

# Memory for emotional and neutral stimuli psychology essay



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Distinctiveness is not an inherent property of a stimulus, but a feature of the context in which it is embedded. Schmidt argued that emotional stimuli are distinct relative to the content of participants' long-term memory because they have unique attributes that they do not share with most stored stimuli, which are neutral. This form of distinctiveness, relative to stimuli stored in long-term memory, is termed secondary distinctiveness (Hunt and Worthen, 2006 and Schmidt, 1991). Emotional stimuli also stand out relative to the neutral stimuli that typically surround them at the time of encoding, for example, neutral stimuli in the same study list or the peripheral details of a crime scene (Schmidt, 1991). Distinctiveness relative to stimuli stored in working memory is termed primary distinctiveness (Hunt and Worthen, 2006 and Schmidt, 1991). To clarify, a picture of a nude model within a set of pictures of clothed models has both primary and secondary distinctiveness, but a picture of a clothed model within a series of nudes only has primary distinctiveness (Schmidt, 2002). There is strong evidence that primary distinctiveness improves memory, but that secondary distinctiveness does not (Hunt and McDaniel, 1993 and Schmidt, 1991). For example, common sentences are remembered as well as sentences with high secondary distinctiveness, such as bizarre or humorous sentences, when each sentence type is presented to a separate group of participants or in separate blocks to the same participants. However, when all sentences are mixed and presented to the same group of participants, the bizarre or humorous sentences are remembered better than the neutral ones, an effect which must therefore stem from their primary distinctiveness (McDaniel et al., 1995 and Schmidt, 1994).

Emotional stimuli always have high secondary distinctiveness, but their primary distinctiveness can be manipulated by varying the composition of experimental stimulus sets. The primary distinctiveness of emotional stimuli is enhanced relative to the primary distinctiveness of neutral stimuli when the same experimental list includes a small number of emotional stimuli intermixed with a larger number of neutral stimuli. By contrast, both stimulus types have equivalent primary distinctiveness when they are presented in 'blocked' sets that only contain other stimuli of the same type. A number of studies blocked stimulus type in this manner and found that EEM was abolished (Dewhurst and Parry, 2000, Hadley and Mackay, 2006, Sommer et al., 2008 and Talmi and Moscovitch, 2004). When organization was also controlled, the same results were obtained with more arousing pictures (Talmi, Luk, et al., 2007). The comparison between blocked and mixed set results suggests that primary distinctiveness plays a role in EEM. A contradictory result was obtained in two other studies (Majerus and D'Argembeau, 2011 and Monnier and Syssau, 2008, Experiment 2), which found EEM for positive words even when stimulus type was blocked. Some methodological differences may account for this difference results. These two studies focused on short-term memory, and therefore employed short lists and a serial recall test. Monnier and Syssau did not control semantic relatedness, and although the semantic relatedness of all word types was very low in the Majerus and D'Argembeau experiment, the positive words were more inter-related than the neutral ones. Notably, Majerus and D'Argembeau did not obtain EEM for negative words.

The finding that EEM can be attenuated by blocking stimulus type at encoding is important because it allows us to discard two alternative accounts of immediate EEM. The first is the suggestion that immediate EEM depends on arousal, just like delayed EEM. Had that been the case EEM should have also been obtained under blocked-sets conditions, because physiological measures of emotional arousal are sustained and even increase after exposure to a series of unpleasant pictures (Smith, Bradley, & Lang, 2005).

Second, the results of the Talmi, Luk, et al. (2007) study also contradicted an explicit prediction of the Binding Theory of EEM (Hadley and Mackay, 2006 and Mackay et al., 2004). According to this theory the amygdala's response to emotional arousal allows emotional stimuli to gain privileged access to 'binding nodes'. Binding nodes link items to their episodic context and facilitate their subsequent retrieval. When items follow each other quickly the binding of emotional stimuli is thought to be prioritized so that neutral stimuli that immediately follow or precede an emotional stimulus would be bound less well to the context, and consequently remembered less well.

Binding Theory thus appears to account for the finding that EEM is obtained under mixed-set but abolished under blocked-set conditions (Hadley & Mackay, 2006). Crucially, however, when a slow presentation rate is used (above 2000 ms per item) Binding Theory explicitly predicts that memory for neutral items would improve in mixed-set relative to blocked-set conditions (Hadley & Mackay, 2006, p. 84), because a slow presentation rate gives all items sufficient time to be bound, and the presence of emotional items would further strengthen the sequential links between neutral items and

their near neighbors to facilitate retrieval. This prediction was falsified by Talmi, Luk, et al. (2007), who used a slow presentation rate and found poorer memory for neutral stimuli under mixed-set relative to blocked-set conditions. In her review, Mather (2007) concludes that Binding Theory does not currently account for the consistency with which primary distinctiveness results in EEM across fast and slow presentation rates.

How primary distinctiveness influences memory is under debate (Hunt & McDaniel, 1993), but experimental evidence suggests that it does so at retrieval (Hunt & Worthen, 2006), when distinct items, which have more unique attributes, are more likely to be recovered following memory search (Tomlinson, Huber, Rieth, & Davelaar, 2009). A retrieval effect is in line with the stronger influence of primary distinctiveness on free recall relative to recognition memory tests (Schmidt, 1991) and with the finding that primary distinctiveness enhances memory even when it is only manipulated at retrieval. For example, when participants encode two sets of stimuli separately, one higher and one lower in secondary distinctiveness, they recall more of the stimuli that are higher in secondary distinctiveness when they recall both sets together – a situation in which these stimuli are also higher in primary distinctiveness – than when they recall them separately (McDaniel et al., 2005 and Talmi et al., 2007). A retrieval effect is also in line with the finding that manipulating set composition does not alter memory for emotional stimuli, (Hadley and Mackay, 2006 and Talmi et al., 2007), as would be expected if primary distinctiveness operated at encoding. To gain insight into the stage with which the primary distinctiveness of emotional stimuli influences EEM Experiment 1 will relate the amount of attention

captured at encoding and subsequently enhanced memory under both mixed- and blocked-set composition conditions.

Main variable in the project is distinctiveness, so when things are processed in a distinct way, they are processed differently to their background, they stand out in some way. The emotional stimuli are distinct from the neutral stimuli, they don't share as many attributes, the emotional ones are unique because they make you feel something, they engage appraisal processes, more information is coded how emotional you are, how sad you are, stressed you are, aroused you are, emotional pictures are significant to people because if you see a dead body of something, it will invariably make you feel something, and they are also distinct because they are different from everything else around in the experiment and in the world in general .

Primary distinctiveness is something that is distinct relative to your primary memory (working memory). Secondary distinctiveness is something that is distinct relative to your entire experience.

What makes the emotional memories stand out so well? And is it related to the fact that they are distinct? Is it something that we do when we see these items that makes it special, or is it what we do when we retrieve the items? Schmidt ? says it's both, that when you see an emotional stimulus, you engage in encoding processes because it has a secondary distinctiveness, and because it is emotionally significant, you pay more attention when you see it. So there is some kind of encoding effect. This project is looking at the retrieval effect. Is there something people do at retrieval that makes

emotional stimulus remembered better? Talmi research suggests that something very important goes on at retrieval.

### Retrieval-induced Suppression

Why is it that retrieval matters so much? And encoding matters a little bit less, possibly?

Need to understand the effect of distinctiveness on encoding but the more important thing is to understand it on retrieval. When people observe a series of emotional and neutral stimuli together, they pay more attention to the emotional instead of the neutral, and then they are asked to retrieve these items. A few different things happen. You retrieve first what is most important to you, which is the emotional pictures, simply engaging and retrieving these emotional pictures inhibits the memory of the other pictures. Recent research has demonstrated that the act of remembering can prompt temporary forgetting or, more specifically, the inhibition of particular items in memory (MacLeod & MacRae, 2001).

A central tool of motivated forgetting is called retrieval suppression, a process whereby people shut down episodic retrieval to control awareness (Anderson & Huddleston, 2012) Retrieval-induced suppression was first discovered by Anderson, Bjork, and Bjork (1994)

Barnier, Hung & Conway (2004) This experiment extended the retrieval-induced forgetting (RIF) procedure from simple, episodic information to emotional and unemotional autobiographical memories.

Anderson and his colleagues (Anderson et al., 1994; Anderson & Spellman, 1995) developed a three-phase paradigm to study retrieval-induced forgetting. In the first phase, participants study a list of words consisting of category labels and exemplars; for example, six instances of eight categories are presented. The second phase requires participants to practice retrieving three members of four of the categories. These practiced items are denoted  $R_{p+}$  items. The three members that were not practiced, but that belong to the four categories that did receive practice, are called  $R_{p-}$  items. Retrieval-induced forgetting is demonstrated during the third phase, a recall test for all of the original study items, if the following pattern of performance is produced:  $R_{p+} > N_{rp} > R_{p-}$ . That is, items from partially practiced categories that have not themselves received practice are recalled at a rate below that of items from completely unpracticed categories. Anderson and his colleagues attribute this forgetting to inhibition resulting from response competition (Anderson et al., 1994; Anderson & Spellman, 1995). During the second phase of the paradigm when only half of the original list items are to be produced, other items, including list items, compete for recall. The competing items are presumed to be suppressed during this second phase, and the inhibition carries over to the final recall test for all of the first list items. Thus, the theory is that response competition results in inhibition of the nonpracticed ( $R_{p-}$ ) list words. Consequently, eliminating response competition should eliminate retrieval-induced forgetting.

Retrieval-induced suppression is the idea that when you retrieve word 1, you inhibit everything else around word 1 – everything related to word 1 is inhibited because you had to select word 1 to bring it up, so it's inhibited



everything else. Something similar is going on when we are retrieving emotional memories. By being allowed to retrieve the emotional, you inhibit the neutral, and the idea of this experiment is what would happen if we tried to counter this effect.

Previous research has shown that the act of remembering can cause forgetting of related information which is known as retrieval-induced forgetting. This study investigates the durability of this inhibitory effect over time. The participants were 92 university students. Using a standard retrieval-practice paradigm, we manipulated the delay between retrieval-practice and a final category-cued recall test (i. e., no delay, ten minutes, one hour, and one week). The results showed that retrieval-induced forgetting occurred at all retention intervals, even after one week. The magnitude of impairment did not change across the retention intervals. The mechanism that enables the durability of retrieval-induced forgetting, even over long periods of time, is discussed.

Retrieval-induced forgetting (RIF) refers to the finding that retrieving a memory can impair subsequent recall of related memories. Here, the authors present a new model of how the brain gives rise to RIF in both semantic and episodic memory. The core of the model is a recently developed neural network learning algorithm that leverages regular oscillations in feedback inhibition to strengthen weak parts of target memories and to weaken competing memories. The authors use the model to address several puzzling findings relating to RIF, including why retrieval practice leads to more forgetting than simply presenting the target item, how RIF is affected by the strength of competing memories and the strength of the target (to-be-  
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retrieved) memory, and why RIF sometimes generalizes to independent cues and sometimes does not. For all of these questions, the authors show that the model can account for existing results, and they generate novel predictions regarding boundary conditions on these results.

Retrieval-induced forgetting under self-referential processing, mother-referential processing and other-referential processing conditions were examined. Under the former two conditions no retrieval-induced forgetting was found while it existed under other-referential processing conditions. Thus, memory superiority of self-referential processing and mother-referential processing to other-referential processing was confirmed with the paradigm used in retrieval-induced forgetting research. The results showed that memory material under self or mother-referential processing condition can not only be remembered more than that under other-referential processing condition, but also showed no inhibition effect on related material during retrieval in Chinese subjects. Meanwhile, it can be concluded that mother-referential processing is a boundary condition for retrieval-induced forgetting for Chinese subjects

### Semantic Relatedness

) (see, e. g.,

Goodmon & Anderson, 2011 for demonstrations of how semantic relatedness insulates items from inhibition in retrieval-induced forgetting).

So can we overcome this potential bias if it really exists? All participants encode a list of mixed pictures together, and in the control condition, they

are just asked to recall everything. In the other condition, they are first asked to recall the emotional and then the neutral, and in the second condition they are asked to recall the neutral and then the emotional.

Three groups:

Group 1 is mixed, mixed, mixed

Group 2 is mixed, emotional-neutral, neutral-emotional

Group 3 is mixed, neutral-emotional, emotional-neutral

Provides relevant and comprehensive background

Shows an extensive critical review of literature

Progress from general issues to specific research questions / hypotheses

Shows critical understanding of the main theoretical issues relevant for this work

Memory for moderately arousing emotional stimuli, such as images of violence, is better than memory for neutral stimuli. There is good evidence for emotion-enhanced memory (EEM) in both humans and non-human animals (Cahill and McGaugh, 1998 and Labar and Cabeza, 2006). Evidence from animals shows that the sympathetic emotional arousal response enhances long-term memory by activating the amygdala, which modulates the long-term consolidation of memory traces in the hippocampus, so that after a prolonged delay, memory for emotional events is enhanced (McGaugh, 2004). Although this model can explain a host of data from

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human participants (Labar & Cabeza, 2006), researchers often overlook the fact that because the modulation mechanism only influences long-term memory consolidation, it does not account for the enhanced memory in immediate long-term memory tests (Cahill & McGaugh, 1998), namely tests that occur shortly after study but following a brief distractor activity, which clears working memory. In the general discussion section we review evidence from animal studies that shows conclusively that the mechanism used by the modulation model to account for delayed EEM does not account for immediate EEM ( Bianchin et al., 1999, Ellis and Kesner, 1983, Frey et al., 2001 and Seidenbecher et al., 1997). A complementary mechanism is therefore required to account for immediate EEM, which humans exhibit readily.

The goal of the current study was to establish a cognitive account of immediate EEM. The cognitive account attributes this effect to altered encoding and retrieval of emotionally arousing events, instead of to their modulated consolidation. The notion that cognitive factors contribute to immediate EEM is not new (Cahill and McGaugh, 1998 and Kensinger and Corkin, 2004), yet it is unknown which factors are necessary and sufficient to account for this effect. Consequently, the cognitive account has had a relatively modest influence on neuroscience research. For example, a recent meta-analysis (Murty, Ritchey, Adcock, & Labar, 2010) highlighted the fact that although many brain regions are consistently associated with EEM, their contribution to EEM is under-investigated. This is likely due to the prominence of the modulation model, as researchers typically focus on brain regions relevant to that model and interpret their findings within its

framework even when memory is tested shortly after study (Kensinger and Corkin, 2004, Sommer et al., 2008 and Strange et al., 2003). Moreover, researchers interested in modulated consolidation test memory after a prolonged delay, which complicates the isolation of an independent cognitive contribution (Ritchey, Bessette-Symons, Hayes, & Cabeza, 2011).

Understanding the critical psychological determinants of immediate EEM can inspire and inform future research of its underlying brain mechanisms.

Our objective here was to show that the influence of three factors – organization, distinctiveness, and attention – on encoding and retrieval provides a necessary and sufficient account of immediate EEM in free recall. The two experiments reported here support this claim by showing that EEM can only be abolished when these three factors are controlled. Our approach relies on the assumption that to fully understand an empirical phenomenon, such as immediate EEM, we need to know the conditions for its manifestation, and that such understanding is evident in the ability to systematically influence the phenomenon by manipulating its triggering conditions.

In the present experiment, participants studied a list of words and at test were presented with a single probe word, which could be either old or new. The critical comparison was between activation to old probes from the beginnings of the lists (early probes) and activation to old probes from the ends of the lists (late probes), thereby replicating behavioral serial position procedures in a neuroimaging study.

This single-probe recognition task yields behavioral results similar to those of the more traditional recall tasks (e. g., Monsell, 1978; Neath, 1993). Item presentation, interstimulus interval (ISI), and retention interval (RI) were purposefully short to discourage rehearsal, which could allow participants to retrieve even early list items from STM-WM (e. g., Zhang et al., 2003) and confound the comparison between early and late list items because primarily early items would be rehearsed. Successful prevention of rehearsal would be evident by elimination of the primacy effect (Glanzer & Cunitz, 1966). Our study lists included 12 items each, which exceeds STM-WM capacity (Tulving & Colotla, 1970). Therefore, dual-store models would predict LTM involvement in the recognition of the early probes, reflected in MTL activation, but not in the recognition of the late probes. Single-store models, in contrast, would predict only a quantitative, not a qualitative, difference between the activations for early and late probes.

## **Method**

### **Participants**

Twenty-one undergraduate students of psychology from the University of Manchester participated in the study in exchange for course credits, none of which having any previous neurological or psychiatric disorders (15 females and 6 males, mean age 20. 24, SD = 3. 21). Participants were allocated randomly to the emotional-neutral first, neutral-emotional first and control conditions. Overall, 8 participants were allocated to the control condition, 7 participants were allocated to the emotional-neutral first condition, and 6 participants were allocated to the neutral-emotional first condition.

## Materials

The experimental pictures included 15 negative, 15 related neutral (domestic scenes) and 15 random neutral pictures which were drawn from the International Affective Picture System (Lang, Bradley, & Cuthbert, 2005) and from the internet. Participants viewed three sets of 15 pictures. The mixed sets included five items of each type (negative, related-neutral, random-neutral), and the blocked sets included all 15 items of a single type. Care was taken to ensure that pictures did not resemble each other too closely, e. g. there was only one picture of a gun, to avoid confusion in scoring free recall data. 12 pilot participants rated all picture pairs for relatedness on a 7-point Likert scale with ' 1' indicating ' not at all related' and 7 indicating ' extremely related'. The relatedness score for each picture was computed as the average rated relatedness of that picture with other pictures of the same type in the list to which it was allocated, and overall relatedness scores for the emotional and the neutral sets were computed across picture for each participant. The emotional and related-neutral pictures were equally inter-related, and more inter-related than the random-neutral pictures. The number of pictures that depicted people was similar in each of the picture types. 12 pilot participants rated pictures on the dimensions of image complexity and brightness using Likert scales and on the dimensions of emotional valence and arousal using the Self Assessment Manikin (Bradley & Lang, 1994). Emotional pictures were more negatively-valenced and more arousing than the neutral pictures, but picture types did not differ on complexity or brightness.

The three practice lists were similar to the experimental lists and included novel negative, related neutral (domestic scenes) and random neutral pictures. Buffer pictures included eight pictures of each type. Buffers for mixed-DA were sampled without replacement from this pool but buffers for the blocked condition were only sampled from the appropriate type. The four training pictures were random neutral. No ratings for these pictures were obtained. The stimuli for the auditory discrimination task were 250, 750, and 2250 Hz pure tones, respectively, with 1 s duration. Materials for the arithmetic task were problems of addition and/or subtraction of two single digits (e. g. “ 4 + 5=”).

## **Procedure**

The experiment was devised of three tasks: an auditory task, an arithmetic task, and a picture recall task. Participants were given the opportunity to practice each task with shorter versions before the experiment began, and after practising each task participants were given feedback on their performance. On the auditory task participants had to achieve an accuracy rate of 80% before being able to continue onto the experiment.

The auditory task was split into two parts. For the first part, participants were asked to listen to a random sequence of tones, and, using a keyboard, to press the number 1 key with the index finger of their dominant hand when they heard the ‘ target tone’ and the number 2 key with the middle finger of their dominant hand upon hearing one of two other tones. Participants were asked to respond to the tones as accurately as possible, but also as quickly as possible, with both accuracy and average speed response being measured. This first part was only performed once.

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The second part of the auditory task (also referred to as the picture encoding task) had participants listening to the same tones whilst also viewing a series of neutral and emotional pictures. The tones and pictures were not related. Participants were asked to focus on the screen at all times and pay 99% of their attention to looking at the pictures, and using the remaining 1% of their attention to listen to the tones. Each picture was presented on the screen for two seconds, followed by four seconds of whiteness, and this continued until all 34 pictures were shown. Of the 34 pictures, only 30 were included in the final data as 4 acted as buffers to control for the serial position effect (described in Talmi et al., 2005).

The arithmetic task, which always immediately followed the picture encoding task, involved participants having to solve a number of simple arithmetic problems. Participants were asked to select the larger number from the sum of two equations presented on either side of the screen by pressing the corresponding arrow key. The aim of this task was to nullify the serial position effect completely by making use of cognitive processes to replace working memory, akin to Talmi et al. (2007). The arithmetic task lasted for 1 minute.

Following the arithmetic task was the free recall task, which required participants to write down brief descriptions of the pictures that they had remembered from the picture encoding task. Participants were asked not to over elaborate on the descriptions, but at the same time provide enough information for the experimenter to understand which picture they were referring to. Participants in the emotional-neutral condition which required to first recall all of the emotional pictures they had memory of, and then all of <https://assignbuster.com/memory-for-emotional-and-neutral-stimuli-psychology-essay/>

the neutral pictures. In the neutral-emotional condition, participants performed the exact same task but in reverse order (neutral pictures first, emotional pictures second). Participants performing in the control condition were asked to describe the pictures they could remember from the picture encoding task in any order. After 3 minutes, participants were presented with the next picture encoding task.

A cycle of these three tasks – picture encoding, arithmetic and the picture recall – repeated three times, once with each of the three practice picture sets (negative, related-neutral, random-neutral, or three mixed lists). The auditory task was then performed alone. The cycle of encoding, arithmetic and recall then repeated three more times, once with each of the three experimental picture sets (negative, related-neutral, random-neutral, or three mixed lists). Thus, in the pure list condition participants encoded only a single list of practice pictures and a single list of experimental pictures of each type.

## **Results**

Descriptive statistics summarise the raw data well

Inferential statistics are used and reported appropriately

Data are described THEN analysed

The student shows initiative in the analyses, especially with respect to procedures covered in Y1 and Y2 statistics courses

The raw data was collected by two researchers, and was scored based on the number of pictures correctly remembered. This was done for both the control condition and the experimental conditions (emotional first or neutral first).

Whilst data was collected for three free recall tasks, only the last two recalls were counted in the analysis. This was because the first recall was ran as an extra practice for the participants, and all participants recalled both emotional and neutral stimuli in any order, identical to the control condition. In the control condition, the number of emotional and neutral stimuli remembered for the last two free recall tasks were averaged out to give one number.

The hypothesis that memory for emotional stimuli would be better than memory for neutral stimuli was examined using factorial analysis of variance with two within-subjects factors: picture type (either emotional or neutral) and recall order (emotional stimuli first, or neutral stimuli first).

The analysis demonstrated that the main effect of picture type was significant,  $F(1, 12) = 14.06$ ,  $p < .05$ , partial = .540

The main effect of recall order was also significant,  $F(1, 12) = 8.47$ ,  $p < .05$ , partial = .414

Indicating that

celebrities were significantly quicker to retch

when foods were alive as opposed to dead

However, the interaction between picture type and recall order was found not to be significant  $F(1, 12) = 1.53, p = .240, \eta^2 = .113$

## **Discussion**

Results are related to hypotheses / research questions

Findings are appropriately discussed in relation to broader issues in this area of research

Limitations are identified and discussed in relation to findings

Useful and insightful suggestions for further research are proposed