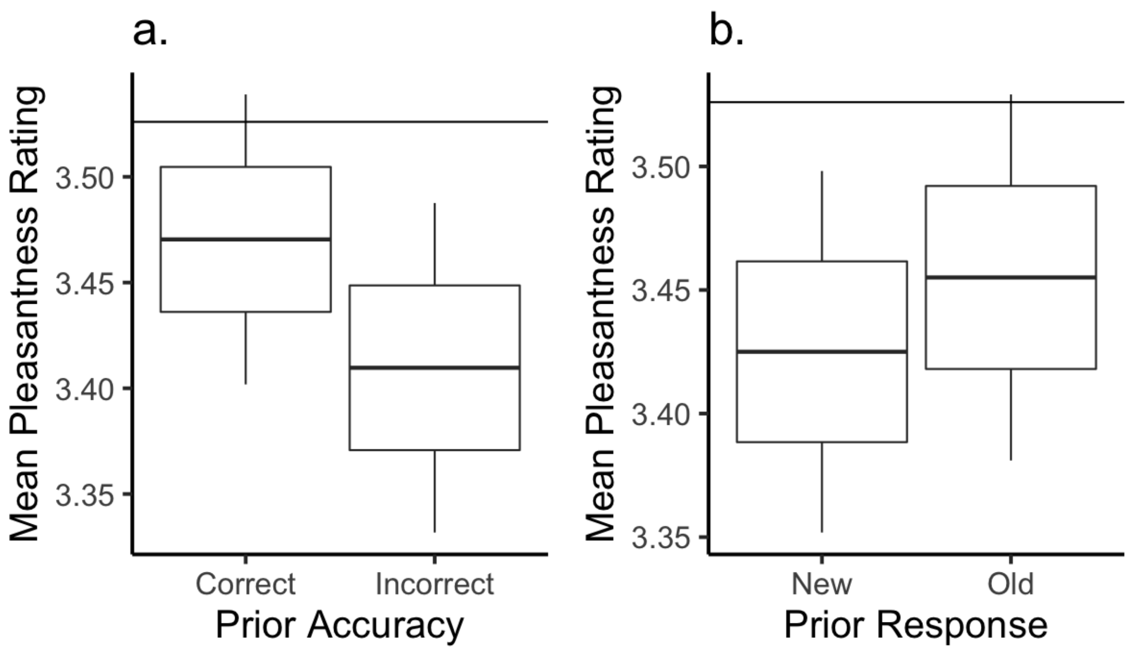

Figure 1. Modified boxplot showing influence of the prior accuracy (A) and prior response (B) of previous recognition judgments on mean pleasantness of subsequent ratings. Thick lines indicate means. Box is +/- 1 SEM whereas Box + Whisker is 2 SEMs. Horizontal line reflects the mean pleasantness rating observed during baseline norming of the materials (3.52).

Despite predicting that prior 'old' responses would increase pleasantness and prior 'new' responses would decrease pleasantness relative to baseline, *Figure 1* suggests a general devaluation of pleasantness ratings at test such that no outcome elicited subsequent ratings exceeding baseline. Indeed, when considered as a whole, the ratings were numerically below baseline ($t(1,42) = -1.40$, $p = .168$) although not reliably so. One tentative possibility was that this pattern may have occurred because all of the words rated for pleasantness were novel in the context of the recognition test. Specifically, because these novel stimuli may have been perceived as 'new', and thus reflect disconfirmations under the COS model, their overall pleasantness ratings may have fallen below baseline. From this perspective, the failure to find a confirmatory/disconfirmatory effect may have resulted because the interleaving procedure induced the participants to automatically evaluate the recognition status of all the materials, even those that did not require such judgments. To the extent that recognition requires the establishment of a retrieval mode (Tulving, 1985) or retrieval set, it is possible that subjects were unwilling to expend the resources required to engage and disengage retrieval processing with each interleaved trial. I address the possibility that automatic memory evaluation masked transfer by using both novel and familiar items during the interleaved pleasantness rating trials. If subjects automatically evaluate the recognition status of the pleasantness rating materials prior to rendering pleasantness judgments, even though they are not required to do so, then there should be an old/new stimulus effect in the pleasantness ratings when both familiar and novel materials are given. This in turn would mean that any potential consequences of the immediately preceding, overt memory confirmations in Experiment 1, were perhaps being swamped or overshadowed by automatic memory evaluation of the pleasantness probes.

Experiment 2

Experiment 2 manipulated the ostensive memory status of the interleaved probes used for pleasantness ratings to test whether they were being automatically assessed for memory status prior to, or in concert with, the pleasantness judgments. This was achieved by adding a familiarization phase in which subjects deeply encoded words that would later serve as one half of the probes rated for pleasantness (but not memory probes). I used a deep levels of processing task historically associated with high levels of recognition to ensure that if automatic recognition were occurring, then on the whole a large proportion of these materials would be recognized, and thus perceived as confirmations in the broader context of memory testing. If this assumption is correct, then the half of the pleasantness probes from the familiarization phase (hereafter, old-pleasantness probes) should yield more positive pleasantness ratings than seen with the novel pleasantness probes (hereafter, new-pleasantness probes). By equally intermixing old-pleasantness with new-pleasantness probes we can directly test whether the memory status of the interleaved pleasantness probes also influences their rated pleasantness. In this context, old-pleasantness probes should be associated with an overall increase in pleasantness in contrast to the overall potential devaluation of new-pleasantness probes found in Experiment 1. Moreover, the main effect of accuracy should replicate with both classes of pleasantness probes.

Method

Participants. Forty Washington University in St. Louis undergraduates participated in exchange for course credit. Informed consent was obtained in compliance with the Institutional Review Board of Washington University in St. Louis. Testing occurred in groups of one to four people using computer carousels.

Materials. Stimuli were identical to Experiment 1.

Design and Procedure. A norming, pleasantness ratings phase was followed by the recognition experiment proper (identical to Experiment 1).

Participants rated 150 serially presented words for pleasantness via a six-point scale in a self-paced manner. After completion, the study-test phase began. In contrast to Experiment 1, before each study phase, participants studied 50 words using abstract/concrete judgments, which asked participants to judge whether items were nonphysical, abstract ideas (e.g., justice) or physical, concrete objects (e.g., chair). Participants recorded responses via keypress (A = Abstract, L = Concrete), requiring decision-processes largely orthogonal to the those used in the pleasantness task. These 50 pre-study items were then randomly intermixed with 50 novel items in the interleaved pleasantness rating task. Subjects then engaged in syllable counting study sessions identical to Experiment 1. The following recognition test contained 100 recognition judgments interleaved with 100 pleasantness ratings that were made on 50 novel items (new-pleasantness probes), as well as 50 deeply encoded items (old-pleasantness probes), in contrast to Experiment 1, which solely tested new-pleasantness probes. This familiarization-study-test cycle repeated for two more cycles. However, because of a coding error that resulted in an unbalanced third test list, the third study-test cycle was dropped from all subsequent analyses. All judgments were self-paced.

Results and Discussion

Basic Recognition Performance. Subjects again displayed moderate recognition correctly responding 71% of the time, and a conservative bias with subjects responding 'old' on 40% of the trials ($t(1,39) = -7.15$, $p < .001$).

Pleasantness Ratings, Pleasantness Probe Status, and Preceding Recognition. Baseline rated pleasantness (3.52) was calculated from the same master-file as Experiment 1, with the inclusion of Experiment 2.

To simplify examining whether the memory status of the pleasantness probes influenced pleasantness ratings or interacted with the effects of prior accuracy and response, analysis was separated into two 2x2 ANOVAs. The first focused on accuracy effects using factors of Prior Accuracy (Correct v Incorrect) and Pleasantness Probe Status (Old-Pleasantness v. New-Pleasantness). The second focused on search confirmation/disconfirmation effects with factors of Prior Response ('Old' v 'New') and Pleasantness Probe Status (Old-Pleasantness v. New-Pleasantness) (*Figure 2*). Contrary to Experiment 1, the effect of Prior Accuracy did not replicate ($F(1, 39) < 1$, $p = .401$). This analysis further showed that Pleasantness Probe Status ($F(1, 39) = 1.30$, $p = .261$) also did not significantly influence ratings, nor did the factors interact ($F(1, 39) < 1$, $p = .742$). The second analysis showed no effect of Prior Response ($F(1.39) < 1$, $p = .496$) or Pleasantness Probe Status ($F(1,39) = 1.17$, $p = .285$), nor an interaction between the two ($F(1, 39) = 2.27$, $p = .139$).

Old and new pleasantness probes were then contrasted with baseline mean pleasantness rating (3.52). Replicating Experiment 1, new pleasantness probes led to ratings numerically, but not reliably below baseline ($t(1,39) = -1.36$, $p = .182$). However, old pleasantness probes did not differ from baseline (t(1,39) < .095 p = .924), and contrary to our conjecture that pleasantness ratings would influence the memory status of the items being rated for pleasantness, a paired t-test indicated no differences between new and old pleasantness probes t(1,39) < .808, p = .421,   Thus, automatic memory evaluation of the pleasantness probes cannot account for the lack of the COS effects on interleaved probes in Experiment 1.

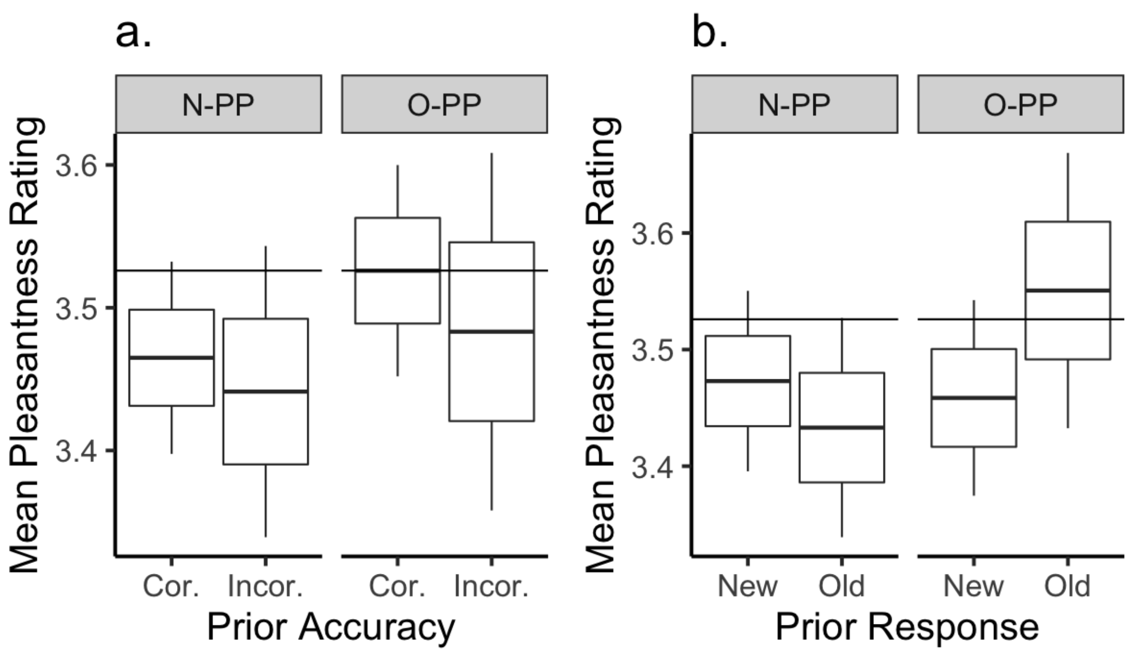

Figure 2. Modified boxplot showing influence of the prior accuracy (A) and prior response (B) on previous recognition judgments on mean pleasantness of subsequent ratings. Plots subdivided by the memory status of pleasantness probes: N-PP = new-pleasantness probes, O-PP = old-pleasantness probes. Thick lines indicate means. Box is +/- 1 SEM whereas Box + Whisker is 2 SEMs. Horizontal line reflects the mean pleasantness rating observed during baseline norming of the materials (3.52).

Experiment 2 produced multiple null effects. However, these findings should be taken with caution since the lack of a third-test block resulted in 33% less trials than Experiment 1. Furthermore, while the effect of accuracy did not replicate, it continued to trend in the same direction, Thus, in conjunction with Experiment 1, these findings provide some indication that the accuracy of prior recognition decisions may yield affective responses that transfer to subsequent stimuli. However, the data provide no support for transfer of the confirmatory/disconfirmatory recognition effect to subsequent pleasantness ratings, despite the robust affective consequences for the recognition probes themselves in earlier work (Table 1).

As a final attempt to maximize the potential of the COS effects to transfer to non-memory probes, in Experiment 3, I present both the recognition probe and the pleasantness rating probes together on each trial. This should maximize the opportunity for possible transfer in two manners. First, since observers may begin both assessments somewhat in parallel (since the simultaneous display affords this opportunity) it may increase the possibility that the affective response tied to episodic retrieval outcomes would transfer to the probe not evaluated for memory[1]. Second, as I discuss more fully in the section below, the joint presentation of both probes may facilitate their perception as belonging to the same general event, in accordance with Event Segmentation Theory (Zacks & Swallow, 2007).

Experiment 3

Thus far there has been little evidence that previous recognition judgments elicit affective responses that transfer to items not tested for memory. According to Event Segmentation Theory, observers segment temporal experience into meaningful events. Since segmentation processes occur relatively automatically (Zacks et al., 2001), one possibility for the lack of effect of previous recognition outcomes is that subjects are segmenting the recognition trials and the pleasantness trials into separate events given that they entail temporally separated decisions on distinct items. This may have obstructed transfer of any affective responses resulting from recognition outcomes.

It may be pointed out that Grybinas, Kantner, & Dobbins (2019) found transfer of affective responses, despite having separate recognition and pleasantness decisions. However, recognition and pleasantness judgments were being rendered on the same item, and thus decision times for the either judgment (recognition or pleasantness) were always much faster when that decision was rendered second rather than first[1]. This suggests that the two judgments were being processed somewhat in parallel and consequently within the same event boundaries. Following this logic, Experiment 3 attempts to combine the recognition judgments and pleasantness ratings into one event by having subjects render them on the same trial screen (with both probes presented closely together in the center of the screen). If the event boundaries of the two judgments were limiting projective transfer of affect, then combining them into a more unified event should help reduce the obstruction.

Method

Participants. Thirty-eight Washington University in St. Louis undergraduates participated in exchange for course credit. Informed consent was obtained in compliance with the Institutional Review Board of Washington University in St. Louis. Testing occurred in groups of one to four people using computer carousels.

Materials and Procedure. Stimuli were identical to Experiment 1 and 2. A norming, pleasantness ratings phase was followed by the recognition experiment proper (identical to Experiment 1 and 2). Because the pre-study manipulation did not have an effect on rated pleasantness in Experiment 2, the pre-study phase was dropped leaving the same study-test cycles as Experiment 1, namely a 50-word syllable counting study session followed by a 100 word recognition test (50 old/50 new) with 100 intermixed pleasantness probes. Critically, in order to have subjects interpret the recognition judgment and pleasantness ratings as a more unified event, recognition judgments and subsequent pleasantness ratings were rendered on the same screen and the two probes were placed together in the center of the screen.

Results

Basic Recognition Performance. Consistent with Experiment 1 and 2, subjects displayed moderate recognition (74% correct) and a conservative decision bias (38% 'old' responses) ($t(1,37) = -7.55$, $p < .001$).

Pleasantness Ratings and Accompanying Recognition. Baseline rated pleasantness (3.52) was calculated from the same master-file as Experiment 1 & 2, with the inclusion of Experiment 3.

As noted, in Grybinas, Kantner, & Dobbins (2019) decision times for recognition and pleasantness judgments were much faster when that decision was rendered second rather than first, indicating that the two were being processed in parallel. Extending this logic to the present experiment, an independent samples t-test was conducted on pleasantness rating reaction time (RT) between Experiment 1 (subsequent pleasantness trials) and Experiment 3 (accompanying pleasantness trials) to see if pleasantness ratings were faster when the pleasantness probe was presented adjacent to the recognition probe. If RTs are faster in Experiment 3, then it can be surmised the two judgments were occurring somewhat in parallel and thus within the same event boundaries, Indeed, pleasantness rating RTs in Experiment 3 were significantly faster than Experiment 1 ($t(1, 79) = -3.03$ $p = .003$) suggesting that the manipulation worked. Nonetheless, as shown below, this did facilitate any transfer of affective responses resulting from recognition probe decisions to the adjacent pleasantness probe ratings. Using a within-subjects 2x2 ANOVA with factors of Response ('Old" v. 'New') and Accuracy (Correct v. Incorrect), neither the main effect of Accuracy ($F(1, 37) = .03$, $p = .859$), Response ($F(1, 37) = 1.02$, $p = .319$), nor the interaction between the two ($F(1, 37) = .21$, $p = .651$) were significant (see *Figure 3*). Again, however, on average the pleasantness ratings during test were numerically below the normative grand average ($t(1,37) = -1.05$, $p = .298$).

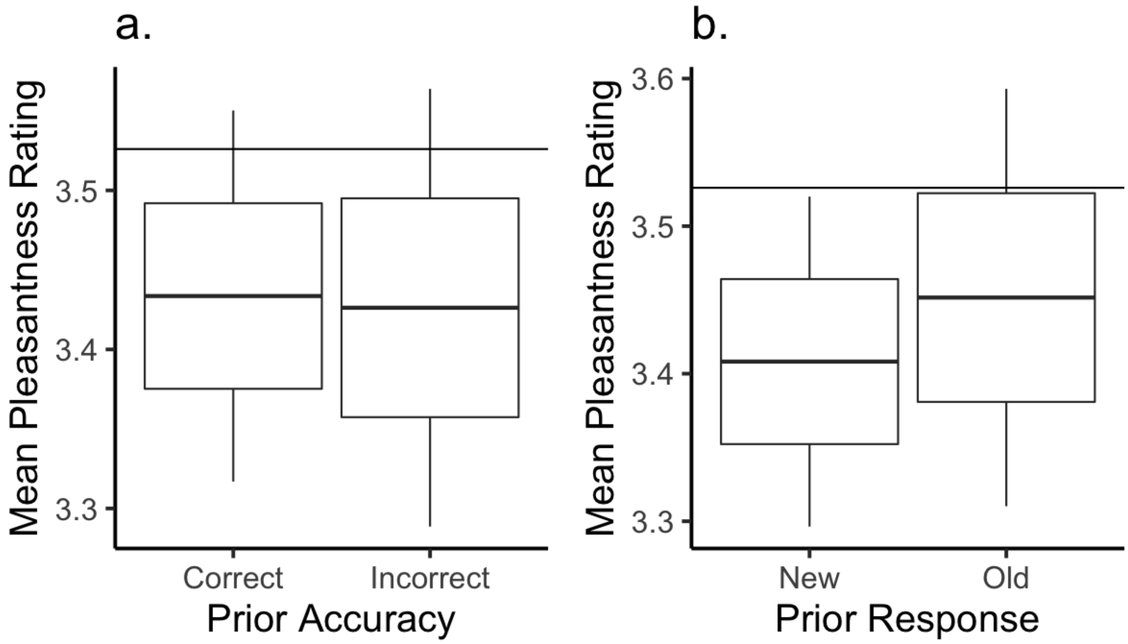

Figure 3. Modified boxplot showing influence of the prior accuracy (a) and prior response (b) on previous recognition judgments on mean pleasantness of subsequent ratings. Thick lines indicate means. Box is +/- 1 SEM whereas Box + Whisker is 2 SEMs. Horizontal line reflects the mean pleasantness rating observed during baseline norming of the materials (3.52).

General Discussion

I aimed to test whether affective responses generated from memory decisions would transfer beyond memoranda. This was accomplished by having subjects make recognition judgments prior to rating the pleasantness of a different item and indexing the projective transfer of positive affect generated from recognition conclusions through the rated pleasantness of the interleaved probe. Despite the documented large effects of recognition outcomes on the rated pleasantness of recognition probes themselves (see

Table 1), three separate experiments failed to show any transfer of this effect to items that were not the focus of retrieval. These null results occurred even when it was clear that the memory and affective decision operations for the two items were temporally overlapping in Experiment 3. Unlike the affective responses elicited from primes in the AMP (e.g., puppy images), the affect elicited from memory conclusions seems be limited to the probe used to initiate retrieval search. One way to rationalize the divergence is that primes, such as an image of a puppy or snake, automatically elicit affect when presented to subjects, whereas recognition requires a controlled decision-making process that is intimate to the memoranda. I will now consider the effects of prior accuracy and response separately.

Prior Accuracy and Response. The effect of prior accuracy on subsequent ratings was mixed: Experiment 1 found a significant effect but it was not replicated in either Experiment 2 or 3. Even though the effect was not significant in the following two experiments, it was numerically in the same direction across all three experiments, and in same direction as the previously documented effects (i.e., correct > incorrect) in Grybinas, Kantner and Dobbins (2019). Thus, if the effect of accuracy is real, it is small. Referring back to Table 1, the within-item effect sizes for accuracy were a priori small and so any transfer of affective response generated by accuracy was likely even more limited in this across-item design.

In stark contrast to the a priori large effects of recognition conclusions (see Table 1), whether subjects confirmed (‘old’) or disconfirmed (‘new’) memory searches did not affect subsequent ratings in any of the present experiments (lowest $p = .32$). This suggests that affective responses elicited by confirmation/disconfirmation are supported by a different mechanism than accuracy effects, which may instead reflect an effort-based phenomenon.

The fact that the a priori smaller effect (accuracy) potentially had some influence on rated pleasantness, but the a priori larger effect (response) did not, suggests that they are supported by different mechanisms. Errors require more cognitive effort than correct responses, which can be indexed in slower decision times for the former. Aggregating decision times for Experiments 1-3, errors were remarkably slower than correct responses ($t(1, 119) = -8.49$, $p < .001$). Thus, it is likely the affective response related to accuracy effects is based in expended effort with effort being negatively related to positive affect (e.g., Garbarino & Edell, 1997). Additionally, effects of cognitive effort have been shown to unwittingly influence behavior. For example, when dyads performed an anagram task, Preston and Wegner (2007) observed more instances of plagiarism when the stimuli used during the task were degraded and more effortful to process. This suggests that affective responses resulting from decision effort may be somewhat free-floating. The affective responses elicited from confirmation/disconfirmation, on the other hand, are fixed to the item under memory operations. This is evidenced, at the very least, by the two being logically dissociable. For example, one could have a very effortful confirmation, a very easy disconfirmation, or vice versa. Additionally, confirmation/disconfirmations require subjects to search their memory for the prior occurrence of the item itself, whereas the relative effort required for correct judgments versus errors may be registered less precisely with relation to its origin (as observed in Preston and Wegner, 2007).

Possible Limitations. Unlike the AMP which uses meaningless, non-valanced items as probes for affective ratings, the present experiments had subjects rate the pleasantness of familiar words. Meaningless, non-valanced stimuli, such as abstract figures, are used to create conditions in which transfer of affect is strongest. That is, because there is no real semantic basis for affective rating of meaningless materials, the affective response elicited by the prime can potentially influence the subsequent rating more freely. The use of highly familiar words (e.g., balcony) may have created conditions in which the affective response elicited from recognition decisions could not properly be detected. However, I decided to use words in accord with Grybinas, Kantner, & Dobbins (2019) that found large effects when subjects were rating valanced stimuli (viz., words concomitantly judged for recognition). Additionally, it is clear that the effect of prior response type in particular was not just attenuated, as you would expect if the effect was being slightly masked, but altogether eliminated. Thus, while switching to meaningless stimuli for the pleasantness ratings may increase the potentially small accuracy effects demonstrated here, it is doubtful that it would yield a COS effect given its apparently complete absence across the three experiments here.

Across all three experiment pleasantness probes at test tended to be rated as less pleasant than baseline average. Experiment 2 examined whether this devaluation resulted from subjects automatically evaluating the recognition status of the pleasantness rating probes, even though they were not instructed to do so. If the perceived newness of probes in Experiment 1 was influencing the devaluation of probes, then manipulating their perceived oldness should increase their rated pleasantness. However, no significant differences in rated pleasantness were found between novel probes and familiarized probes indicating that some unknown factor may be producing the devaluation of the interleaved ratings. One speculative possibility, consistent with the idea that effort expenditure yields a more free-floating affective response, is that the demanding nature of the recognition task in general yielded a slight devaluation of the interleaved pleasantness rating probes. This possibility could be addressed directly by alternating blocks of exceedingly difficult and exceedingly easy recognition through a levels of processing manipulation (Craik & Tulving, 1975). If the general difficulty of the recognition task influences the rated pleasantness of interleaved non-memory probes, then there should be a mean difference in rated pleasantness for probes within difficult tests compared to probes within easy tests.

Future Directions. Given the lack of across-items effects, future research should focus primarily on within-item misattribution effects and their potential consequences. Specifically, the affect that is generated towards items under memory search operations could have both social-cognitive and clinical implications.

Consider the case of meeting a recent acquaintance but failing to successfully retrieve their name or some other desired piece of biographical information (e.g., their career). If COS effects transfer to this more naturalistic scenario, then our ability to complete this search may influence our positive affect towards said acquaintance. For instance, the COS model would predict the acquaintance would be found less attractive when recall their name or biographical information fails rather than succeeds. As we are constantly remembering faces, names, and biographical information it would be intriguing to test whether our ability to do this flavors our social experiences.

Clinically, the COS model may make important predictions with relation to the affective lives of patients suffering with various forms of early stage dementia and healthy older adults with normative memory decline. For example, since concluding some item is novel or cannot be recalled (disconfirmations) reduces positive affect towards that item, the increasing inability to retrieve desired target information for close others, or other memoranda, for which there is a strong sense that the episodic information should be available, might lead to negative reactions that are misattributed by patients onto these close others. Conversely, if there are areas or domains in which retrieval attempts remain normatively successful, then this may be particularly rewarding and thus elicit strong positive affective responses, which would again be misattributed to the targets of retrieval per se. Thus, the gradual degradation of memory may have consequences for affective responses towards others or activities that require episodic retrieval. However, these possibilities remain largely speculative since the duration and the additivity of the confirmation/disconfirmation effects have yet to be established. Given this, perhaps the most pressing area for future research is determining how long lasting these affective reactions following retrieval outcomes are. If they do not last beyond the retrieval demand then their potential impact on long lasting affective impressions of memoranda could be ignored, even if they carry consequences for the immediate appraisal of the memoranda during the context of search.

Conclusion. The argument for null effects is generally weak, since there is never one falsifying critical test of a hypothesis (Lakatos, 1976). However, given the points above, if there were a COS recognition effect yielding across-item misattributions, our design should have created conditions that were sufficiently sensitive to detect it. I instead conclude that COS effects are limited to items that are the targets of memory search and that these effects do not easily transfer to non-memoranda. These COS effects may be separable from effort based affective misattributions, which though weak in the current studies, are nonetheless consistent with the direction predicted and other literature suggesting that effort-based affective responses may more easily drift to stimuli not responsible for their elicitation.

Chapter 2: Back Matter

References

Bornstein, R. F., & D'agostino, P. R. (1992). Stimulus recognition and the mere exposure effect. *Journal of personality and social psychology*, *63*(4), 545-552.

Craik, F. I., & Tulving, E. (1975). Depth of processing and the retention of words in episodic memory. *Journal of experimental Psychology: general*, *104*(3), 268-294.

Garbarino, E. C., & Edell, J. A. (1997). Cognitive effort, affect, and choice. *Journal of consumer research*, *24*(2), 147-158.

Grybinas, D., Kantner, J., & Dobbins, I. G. (2019). Mere exposure effect (s) in the context of explicit memory search. *Memory & cognition*, 1-14.

Norman, D. A., & Bobrow, D. G. (1979). Descriptions: An intermediate stage in memory retrieval. *Cognitive Psychology*, *11*(1), 107-123.

Lakatos, I. (1976). Falsification and the methodology of scientific research programmes. In *Can theories be refuted?* (pp. 205-259). Springer, Dordrecht.

Lee, A. Y. (2001). The mere exposure effect: An uncertainty reduction explanation revisited. *Personality and Social Psychology Bulletin*, *27*(10), 1255-1266.

Payne, B. K., & Lundberg, K. (2014). The Affect Misattribution Procedure. *Social and Personality Psychology Compass,* 8(12), 672-686.

Payne, B. K., Cheng, C. M., Govorun, O., & Stewart, B. D. (2005). An inkblot for attitudes: affect misattribution as implicit measurement. *Journal of personality and social* *psychology*, *89*(3), 277-293.

Peirce, J. W. (2007). PsychoPy—psychophysics software in Python. *Journal of neuroscience methods*, 162(1), 8-13).

Preston, J., & Wegner, D. M. (2007). The eureka error: Inadvertent plagiarism by misattributions of effort. *Journal of Personality and Social Psychology*, *92*(4), 575-585.

Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological review*, *110*(1), 145-172.

Tulving, E. (1985). Elements of episodic memory.

Wilson, M. (1988). MRC Psycholinguistic Database: Machine-usable dictionary, version 2.00. *Behavior Research Methods, Instruments, & Computers*, *20*(1), 6-10.

Zacks, J. M., Braver, T. S., Sheridan, M. A., Donaldson, D. I., Snyder, A. Z., Ollinger, J. M., ... & Raichle, M. E. (2001). Human brain activity time-locked to perceptual event boundaries. *Nature neuroscience*, *4*(6), 651-655.

Zacks, J. M., & Swallow, K. M. (2007). Event segmentation. *Current directions in psychological science*, *16*(2), 80-84.