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THE EFFECTS OF PSYCHOLOGICAL DISTRESS AND RETENTION INTERVALS ON THE FADING AFFECT BIAS AND RESPONSE TIME

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by

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Abstract

The Fading Affect Bias (FAB) is a phenomenon in which emotions associated with negative memories generally tend to fade faster over time than those of positive memories. Although researchers have shown that this phenomenon tends to be reversed in individuals who are diagnosed as depressed, less is known about the degree to which varied or general levels of psychological distress impact this phenomenon. Further, less is known about the impact of varied retention intervals not only on the Fading Affect Bias, but also the degree to which the memories are recalled in a similar manner. The aim of this thesis was to shed additional light on thew two issues by focusing on individuals reporting experiencing varied levels of psychological distress (e.g., anxiety, stress, and depression/dysphoria) over extended time intervals. Drawing upon the available research findings published to date, both the affect intensity of FAB and the latency of time to recall the content of past events were predicted to increase as a function of the time since the events occurred. In general, we expected to see greater decreases in fading for negative events (as assessed by the scores on the 21 item Depression Anxiety and Stress scale) and recall time when compared to positive events. Overall, recall time was higher for positive memories and fading was greater for negative memories. In short, psychological distress also had statistically significant impacts on response time and the Fading Affect Bias.

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Introduction

Memory Encoding and Recall

Memory, the ability to retain and subsequently recall, is a rudimentary biological function essential for survival (Bisaz et al., 2014). To expand upon, memory is the psychological process of receiving, storing, retaining, and later retrieving information. Furthermore, human memory encompasses mental state, also known as mental property, which is the state of mind of a person. Notably, a person's mental state encompasses desire, intention, pain experience, belief, perception, emotion, and memory.

Short-term memory consists of storing and recalling information for brief periods, usually a few seconds; whereas long-term memories refer to information that is stored for extended periods, often throughout one's entire life (Bisaz et al., 2014). Long-term memories can be categorized into two types, declarative and procedural. Declarative memories consist of past life experiences/events and facts like birthdays and what one consumed the previous night, whereas procedural memories refer to information typically learned throughout one's life (e.g., walking, riding a bike, driving a car, etc.) (Byrne, 2020).

Declarative, also referred to as explicit memories, can be further divided into three subtypes--episodic, semantic, and autobiographical. Episodic memory consists of firsthand experiences that happen to a person, whereas semantic memory pertains to general information and facts. Autobiographical memory consists of all events that have occurred throughout a person's life and are thought to provide the individual an idea of who they are as a person. Autobiographical memory is frequently confused with episodic memory; however, it is a combination of both episodic and semantic (Bauer, 2015).

Memory recall is the action of retrieving information or events from the past. For a memory to be stored for later usage, it first must be successfully encoded. Researchers have long believed that memories form due to changes in nerve cells/neurons. Memories are created and formulated when existing neuronal connections are strengthened or new connections are made. External and internal reminders serve to cue or recall vivid memories; in which, the metamorphosis of a simple cue to a full-blown memory can take place very quickly, typically occurring within 500-1,500 milliseconds (Staresina & Wimber, 2019).

Mood and Memory

Context-dependent memory has been discussed in the psychological literature since the 1950s and refers to the finding of memory recall being stronger when one is present in similar environments in which the memory was originally formed (Hupbach et al, 2008). Context-dependent memory presumes that retrieval cues are necessary to enable recall (Isarida & Isarida, 2014). Context-dependent memory is episodic and can be brought upon by external reminders (i.e., environmental factors like setting, music, smell, etc.) or internal reminders (i.e., mood; Hupbach et al., 2008). The physical reinstatement of environmental cues for context-dependent memory recall is not always possible; thus, the reinstatement/recollection of said episodes is retraced in memory (Isarida & Isarida, 2014).

Memory recollection frequently evokes an emotional response and, as shown by Levine and Burgess (1997), individuals who exemplify positive moods are more likely to recall information presented to them than those who are in negative moods. Subsequent research revealed that the emotional response evoked by positive memories is often stronger than that evoked by negative memories (Skowronski et al., 2014).

Walker and his colleagues (Gibbons et al., 2022; Walker et al., 2003), who began to delve more deeply into these phenomena coined the term the Fading Affect Bias (FAB) in 2003. The ability to exert control over memories has substantial implications for cognitive functioning and psychological well-being as well (Paz-Alonso et al., 2009). Clinicians have found that anxiety, depression, and other related psychopathologies are associated with high ratios of unpleasant thought processes (Gibbons et al., 2010). The FAB is believed to occur because of cognitive, biological, and emotional qualities that lessen the unfavorable effects of unpleasant events which minimize their significance by keeping them grounded (Gibbons et al., 2022).

Maintenance of psychological well-being can thus be viewed as resulting from autobiographical memory being typically biased toward positive events in mentally healthy individuals (Hitchcock et al., 2020). While one research camp deems the fading affect bias as a healthy coping mechanism, others view it as being more of a hindrance as it can cloud one's true judgment and outlook on reality (Gibbons & Lee, 2019). Furthermore, Walker & Skowronski (2009) found that the FAB was exhibited within non-depressed individuals as well, but not by individuals experiencing mild depression. The FAB is negatively associated with dispositional mood, dysphoria, anxiety, and stress (Gibbons et al., 2022); thus, the FAB can be disrupted and is dependent upon an individual's mental state and scenario (i.e., depression/negative emotional state and continuous psychological stress.).

Depression is a mood disorder that negatively influences the way an individual thinks, feels, and acts (American Psychiatric Association, 2022). Major depressive disorder is associated with weakened memory recollection; however, little is known about the neural apparatus responsible for this deficit (Kane et al., 2019). While depression is often defined as a mood disorder with no single cause and many triggers, stress is a common factor (American Psychological Association, 2019), one that merits further discussion.

Stress is the body's response to anything that requires attention or action and can be defined as any classification of change that causes psychological, physical, and/or emotional strain (American Psychological Association, 2019). Whether the danger sensed is real or imagined, the body has an automatic "fight-or-flight" response, also known as the "stress response." Stress can cause acute and even chronic brain changes, leading to long-term damage if left untreated. Most frequently, the over-secretion of stress hormones can impair memory, and while this can lead to the enhancement of short-term immediate recall, it often delays long-term memory recall (Kim et al., 2015).

Holmes (1970) was perhaps the first investigator to suggest the existence of a persistent positivity bias in memory based on the observation that the affect for pleasant events was remembered better than those for unpleasant events which led to pleasant events being recalled better. He attributed this to the existence of a persistent positivity bias in memory. Contrary to Holmes, Walker et al. (1997) proposed that the differential fading of event affect was due to enhanced recall of pleasant events. Although event recall was measured objectively by Holmes (1970), it was further investigated and suggested that he assumed incorrectly on his findings that fading affect could account for the differences found in event recall (Gibbons et al., 2022).

Retention Intervals

Pioneering research in the area of autobiographical memory shows participants remember more pleasant than unpleasant memories over extended retention intervals ranging from 2 to 140 days (Gibbons et al., 2010). Research also shows that the FAB increases over 3-month, 9-month, and 4.5-year intervals (Gibbons et al., 2010). The FAB has been observed to follow a somewhat set cycle, as it typically emerges within the first 12 hours, stabilizes for approximately 3 months, and then becomes more pronounced across retention intervals greater than 3 months (Gibbons et al., 2022). Additionally, not much is known about how varied retention intervals impact and/or affect the magnitude of the FAB (Gibbons et al., 2010). Though much remains to be explored, Hitchcock et al. (2020) focused on assessing the possibility of positive memory biases and how they are lessened in individuals diagnosed with mental health problems.

The psychological effects of depression and negative emotional states have been examined and documented in a range of studies including dispositional mood (Ritchie et al., 2009), dysphoria (Gibbons & Lee, 2019; Walker, Skowronski, Gibbons, et al., 2003), and stress (Gibbons et al., 2017; Gibbons & Lee, 2019). However, the number of studies on the cognitive effects is disproportionate. Though depression and negative emotional states can change the way the brain functions, it is often described as a psychological disorder that affects mood and emotion. The Depression Anxiety and Stress Scale-21 Items (DASS-21) has frequently been used to measure different forms of emotional distress in clinical and research settings (Osman et al., 2012). While the DASS-21 purports to provide valid, minimally overlapping measures of depression, anxiety, and stress, subsequent psychometric investigations have questioned the utility of these subscales, with most researchers finding the overall or total score to provide a sound measure of overall distress (Osman et al., 2012). More recently, Lee et al.'s (2019) extensive review provided acceptable support for the criterion validity of the depression subscale.

Current Study

<u>Overview</u>

The current study consists of a secondary analysis of select portions of a comprehensive data set, collected on a nearby campus, that was designed to explore the role of psychological distress and time since event occurrence of significant positive and negative events through the lens of the FAB concept (Gibbons & Lee, 2019; Walker, Skowronski, Gibbons, et al., 2003). More specifically, the aims were to explore: (1) differences and interactions in memory recall time as a function of memory type and length of retention intervals, (2) whether any differences and interactions in affect intensity ratings were a function of memory type and/or retention interval, and (3) the extent to which the FAB occurred was impacted by the presence of depression or specific forms of dysphoria (e.g., anxiety, stress, and depression).

Hypotheses:

Drawing upon the available literature, we hypothesized that recall time would be greater for negative memories than to positive memories and that the difference would be magnified as the recall intervals increased in length. As FAB is disrupted in individuals who are experiencing dysphoria, we further predicted recall time would be greater for positive memories as a result of higher Total DASS-21 scores.

Considering the findings from FAB research reported to date, we hypothesized that the FAB would be more prevalent when recalling negative events versus positive events. We expected to see less fading in the FAB for negative events as a result of psychological distress (measured using the DASS-21).

Methods

Participants

The data analyzed in the current study were collected previously from a sample of 52 undergraduate students attending a private university in the Mid-South. Participants were recruited through the university's psychology participant pool, and via signs, electronic announcements, and verbal communications distributed across campus. Given that the main study collected electroencephalography (EEG) data as well, participants who had hair caps that prevented gel and electrodes from contacting the scalp were excluded from the study. Two cases were excluded due to missing or incomplete response time data. All procedures implemented in the initial study were approved by that university's IRB. None of the data made available for the present analyses contained any identifying information, with all procedural aspects submitted and approved by the University of Memphis IRB.

Materials

Information was presented to participants using Super Lab, which also recorded the behavioral data for these analyses. Data includes de-identified behavioral and self-report data. Two self-report measures, described below, were collected to assess emotional state/response.

Depression, Anxiety, and Stress Scale-21 (DASS-21)

The DASS was developed by Lovibond and Lovibond (1995) to comprehensively measure 3 common, highly-related negative emotional states of depression, anxiety, and stress (or tension) in a brief, integrated manner. The 42 initial items were subsequently reduced to 21, with each of the 3 subscales comprised of 7 items. Each item is rated on a 4-point scale (where 0 = "Did not apply to me at all", 1 = "Applied to me to some degree, or some of the time", 2 = "Applied to me to a considerable degree or a good part of time", and 3 = "Applied to me very much or most of the time"). As described in the manual:

The depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest / involvement, anhedonia, and inertia. The anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The stress scale is sensitive to levels of chronic non-specific arousal. It assesses difficulty relaxing, nervous arousal, and being easily upset / agitated, irritable / over-reactive and impatient. (Lovibond & Lovibond, 1995).

The 7 separate rating values for each scale are totaled allowing them to be placed within 1 of 5 severity levels: “normal”, “mild”, “moderate”, “severe”, or “extremely severe”. From there, scores from each scale are added together and multiplied by 2 on the 21-item version to make it comparable to the full version.

Preliminary investigations of key psychometric properties compared the depression and anxiety DASS subscales to 2 more well-known scales that provided separate measures of depression (the Beck Depression Inventory, Beck et al., 1961) and anxiety (Beck Anxiety Inventory, Beck et al., 1988), revealing acceptable levels of correlation. While the DASS-21 purports to provide valid, minimally overlapping measures of depression, anxiety, and stress, subsequent psychometric investigations have questioned the utility of these subscales, with most researchers finding the overall or total score to provide a sound measure of overall distress (Osman et al., 2012). More recently, Lee et al.’s (2019) extensive review provided acceptable support for the criterion validity of the depression subscale. Given the continuing questions about the validity of using either subscale in isolation, only the DASS-total score (which ranges from 0 to 63 for the 21-item DASS, and 0 to 126 for the 42-item DASS) wherein higher scores indicate greater severity and/or frequency of negative emotional states) have been used in the analyses to follow.

Self-Assessment Manikin (SAM)

The SAM (Bradley & Lang, 1994) is a brief, non-verbal, picture-oriented tool designed to measure 3 key features of an emotional response that Lang et al. (1993) had earlier identified as central—pleasure, arousal, and dominance. Early versions of the SAM asked respondents to rate their responses to a series of simple characters experiencing various levels of emotional responses of interest on 21-point scales. Currently, the SAM measures valence/pleasure of the response (positive to negative), perceived arousal (high to low), and perceptions of dominance/control (low to high levels) (Bynion & Feldner, 2020). In the present study, the valence self-assessment manikins (V-SAM) and arousal self-assessment manikins (A-SAM) were utilized. Participants were instructed to select 1 of 9 images that reflected their current "emotion" (V-SAM; where 1 = "Unhappy", 5 = "Neutral", and 9 = "Happy"), as well as their current "arousal" (A-SAM; where 1 = "Calm", 5 = "Neutral", and 9 = "Aroused") at various points during the study.

Procedure

Written informed consent was obtained upon arrival with each participant being assigned a separate number to ensure confidentiality and allow the researchers to identify and match data files and descriptions of events recalled. Participants were seated in a private room at a table with a computer and monitor at which they completed recall and self-report tasks as described in (refer to *Table 1*). Instructions to sit quietly and relax were provided on the computer screen, and participants were asked to rate their current state of emotion and arousal using the respective self-assessment manikins.

The prompts were delivered in a random order, and each prompt was presented three times during the study. Participants were prompted to press the spacebar to indicate the point at which the specific memory was recalled. SuperLab tracked the time (ms) it took each participant to recall an event from the moment the prompt appeared on the screen until the participant pressed the spacebar (signaling that the memory has been recalled). For each event, participants were then asked to rate the degree to which they remembered the event (with 1 indicating "not at all" up to 7 indicating "perfectly"), when the event occurred, which allowed participants to further specify a time frame (with options ranging from within the past day, week, month, year, 1-3 years, 1-15 years, and over 15 years ago), briefly describe the event, and provide several ratings of the memory. These latter ratings pertained to the pleasantness/emotional content of the event at the time it occurred and when recalled in the study. Rating values ranged from 1 ("extremely unpleasant") to 7 ("extremely pleasant") with 4 being "neutral". The ratings typically range from -3 to 3; however, for this study we used 1-7 for simplicity (i.e., participants only had to press one key and the keys were in intuitive order from least pleasant to most pleasant). As previously stated, the past and current pleasantness/emotional content of the event were used to calculate the FAB.

Participants were asked to recall a new event for each trial and refrain from using any event more than once. Afterwards, participants completed the 21-item version of the DASS once all recall tasks and ratings were completed. All directions were presented to participants on a computer screen, with participants providing their responses on the computer keyboard when prompted. Finally, participants were also asked to provide basic demographic information (e.g., sex, race/ethnicity, age) and a handedness inventory which were all completed on paper.

Statistical Analysis

Values resulting from the behavioral data were analyzed using SPSS Version 29 (IBM-Analytics, New York, USA). A 2 (memory type: positive vs negative) x 4 (time of memory: within the last month, within the last 6 months, 2-10 years, and at least 10 years) within-subjects repeated measures ANCOVA was used to analyze group differences in response time averages and Fading Affect Bias with DASS-Total scores serving as the covariate. A criterion of $p \leq .05$ was used for indicating statistical significance. Frequency distributions were prepared to help describe the dataset and provide a succinct visual display of the FAB affect intensity relations between positive and negative memory event types, as well as between memory time period and memory type categories.

Results

The final sample included 50 participants, 18 of whom self-identified as males and 32 as females ranging in age from 17 to 33 years (*M* = 20.1, *SD* = 2.5). The majority of the sample self-identified as Caucasian (53%) and Hispanic (31%), with others identifying as Black (7%), Asian (5%), and Other (4%).

Psychological Distress

Frequencies were conducted to determine and categorize DASS-21 subscale severity. Responses for 43 (or 86%) of the participants scored within normal range for the depression subscale (*M* = 4.9 , *SD* = 3.95), responses for 39 (or 78%) of participants were within the normal range for the anxiety subscale (*M* = 4.9, *SD* = 3.95), and responses for 46 (or 92%) of participants were within the normal range for the stress subscale (*M* = 8.7, *SD* = 4.63). The mean total score on the DASS-21 was 36.8 for the 50 participants, with 23 participants (or 46%) scoring above average and 27 of the participants (or 54%) scoring below average. (*See Figure 1 for a representation of the DASS-Total score distribution*).

Response Time

Mauchly's Test of Sphericity was conducted for each of the effects within the model. The significance values of this test indicated that the assumption of sphericity was not met for the main effect of memory time (*p* < .001). Furthermore, the "memorytype" x "memorytimeperiod" interaction also did not meet the assumption of sphericity (*p* < .001). Because, the assumption of sphericity was not met the appropriate sphericity correction tables, wherein the degrees of freedom are adjusted, were used in the findings reported in *Table 2*. Note, this approach has an impact on the statistical significance of the test.

A two-way ANCOVA was conducted that examined the effect of memory type and memory time period on response time with DASSTOTAL scores as the covariate (*see Tables 2-5)*. There was a statistically significant interaction between the effects of memory type and memory time period on response time, F (3,144) = 3.984, *p* = 0.009 (*see Figure 7)*. A post hoc test, Tukey's HSD, was conducted and showed there was a significant difference between memory time periods 3 (2-10 years) and 4 (10 years or more) (*p* = 0.01).

Commented [FA1]: As a number of post hoc tests exist, you need to list the name of the one employed in the Stat Package you used (most likely Tukey's HSD) and report the significance level. Why, some are considered more rigorous than others.

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Fading Affect Bias

Mauchly's Test of Sphericity was conducted for each of the effects within the model. The significance values of this test indicated that for the main effect of memory time, the assumption of sphericity was met (*p* =.31). Furthermore, the "memorytype" x "memorytimeperiod" interaction also met the assumption of sphericity (*p* =.09).

A two-way ANCOVA was conducted to examine the effect of memory type and memory time period on the mean decrease in affect intensity (*see Tables 2-5)*. There was a statistically significant main effect of memory type, F (1,48) = 49.274, *p* < 0.001.

Furthermore, the analysis of between-subjects effects revealed that DASSTOTAL scores were significantly different between subjects, $F(1,48) = 6.043$, $p = 0.018$, $\eta p2 = 0.112$.

Frequencies were also conducted to determine the top retention intervals with the greatest mean decrease in affect intensity. Of the different groups, "within 1 month (+)", "within 6 months (+)", and "within 1 month (-)" had the greatest decrease in affect intensity (see *Figure 2)*.

Follow Up: Median Split

Due to these findings, participants were split into two groups (above average vs below average) based on their DASSTOTAL scores determined by the average of the covariate (*see tables 6 & 7)*. A three-way ANOVA was conducted to further examine the effects of psychological distress, memory type, and memory time period on response time and the Fading Affect Bias. There were no statistically significant interactions between (DASSSTOTAL group average vs. memorytype vs. memorytimeperiod). However, for response time, there was a statistically significant main effect of the memory time period, $F(3,66) = 2.99$, $p = 0.037$. There was also a statistically significant interaction between DASS-21 group averages (above vs. below) and memory time period, $F(3,66) = 2.75$, $p = 0.05$.

As it relates to the Fading Affect Bias, there was significant interaction between memory type and memory time period, $F(3,66) = 8.24$, $p < 0.001$. A post hoc test, Tukey's HSD, was conducted and showed there was a significant difference between memory types 1 (positive) and 2 (negative) ($p = 0.001$).

Discussion

Response time

There was a significant interaction between memory type and memory time period implying that individuals' recall time was affected by memory type and memory time. This interaction further tells us that the response time for the different time periods was significantly different for positive and negative events. Overall, individuals had a lower recall time average for the memory period “2-10 years” for both positive and negative memory types, and the greatest average recall times for positive memories in the memory period “within the last month” (*see Figure 3)*.

Furthermore, the data also found that there was a statistically significant effect of psychological distress on memory recollection. The response time for negative events of those who were above average was less than those who were below average for the retention intervals “within the last month” and “within the last 6 months”. This reflects the theory of their more recent negative events being at the forefront of memory for those experiencing above-average psychological distress. Additionally, one of the most compelling explanation for the present set of findings is that given the age group and the fact that the average age for participants was 20 years old, they were able to recall memories more readily as far as 10 years old.

Fading Affect Bias

There was a statistically significant main effect of memory type. This effect tells us that fading was statistically significant for the memory types: positive and negative. The emotional intensity of negative events faded more than positive events. This seems to reflect that individuals’ negative emotions were more likely to fade over time.

This idea is further supported by the findings across several works of literature (Walker & Skowronski, 2009) that negative events and emotions of all kinds have greater and longer-lasting impacts on individuals than positive events and emotions. Our findings also highlight that the Fading Affect bias does not solely reflect forgetting. Just as those in Walker et al. studies were asked to recall memories and rate the emotions during the time the memory occurred and the time in which they were being asked to recall it, the overall data showed that participants remembered the positive and negative events almost equally for both memory types. With that, it is important to note that though the emotions associated with positive and negative events faded differentially, the memory of the events themselves did not.

In terms of overall psychological distress, data also suggests that there was a statistically significant effect of psychological distress on fading (FAB). For those who were above average as it relates to psychological distress, for the negative memory type retention intervals "within the last month" and "within the last 6 months", the averages were less negative which indicates greater fading towards zero. However, for retention intervals "2-10 years" and "at least 10 years" for both positive and negative memory types, those who were below average had greater averages meaning memories faded faster for those who were not experiencing psychological distress.

Future Research Directions

Because prior research suggests that the Fading Affect bias is disrupted in those with depression, the objective of this study was to first take the theory a step further to analyze if psychological distress affected recall time overall. The next steps should look further into how psychological distress impacts the Fading Affect Bias as it relates to time (recent vs distant). Furthermore, future research should also analyze electroencephalogram (EEG) data and demographic factors to explore any links that could contribute to the differences in affect intensity between the time intervals “within 1 month (-)” “within 1 month (+)” and within 6 months (+)”. The addition of electroencephalography data will allow researchers to visibly explore and further analyze any differences between brain signals and areas of the brain involved with memory recollection. Examining the differences and similarities between said signals could also give further insight and explanation on the differences and similarities as it relates to memory recall and the FAB.

Further, considering the significant main effect of the memory time period and the interaction between memory type and memory time period, future research may profit from looking into what additional demographic variables could influence memory recollection, such as socioeconomic and social factors. Intentionally studying demographics as such could be vital in analyzing the types of memories recalled, how they are recalled, and the impact they have across different groups of people. Though much work remains to be done before a full understanding to the extent of evaluating the specific memory characteristics that are being recalled, it may be helpful to evaluate if certain types of memories or traumas are excluded or greatly affected by the Fading Affect Bias.

Summary and Conclusion

The current study aimed to examine how clinically relevant levels of psychological distress may impact memory recollection. There were no statistically significant differences in recall time between positive and negative memories and memory time periods; thus, this did not turn out to be the rigorous test we hoped it would be due to the results that showed many participants were within clinically normal limits of psychological distress. Counter to the expectations, psychological distress did not have an impact in this preliminary study; however, the time periods in which the memories occurred did have an effect on recall time. Results also showed statistically significant differences in fading between positive and negative memories. This data also has some potential intervention implications. For example, the validity, quality, and accuracy of the memories recalled are important aspects to consider, as it is not known if the memories recalled are true, came from someone else, or is a made-up memory. However, there is a need for future research to explore whether the Fading Affect Bias is associated with memory quality.

Further, though not statistically significant, results showed differences in fading between retention intervals that should be further explored in future research. Despite these limitations, the present study has enhanced our understanding of the relationships between psychological distress and the Fading Affect Bias and memory recall and retention intervals. Although the generality of the current results must be established by future research, the present study has provided clear support for the Fading Affect Bias and further explored a relationship that has not been directly linked to our knowledge. To conclude, though the results are not significant from a statistical stance, clinically the results may be seen as significant to explore how traumatic events are recalled later in life and the impact psychological well-being could have on memory recollection.

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Table 1. Recall Prompts

Prompt	Memory Type	
"Recall a memory event that occurred within the last month. Press the space bar after you remember the event."	Positive x 3	Negative x 3
"Recall a memory event that occurred within the last 6 months. Press the space bar after you remember the event."	Positive x 3	Negative x 3
"Recall a memory event that occurred 2-10 years ago. Press the space bar after you remember the event."	Positive x 3	Negative x 3
"Recall a memory event that occurred at least 10 years ago. Press the space bar after you remember the event."	Positive x 3	Negative x 3

Table 2: Descriptive Statistics

	Positive				Negative			
	n	**M**	**SD**	**Std. Error**	**n**	**M**	**SD**	**Std. Error**
Response time: 1 month	50	44880.74	180344.1	24978.86	50	23658.48	14265.54	2027.785
Response time: 6 months	50	20446.26	13962.86	1983.499	50	21115.07	11604.95	1657.717
Response time: 2-10 years	50	19067.5	10799.49	1529.789	50	19303.67	10193.88	1447.232
Response time: 10 years or more	50	26041.04	20423.05	2842.705	50	23991.42	14929.21	2129.967
FAB: 1 month	50	0.4067	0.5561	0.079	50	-0.66	0.82062	0.116
FAB: 6 months	50	0.44	0.82325	0.116	50	-0.82	0.73528	0.105
FAB: 2-10 years	50	0.6933	0.92051	0.128	50	-0.9067	0.88073	0.123
FAB: 10 years or more	50	0.74	0.77163	0.103	50	-1.3533	0.70762	0.099

Table 3: Tests of Within Subjects Effects

	Response time			FAB		
	F	**df**	***p***	**F**	**df**	***p***
memorytype	2.981	1	0.091	49.274	1	0.001
memorytimeperiod	4.314	3	0.006	2.391	1	0.071
memorytype x DASSTOTAL	2.06	1	0.158	1.218	3	0.275
memorytimeperiod x DASSTOTAL	3.369	3	0.02	3.891	3	0.01
memorytype x memorytimeperiod	3.984	3	0.009	2.08	3	0.105
memorytype x memorytimeperiod x DASSTOTAL	3.346	3	0.021	0.423	3	0.737

Table 4: Test Between Subjects Effect (FAB)

Source	Type III Sum of Squares	df	Mean Square	F	p
Intercept	0.005	1	0.005	0.006	0.937
DASSTOTAL	4.389	1	4.389	6.043	0.018
Error	34.858	48	0.726		

Table 5: Test of Between Subjects Effects (Response time)

Source	Type III Sum of Squares	df	Mean Square	F	p
Intercept	1.15E+11	1	1.15E+11	22.474	0
DASSTOTAL	9761569230	1	9761569230	1.911	0.173
Error	2.45E+11	48	5107958900		

Table 6: Descriptive Statistics (Median Split-Above Average)

	Positive			Negative		
	n	**M**	**SD**	**n**	**M**	**SD**
Response time: 1 month	23	18898.19	11448.65	23	21689	13480.63
Response time: 6 months	23	21189.88	14944.93	23	21324.17	10466.58
Response time: 2-10 years	23	19508.12	11740.32	23	19314.81	9719.495
Response time: 10 years or more	23	31933.06	27133.76	23	26101.09	15619.43
FAB: 1 month	23	0.347826	0.647281	23	-0.53623	0.789701
FAB: 6 months	23	0.304348	0.97397	23	-0.71014	0.786915
FAB: 2-10 years	23	0.536232	0.770276	23	-1	0.765414
FAB: 10 years or more	23	0.42029	0.683259	23	-1.37681	0.661376

Table 7: Descriptive Statistics (Median Split-Below Average)

	Positive			Negative		
	n	**M**	**SD**	**n**	**M**	**SD**
Response time: 1 month	27	20333.32	12769.63	27	24317	13076.26
Response time: 6 months	27	20104.81	14200.77	27	22224.99	12815.58
Response time: 2-10 years	27	18607.59	10478.68	27	18178.04	7406.116
Response time: 10 years or more	27	20826	10712.34	27	20932.26	12523.59
FAB: 1 month	27	0.478261	0.490579	27	-0.75362	0.894524
FAB: 6 months	27	0.565217	0.614922	27	-0.91304	0.683259
FAB: 2-10 years	27	0.855072	0.994053	27	-0.76812	0.997141
FAB: 10 years or more	27	1.014493	0.755306	27	-1.30435	0.751517

Figure 1. DASS-Total Score Distribution

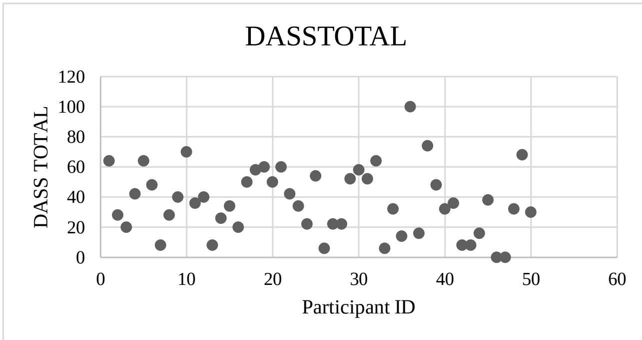
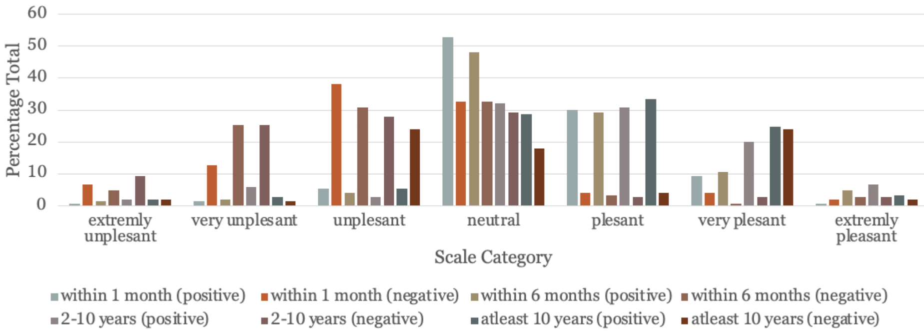


Figure 2. Overall FAB Distribution



Key: Extremely unpleasant: ≥ -3, Very unpleasant: -2, Unpleasant: -1, Neutral: 0, Pleasant: 1, Very pleasant: 2, Extremely pleasant: ≥ 3

Figure 3. Overall Response time

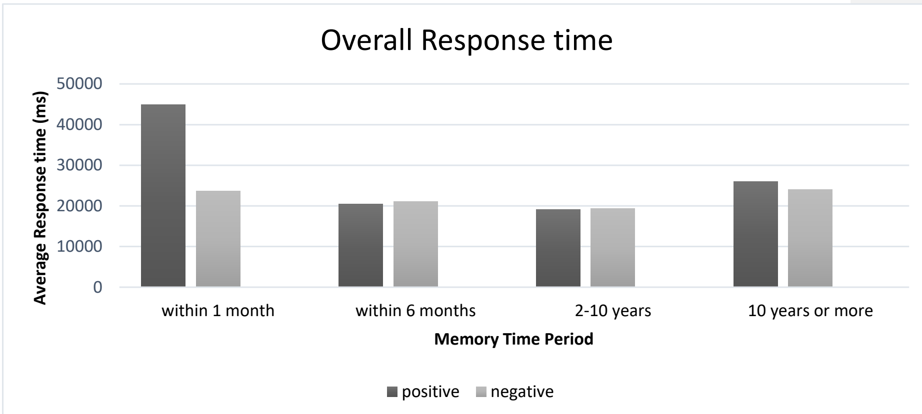


Figure 4: Median Split- Average Response time

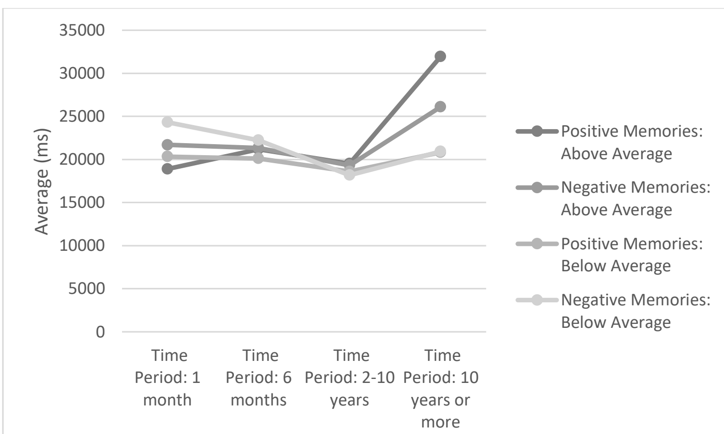


Figure 5. Median Split- Positive Memories FAB

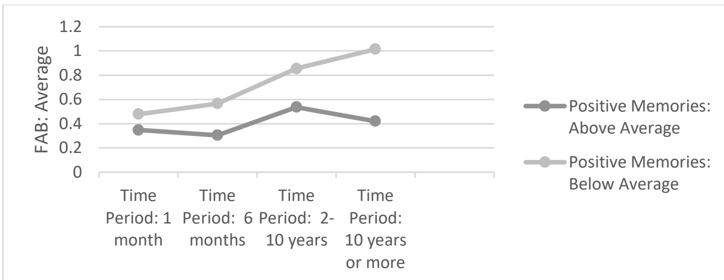


Figure 6. Median Split- Negative Memories FAB

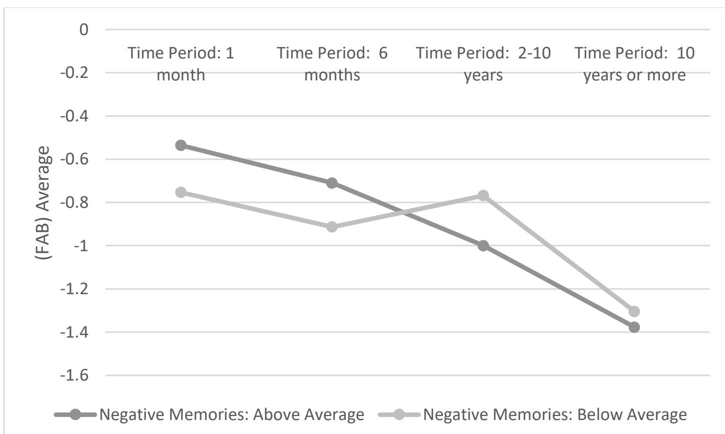
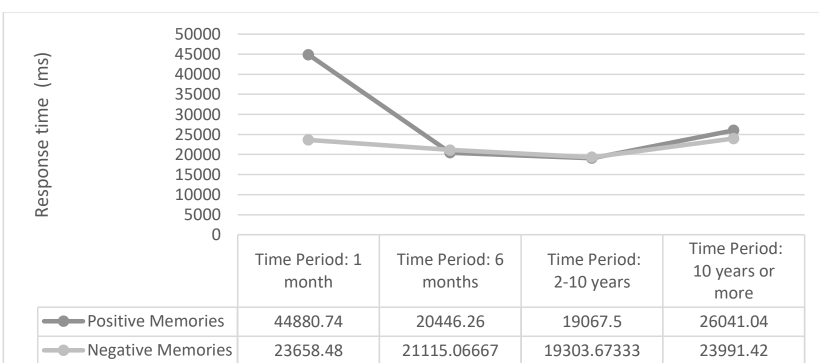


Figure 7. Interaction of Memory Type x Memory Time Period with DASS-TOTAL as Covariate



	Time Period: 1 month	Time Period: 6 months	Time Period: 2-10 years	Time Period: 10 years or more
Positive Memories	44880.74	20446.26	19067.5	26041.04
Negative Memories	23658.48	21115.06667	19303.67333	23991.42