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Induced Boredom Suppresses the Recall of Positively Valenced Information: A Preliminary Study

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Abstract

The mood-congruence memory (MCM) effect in the case of depressed mood is typically evidenced by enhanced recall of negatively valenced information and/or a corresponding reduction in the recall of positive information. However, the impact of the related affect of boredom on memory has been overlooked. A sample of undergraduate and graduate students (n = 28) were asked to either read an interesting story (Low Boredom condition) or complete a tedious vowel-counting task (High Boredom condition) after studying a list of neutral, negative, and positive words. Following the experimental manipulation, the participants were asked to recall as many words from the list as they could remember. The participants in the low boredom (LB) group reported (i.e., recalled words + misremembered words) significantly more positive words than participants in the high boredom (HB) condition. However, no differences were found between groups in terms of the total number words reported, total number of positive, neutral or negative words recalled, or the overall accuracy of recall. Boredom appears to inhibit the reporting and recall of positively valenced information, but seems to have less influence on the recall and reporting of emotionally negative information than what is typically reported in studies with depressed mood. This finding is consistent with a conception of boredom as an affect state that is more closely tied to the perceived depletion of potential positive reinforcement (e.g., novelty, enjoyment, meaningfulness) than the depletion of negative reinforcement (e.g., escape from suffering, loss, failure). Larger implications of the findings are discussed.

Keywords: boredom, boredom-induction, mood-congruence, memory

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The mood congruence memory effect (MCM) effect refers to the observation that information of a particular affective valence tends to be more readily recalled when one is in a congruent mood state (Blaney, 1986). The MCM effect has been shown to occur in both analog studies in which a sad mood has been induced experimentally (e.g., Bower, 1981; Teasdale & Russell, 1983; Teasdale & Spencer, 1984) and in clinical populations for which the relevant affective state is presumed to be a defining characteristic (e.g., Eden et al., 2015; Russo et al., 2006; Watkins, Mathews, Williamson, & Fuller, 1992).

Although there is some disagreement about the underlying mechanisms that account for the MCM effect in all of its various manifestations, there is an ample and long established body of research that attests to the robustness of the phenomenon (Blaney, 1986; Bower & Forgas, 2000; Lewis, Critchley, Smith, & Dolan, 2005).

For example, in one of the earliest experiments to demonstrate the MCM effect, Isen, Shalker, Clark, and Karp (1978) demonstrated that participants induced into a positive mood state as a result of winning a game were able to recall more positive memories than those who had lost. In another early study, researchers found that participants who had been induced to experience positive and negative moods and then asked to recall either positive or negative memories were much faster at remembering mood-congruent memories (Teasdale & Fogarty, 1979). Similarly, Teasdale and Russell, (1983) had participants study a list of positive, negative and neutral words, and then used the Velten technique (Velten, 1968) to induce either a happy or sad mood. They found that significantly more positive words were recalled in the happy condition than in the sad condition, and that significantly more negative words were recalled in the sad than in the happy condition. Recall of neutral words did not differ between conditions (see also Teasdale & Taylor, 1981; Teasdale, Taylor, & Fogarty, 1980).

It is also true, however, that the MCM has not always been to replicated and there is a general consensus in the field that mood congruent cognition is neither an inevitable nor a universal response, and is sensitive to a host of methodological and contextual factors (Ellis & Ashbrook, 1989; Hasher, Rose, Zacks, Sanft, & Doren, 1985). Attempts to account for these moderating and mediating contextual factors and the mechanisms underlying the MCM effect have led to a variety of theories, the most notable being the affect-as-information-type models (AAI; e.g., Clore & Storbeck, 2006; Schwarz & Clore, 1988) and the affect-infusion model (AI; Bower & Forgas, 2000; Forgas, 1995). A full review of these theories is beyond the scope of this paper (see Buchanan, 2007 for a review) but, in brief, the AAI models can be characterized as a class of theories that posit that the congruency effect is due to an attribution error in which the individual misattributes a current feeling state to a target of attention or memory retrieval. The proponents of the AI model, on the other hand, have argued that a mood congruence effect is more likely to obtain under conditions that call for a high degree of open and constructive cognitive processing, such the free recall of personal information. They suggest that it is under such conditions that the affective “infusion” or priming of the retrieval process is most likely to be determinative in the discrimination of to-be-remembered or to-be-attended information (Bower & Forgas, 2000).

One of the predictions that follow from both theories is that the putative evolutionary function of an affective state should inform the processing strategies, motivations and decision making of the person experiencing the emotion. Hence, if different negative emotional states such as depression, anxiety and boredom have different adaptive functions it would be reasonable to assume that they would also provoke different patterns of mood congruency effects, assuming all other things are equal. For example, this type of distinction has been shown to be the case with anxious and depressive mood states. Whereas an enhanced bias for negatively valenced information has been observed in both clinically depressed and nonclinical (experimentally induced) participants (e.g., Teasdale & Russell, 1983), reliable anxiety-related congruency effects have been found almost exclusively in pathologically anxious or anxiety-prone (high trait anxiety) samples, and typically have been characterized by a bias toward threat-related, negative information (Eden et al., 2015; Russo et al., 2006). Surprisingly, however, the mood congruency literature has been conspicuous in its reticence with respect to boredom, despite the fact that it is arguably the most ubiquitous of the negative mood states.

Boredom: A Different Type of Negative Affect

Although measures of boredom and depression tend to be highly correlated, there is ample evidence to support the argument that boredom and depression are distinctive negative affective states with different functional profiles (see Goldberg, Eastwood, LaGuardia, & Danckert, 2011). Indeed, most researchers seem to agree that the evolutionary purpose of boredom can be characterized in the following way: A subjectively aversive state that signals that the current mode of interaction with the available environment has ceased to be a viable source of positive reinforcement and serves to encourage the exploration of new environments and/or new modes of interaction (Bench & Lench, 2013; Todman, 2003). In other words, boredom can be conceived as a sort of hedonic compass that helps us to avoid squandering valuable resources on environments and strategies that are no longer likely to yield a worthwhile return on the investment. This is in marked contrast to depression, which is often construed as a response to an offending or unyielding circumstance that is perceived to be both distressing and potentially intractable (Hiroto & Seligman, 1975; see also Oakes & Curtis, 1982). It is therefore negative reinforcement (escape) that is desired, something that in true depression is experienced as being unattainable without considerable assistance from others (hopelessness).

That leads to a second important pillar in the boredom research literature, which is that individuals vary greatly in their propensity to become bored. The differences between individuals who are particularly vulnerable to boredom and those who are not, has been a primary focus of much of the boredom research over the last 30 years, with the preponderance of that research centering on the personality trait of boredom proneness (BP; Farmer & Sundberg, 1986). Based on this body of research, there is now general agreement among researchers that a high level of BP is associated with an of array of negative outcomes and dispositions, ranging from pathological gambling (Blaszczynski, McConaghy, & Frankova, 1990) to motivational deficits and community adjustment problems in schizophrenia spectrum disordered individuals (Gerrittsen, Goldberg, & Eastwood, 2015). What is less clear, however, is the extent to which the findings associated with boredom proneness (BP) can be generalized beyond the trait of being highly predisposed to boredom to the actual experience or state of boredom (Todman, 2013, 2003; Todman et al., 2008). For example, it is entirely possible (as it is the case with anxiety) that boredom-specific mood congruency effects are evident only in extreme cases of boredom susceptibility (i.e., analogous to high trait anxiety individuals) or in pathological groups, such as individuals with ADD/ADHD, that are known to have a high susceptibility to boredom (Malkovsky, Merrifield, Goldberg, & Danckert, 2012). Consequently, investigations involving both trait and state forms of boredom are particularly valuable at this juncture.

Lastly, it should come as no surprise that one of the well documented concomitants of being bored is the tendency to experience what is referred to as episodes of mind wandering (Antrobus, 1968; McVay & Kane, 2009, 2010; Smallwood, McSpadden, & Schooler, 2008; Smallwood & Schooler, 2006; Watkins, 2008). Recent research suggests that mind wandering may be the result of a failure by the executive control system to prevent ongoing, automatic streams of task-unrelated-thoughts (TUTs) from breaking into awareness (McVay & Kane, 2010). Mason et al. (2007) have suggested that TUTs originate in the neural default network, which they describe as a critical ingredient in the capacity to project ourselves into alternate times, environments and perspectives (i.e., imagining the future and reimagining the past). They also note that this self-projection process can be triggered by internal (e.g., an emotional state like boredom) and/or external cues (e.g., second hand cigarette smoke for a former smoker).

Given the presumed functional role of boredom, which is to motivate the individual to seek an alternate environment or an alternate mode of engagement, mind wandering as a concomitant to boredom makes sense. Indeed, when performing a boring task for which there is at least an implicit injunction or constraint against changing or leaving the situation (e.g., in a lab study or working as an air traffic controller or an assembly line worker) an increased reliance on TUT's as a means of self-projection to an alternate and potentially more reinforcement-rich environment (i.e., positively valenced thought content) has an appealing adaptive logic. However, TUT's come with a potential cost in that they can interfere with the demands of the task at hand (e.g., accurate recall of words from the study list). On a standard mood congruence memory task this could be manifested in performance deficits (due the direct effects of interference with the recall process) and possibly a reduction in performance confidence. More than likely, however, and to varying degrees of success, the bored individual might try to avoid these undesirable outcomes by attempting to limit the interference from TUT intrusions through increased executive control. To the extent that this effortful and deliberate activity frustrates a normal coping response (mind wandering), one could speculate that this lowering of expectations of positive reinforcement might also limit the amount of positive affect that would normally be available to "infuse" or prime the retrieval process per the AI model (Bower & Forgas, 2000). This conjecture, if correct, would predict a diminished bias for positive memorial items in boredom induced individuals and less of an impact on negative and neutral to-be-recalled items. Less certain, however, is whether high levels of trait boredom (boredom proneness) as is the case with anxiety, is a necessary precondition for congruency effects to obtain.

In one of the few studies to study the effects of boredom on memory, Van Tilburg and colleagues have been able to demonstrate in series of experiments that boredom-induced individuals are more likely to recall a nostalgic memory when asked to retrieve an unspecified past event than individuals who were not similarly induced (Van Tilburg, Igou, & Sedikides, 2013). Although the authors do not make the connection explicit, it would not be unreasonable to consider spontaneous nostalgic reverie to be a subgenre of mind wandering. What is different about the Van Tilburg, Igou, and Sedikides (2013) position, however, is the contention that nostalgic reverie is a self-regulatory coping response to feelings of meaninglessness that emerge in states of boredom, and that this function supersedes any direct role that it may play in counteracting negative affect. This interpretation by Van Tilberg and his colleagues is instructive for variety of reasons, not least of which is that it raises the possibility that induced boredom, somewhat paradoxically, might actually increase the level of positive affect in individuals who are given an opportunity to cope with their boredom through nostalgic mind wandering. It is possible that many of the subjectively unpleasant aspects of boredom may come not from the TUT's or the contexts that trigger them, but rather from the resulting conflict with the mechanisms (internal and external) that are deployed to constrain them (e.g., executive controls, injunctions against leaving the environment, task demands and so on).

The Present Study

The current study is the first that we are aware of that has explored the possibility of a boredom-specific, mood-congruency effect with respect to free recall in a sample of boredom-induced participants. We conjectured that several outcomes were possible, including the following:

1. Despite being a negative emotional state, the pattern of recall among boredom-induced individuals would prove to be no different than that of non- bored controls.
2. Given the relatively high correlation between the affective states of boredom and depression it is possible that induced boredom affects recall in much the same way as depressed mood. In other words, there would be a discernable and significant bias for negatively valenced items, along with diminished recall for positively valenced items.
3. On the other hand, it is possible that the attempts to limit interference (through heightened executive control) from what are likely to be predominantly positively valenced TUTs would have the unintended effect

of also dampening the recall of positively valenced memorial items. One way to account for this would be to presume that executive control processes used to limit the access of TUTs to awareness also limit the amount of positive “affective infusion” that is available to facilitate the recall of affectively congruent memorial information (Bower & Forgas, 2000). This would result in a pattern of poorer recall of positive items than non-bored individuals but probably far less pronounced differences in terms of negative and neutral items;

4. Finally, it is possible that all of the above mentioned outcomes could be contingent upon an interaction between individual differences in the predisposition to become bored (i.e., boredom proneness) and the conditions that induce boredom. In other words, it is quite possible that the only way that a boredom-related congruency effect is made apparent is when high boredom prone individuals are the subject of study.

Method

Participants

A sample of 28 students were recruited from the graduate and undergraduate populations at the New School University. All of the participants spoke English as their primary language, and ranged between 20 and 32 years of age (M = 25.8, SD = 4.05). Eighteen of the participants were female, with the majority of sample self-identifying as Caucasian (N = 24; 85.7%). Two individuals self-identified as Hispanic (7.1%) and two self-identified as other (7.1%).

Measures

Boredom Proneness Scale (BPS)

Developed by Farmer and Sundberg (1986) to assess the personality trait associated with the propensity to become bored, the BPS is a 28-item, self-report scale presented in either true or false format or, as in the current study, on a seven-point Likert scale with items ranging from strongly agree to strongly disagree. With a Chronbach’s alpha coefficient of .79, the BPS has been shown to have adequate internal consistency, as well as good test-retest reliability for both females and males (Farmer & Sundberg, 1986). In terms of construct validity, the authors have been able to find converging correlations with a number of conceptually related measures such as the Lee's Job Boredom Scale (LBS; Lee, 1986) and the Boredom Susceptibility Scale (BSS: Zuckerman, 1971).

State Boredom Measure (SBM)

The State Boredom Measure (SBM) is an eight question self-report inventory developed by Todman (2013) that permits the sampling of an individual’s recollections, attributions, and perceptions surrounding boredom episodes during a circumscribed period of time in the recent past (usually 1-3 weeks). Conceived as a memory-based analogue to the Experience Sampling (ES) technique (Csikszentmihalyi & Larson, 1987), the SBM asks participants to sample their recollections about past episodes of boredom and to rate the quantity and quality of those experiences using a 7- point Likert scale.

Typically, the responses to the eight items on the SBM are analyzed separately but they can also be combined to form a summary score. Four of the eight SBM items were used in the present study. They consisted of following items: Item 1 (frequency): How often can you remember feeling bored over the last three weeks; Item 2 (frequency of extended periods of boredom): How often can you remember feeling bored for longer than 3hrs at a time over the last three weeks; Item 4 (aversiveness): During the last three weeks, how unpleasant has the experience of boredom been for you; Item 5 (impact on quality of life): How much of an impact has boredom had on the quality of your life over the last three weeks.

Although the SBM does not have a formal summary score, it does have good internal consistency (Chronbach's Alpha = 0.81), with item-total correlations ranging from .73 to .36 and test-re-test reliability ranging from .69 to .41, across the eight items in a sample of 160 adults (age range = 24 to 65 years) (Todman, 2013). In terms of validity, the total score and all of the individual SBM items were found to have significant correlations with the most widely used measure of trait boredom, the Boredom Proneness Scale (BPS; Farmer & Sundberg, 1986). Five of SBM items were also found to be correlated with the total score of the Boredom Susceptibility Scale (BSS: Zuckerman, 1971); a finding that is not inconsistent with the modest correlation that is typically found between the BPS and BSS (Farmer & Sundberg, 1986; Vodanovich, 2003).

Procedure and Materials

The study was conducted in a laboratory in the psychology department at the New School University in New York City and approved by the New School's IRB. During the study, participants were seated at an office desk located near the entrance to the laboratory. In order to minimize distractions, phones and clocks were removed from the room. After signing the informed consent form, participants were then given 2 minutes to study a list of 24 words selected from the Teasdale and Russell (1983) study. The study list included eight positive personality trait words, eight negative personality trait words, and eight neutral nouns. The words were written in a vertical list on a blank 8.5 by 11 inch sheet of paper. The order of the words were not counterbalanced and were presented to each participant in the following sequence: trombone, caring, golf, thoughtful, heartless, dishonest, brass, warm-hearted, likeable, vanilla, depressed, impolite, mountain, trustworthy, desk, unfriendly, spiteful, ungrateful, friendly, good-natured, hand, happy, jacket, worthless.

After the learning phase of the study, participants completed a brief demographic form and were then randomly assigned to either the High Boredom (HB) or Low Boredom (LB) condition. In the LB condition, participants were given 10 minutes to read a short story, titled "Beware of the Dog", taken from a book of short stories by Roald Dahl. In the HB condition, participants were engaged in a boredom induction procedure for 10 minutes, which entailed counting the number of vowels in random collection of paragraphs of text taken from a variety of sources that included an economics textbook and a computer manual.

Immediately following the study manipulation, participants in both conditions were given a blank sheet of paper on which they were asked to write down as many words as they could remember from the previously studied list. Participants were given 10 minutes to complete the recall phase of the task.

Manipulation Check: In order to ensure that the experimental manipulation produced the desired result, and following the recall portion of the study, participants in each condition were presented with an eight-question rating form. On the form, they were asked to rate the task that they had been assigned to perform and the feelings that it engendered on a five-point Likert scale, indicating the extent to which they felt the task was anxiety provoking, amusing, difficult, boring, enjoyable, tiring, tedious, and depressing.

Finally, subjects completed the SBM and BPS and were debriefed by the experimenter.

Results

Two separate one-way, analyses of variance (ANOVA) were computed using the Boring and Tedious items on the manipulation check rating scale as dependent variables and condition as the independent variable. This analysis confirmed that participants in the HB group found the vowel counting task to be significantly more boring (M = 3.6 vs M = 2.0), $F(1, 23) = 10.7$, $p = .003$ and tedious (M = 4.2 vs. M = 1.9), $F(1, 23) = 18.3$, $p < .001$, than participants in the LB condition. Also as expected, the reading task in the LB condition was found to be significantly more enjoyable than the vowel counting task (M = 3.3 vs M = 1.2), $F(1, 23) = 25.0$, $p < .001$.

Table 1 summarizes the means and standard deviations for the SBM and BPS measures, as well as the dependent variables (i.e., word recall and reporting indices), across both study conditions. Four outliers were identified and removed from the analyses, thus bringing the total number of participants to 24. With the exception of the total number of positively valenced words reported ([PRp]; i.e., positive words recalled from the study list + positive words reported that were not on the list), which was greater for the LB group (M = 3.92, SD = 0.99) than the HB group (M = 2.92, SD = 0.90), $F(1,23) = 6.66$, $p = .02$, there were no differences found in terms of any of the key variables, including the SBM, the BPS and the demographic indices. It is also worth noting that when the comparison involving positive words was limited to the number of remembered positive words from the study list ([PRc]; i.e., not including falsely remembered positive words that were not on the study list), the mean difference between the HB (M = 2.50, SD = 1.17) and LB (M = 3.08, SD = 0.90) groups failed to reach statistical significance, $F(1,23) = 1.89$, $p = .18$.

In terms of the key recall and reporting variables, a series of paired sample t-tests revealed that participants recalled significantly more neutral words (M_{neu} = 4.54, SD = 1.44) than either positive (M_{pos} = 2.79, SD = 1.06), $t(23) = -5.29$, $p < .001$, or negative words (M_{neg} = 2.05, SD = 1.33), $t(23) = -6.41$, $p < .001$; and tended to recall more positive words (M_{pos} = 2.79) than negative words (M_{neg} = 2.05), $t(23) = 2.27$, $p = .03$. There were, however, no differences found across the three word categories with regard to the number of reported words that were not on the list (i.e., false memories). Interestingly, when the HB and LB groups were analyzed separately, a similar pattern of results emerged but with one exception: in the case of participants in the HB condition, the mean number of positive words recalled (M_{pos} = 2.50, SD = 1.17) did not differ significantly from the mean number of negative words recalled (M_{neg} = 2.25, SD = 0.97; $t(23) = .67$, $p = .515$).

As expected, BPS mean total scores were highly correlated with the mean scores of each the four SBM items (Table 2). However, a separate analysis revealed no significant associations between the two measures and any of the dependent measures (i.e., total words reported, total words recalled [words reported from the study list], total positive, negative and neutral words reported, and total positive, negative and neutral words recalled [positive, negative and neutral words reported from the study list]). Moreover, this occurred, both when the study condition was controlled for and when it was not. In short, no evidence was found to indicate that differences in trait boredom or recent experiences with boredom had an impact on recall performance in the study.

Table 1

Mean Recall and Boredom Scores for High and Low Boredom Participants

	Total (*n* = 24)		Hi Boredom (*n* = 12)		Lo Boredom (*n* = 12)		
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*p*
TRc	9.50	2.47	9.33	2.67	9.67	2.35	.75
PRc	2.79	1.06	2.50	1.17	3.08	0.90	.18
NgRc	2.05	1.33	2.25	0.97	1.83	1.64	.46
NuRc	4.54	1.44	4.50	1.24	4.58	1.68	.89
TRp	10.96	1.83	10.50	1.78	11.42	1.83	.23
PRp	3.42	1.06	2.92	0.90	3.92	0.99	.02
NgRp	2.54	1.47	2.58	1.00	2.50	1.88	.89
NuRp	4.96	1.52	5.00	1.21	4.92	1.83	.90
BPSt	112.75	12.24	113.25	8.23	112.24	15.66	.85
SBM1	4.67	1.88	4.92	1.73	4.42	2.07	.53
SBM2	5.58	1.79	6.00	1.21	5.17	2.21	.26
SBM4	4.50	1.79	5.00	1.41	4.00	2.01	.18
SBM5	5.04	1.68	5.42	1.24	4.67	2.02	.28

Note. TRc = Total words recalled (only words correctly recalled); PRc = number of positive words recalled; NgRc = number of negative words recalled; NuRc = number of neutral words recalled; TRp = Total words reported (words correctly recalled + reported words not on list); PRp = number of positive words reported; NgRp = number of negative words reported; NuRp = number of neutral words reported; BPSt = Boredom Proness Scale total score; SBM1 = State Boredom Measure - item 1: How often were you bored in the last three weeks? SBM2 = item 2: How often were you bored for more than three hrs at a time in the last three weeks? SBM4 = item 4: How unpleasant has boredom been for you in last three weeks? SBM5 = item 5: How much of an impact has boredom had on your life in the last three weeks?

Table 2

Pearson's Product Moment Correlations Between SBM Subscales and BPS (N = 24)

Measure	1	2	3	4	5
1. BPSt					
2. SBM1	.51*				
3. SBM2	.51*	.83**			
4. SBM4	.53*	.59**	.66**		
5. SBM5	.64**	.87**	.86**	.69**	

Note. BPSt = Boredom Proness Scale total score; SBM1 = State Boredom Measure - item 1: How often were you bored in the last three weeks? SBM2 = item 2: How often were you bored for more than three hrs at a time in the last three weeks? SBM4 = item 4: How unpleasant has boredom been for you in last three weeks? SBM5 = item 5: How much of an impact has boredom had on your life in the last three weeks?

*$p < .05$. **$p < .01$.

In order to further address the question of whether induced boredom differentially affected the reporting of emotionally valenced words, a multivariate analysis of covariance (MANCOVA) was conducted using condition (HB vs LB) as the independent variable and the total number of items reported at recall in each of the three word categories ([PRp; NGRp; NuRp]- i.e., accurately recalled words + misremembered words not on the list) as the dependent variables. The BPS scores and the total number of recalled words (TRc) from the study list served as covariates. As shown in Table 3, the linear combination of the three dependent variables failed to discriminate between the two boredom groups, Wilks'Λ = .71, $F(3, 18) = 2.46$, $p = .10$, but a significant main effect was found in the follow-up univariate ANOVA for positive words $F(1, 20) = 6.24$, $p < .02$, $\dot{\eta}^2 = .24$, with participants in the HB condition reporting significantly fewer positive words than participants in the LB condition ($M_{exp} = 2.92$, $SD = 0.90$ vs $M_{cont.} = 3.92$, $SD = 0.99$). By contrast, the differences in terms of both the number of neutral words and negative words reported by participants in the low boredom and high boredom conditions failed to reach significance (Negative words: $M_{exp} = 2.58$, $SD = 1.00$ vs $M_{cont.} = 2.50$, $SD = 1.88$; Neutral words: $M_{exp} = 5.00$, $SD = 1.21$ vs $M_{cont.} = 4.9$, $SD = 1.83$).

Table 3

Multivariate Analysis of Covariance for Total Words Reported by Type

		Source				
Variable	**Word Type**	***df***	**Mean Square**	***F***	**$\dot{\eta}^2$**	**Wilks'Λ**
TRc		3		2.53	.76	.24
	PRp	1	0.62	0.67	.03	
	NgRp	1	9.86	5.69*	.22	
	NuRp	1	10.89	5.66*	.22	
BPSt		3		1.52	.20	.80
	PRp	1	0.43	0.46	.02	
	NgRp	1	6.64	3.83	.16	
	NuRp	1	2.58	1.34	.06	
Condition		3		19.11	.29	.71
	PRp	1	5.83	6.24*	.24	
	NgRp	1	0.28	0.16	.01	
	NuRp	1	0.13	0.07	.00	
Error		18				
	PRp	20	0.93			
	NgRp	20	1.73			
	NuRp	20	1.92			

Note. Condition = High boredom vs Low Boredom. TRc = Total words recalled correctly from study list (covariate). BPSt = Boredom Proness Scale total score (covariate). PRp = number of positive words reported). NgRp = number of negative words reported). NuRp = number of neutral words reported. TRc = Total words recalled correctly from study list (covariate). BPSt = Boredom Proness Scale total score (covariate).

**p* < .05.

Because participants in both conditions reported a significant number of words at the time of recall that were not on the study list, a second analysis was conducted using the ratios of the number of correctly recalled words in each of the three word categories to the overall number of words actually reported. The derived ratios for the positive and negative words were then used as the within-subject factor in a two-factor (2x2) mixed analysis of covariance (ANCOVA), with the boredom condition as the between-subject factor and controlling for the total number of words reported.

As shown in Table 4, there was a significant condition x word type ratio interaction $F(1, 21) = 5.94$, $p = .024$, $\dot{\eta}^2 = .22$, in which the HBgroup demonstrated comparable levels of recall for positive ($M = 25.83\%$, $SD = 7.85$) and negative words ($M = 24.31\%$, $SD = 7.65$), whereas the LB group remembered a decidedly larger proportion of positive words ($M = 33.23\%$, $SD = 11.19$) than negative words ($M = 17.61\%$, $SD = 13.17$). Moreover, as expected, the pairwise comparison of the within- subject estimated means confirmed that the proportion of positive words accurately recalled by the study participants ($M = 29.58\%$) was significantly larger than the

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proportion of negative words recalled (*M* = 20.96%), with most of the difference being attributable to the large disparity in the recall of the two word types among the LB participants.

Table 4

Mixed Two-Way Factorial Analysis of Covariance for Recall of Positive and Negative Words From Study List (N = 24)

Source	*df*	Mean Square	*F*	η^2
Between subjects effects				
TRp	1	109.53	1.25	.05
Cond	1	2.83	0.03	.00
Error (cond)	21	87.48		
Within subjects effects				
Word Type Ratio	1	287.14	2.41	.10
Word Type Ratio x TRp	1	24.31	1.30	.06
Word Type Ratio x Cond	1	708.46	5.90*	.22
Error (Word type)	21	119.34		

Note. Cond = Hi vs. Lo boredom groups. TRp = Total number of words reported (covariate). Word Type Ratio = Ratio of correctly recalled positive words/Total number of words reported) vs Ratio of correctly recalled negative words/ Total number of words reported.
*$p < .05$.

Discussion

The present study examined the relationship between state boredom and memory recall and found evidence to suggest that not unlike the findings from studies of depressed mood, participants induced into a bored state prior to retrieval appear to report fewer positively valenced items than non-bored controls. The findings are somewhat less clear, however, with respect to the impact of boredom on negatively valenced items. Although the significant interaction effect in the two-factor mixed ANCOVA suggests that the observed differences in the recall of negative words could become statistically significant in a larger sample, it is also worth noting that the means for positive and negative words reported by individuals in the high boredom condition were not statistically different, and the two groups did not differ in any other respect. Indeed, the participants in the high and low boredom conditions did not differ in terms of the total number of words recalled, number of additional misremembered words (words not on study list), or the percentage of neutral and negative words reported and accurately recalled. Furthermore, the results do not appear to have been affected by differences in trait boredom (BPS) or differences in the perceived prevalence and impact of boredom on recent everyday functioning (SBM). This latter finding strongly suggests that unlike the anxiety-related MCM effect, the boredom-related congruency effects are not limited to extreme trait-based differences in the susceptibility to boredom.

The finding that fewer positive words are reported by bored individuals is consistent with both the boredom-is-like-depression view and the boredom-is-a-distinct affect position. However, the absence of a corresponding and confirmed bias for negative words among the members of the HB group is not consistent with many of the MCM findings for depression. Although it is possible that too few negative words were a recalled and reported by both groups to effectively discriminate between the groups, the fact remains that there were nearly identical rates of recall for negative words across groups, and the rates of recall of neutral words were similarly indistinguishable, despite the fact that neutral words was the best recalled category of words for both groups.

It is a pattern, however, that is consistent with the possibility that boredom is associated with a distinct and unique MCM effect. As was suggested previously, one possible explanation for such a pattern may be that by attempting to limit the intrusion of TUTs via heighted executive control, the individual also frustrates and disables a normal and usually effective coping response to a boredom–inducing environment, which is the tendency to engage in mind wandering. Consequently, the bored individual is far more likely to become acutely aware of the diminished potential for positive reinforcement from their current engagement with the environment, which in turn would lower the amount of positive affect that could be made available to facilitate the retrieval of congruent memorial information via “affective infusion” (Bower & Forgas, 2000). Moreover, because escape or relief from a noxious or distressing situation (i.e., negative reinforcement) is less of a motivating factor in contexts that promote boredom than in the case in depression-inducing environments, one would not expect that there would be an equally large increase in negative affect. The results from the current study are consistent with this notion.

The current study has a number of important weaknesses that limit the confidence that can be placed in the present findings, not least of which is the extremely small sample size. However, it is not unreasonable to argue that a small sample size should have made it more difficult to detect differences between the control and experimental groups, not less so, especially in cases where there are non-trivial effect sizes. Another methodological concern is the fact that the presentation of the to-be-recalled list of words was not randomized or counterbalanced across participants. Consequently, we cannot rule out the possibility of order effects, especially in the form of a study condition x word order interaction. A third and important limitation of the current study is the absence of a depressed mood condition. Obviously a direct comparison with such a group would be desirable if we hope to buttress the conjecture made in the current paper that the memory congruency effects observed during depressed and bored emotional states are meaningfully different from each other. Similarly, the study design did not make it possible to distinguish between response bias and true recall bias. For example, it is entirely possible that the obtained pattern of findings could be accounted for by differential levels of confidence among the study groups in their ability to accurately recall the positively valenced words. Future studies should probably endeavor to measure confidence levels in addition to accuracy. Finally, the study did not include a direct assessment of the hypothesized TUT’s. The fact that the high boredom participants were not actually engaged in the boring task when attempting to recall the target words, makes this even more critical, as we cannot be certain that the participants were still bored at the time of recall. In short, the mechanisms proposed to account for the findings make three critical assumptions that still await future confirmation: That the boredom state induced by the study manipulation carried over to the recall task; that the boredom state induced higher rates of TUTs; and that this increase rate of TUTs also carried over to, and threatened to interfere with, the recall task. None of these assumptions were tested directly in the current study.

As a final note, it is worth mentioning that while there were no statistical differences found between the study groups in terms the mean scores for the BPS and the four SBM items, all of the means for the HB group were slightly higher than those of the LB group. This apparent trend may reflect the fact that these measures were administered after the completion of the recall task and introduces the possibility that the experimental induction of boredom colored recollections and judgments about experiences from the more distant past in a way that made those experiences seem more boring, albeit perhaps minimally. Since the differences were not significant in the current study, this can only be considered conjecture, but it is not inconsistent with what would be expected based on past memory congruency research, and thus perhaps an avenue for future exploration.

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Competing Interests

The authors declare that no competing interests exist.

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