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THE EFFECT OF MOOD ON SHORT TERM MEMORY

by

Amy Vitell

A thesis submitted to the faculty of the University of Mississippi in partial fulfillment of
the requirements of the Sally McDonnell Barksdale Honors College

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ABSTRACT

AMY VITELL: The Effect of Mood on Short Term Memory

Eighty-four undergraduate students (13 males and 71 females) from the University of Mississippi were tested on the effect of mood on short term memory. The participants, with a mean age of 19, were made up of 61 Caucasians, 21 African American, and 2 Asians. The participants took part in a free recall task involving 25 neutral words. Next, a film clip was shown to induce a particular mood (either positive or negative, depending on assigned condition). Following the mood manipulation the participants took part in a second recall task involving another set of 25 neutral words. Data analysis revealed that after the mood manipulation participants in the positive mood condition recalled more words while participants in the negative mood condition recalled fewer words.

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LIST OF ABBREVIATIONS

EIS	Emotional Intensity Scale
TAS-20	Toronto Alexithymia Scale
TMMS	Trait Meta-Mood Scale

The Effects of Mood on Short Term Memory

Previous research has shown that there is a significant correlation between mood and memory. The research of Clark and Teasdale (1985) focused primarily on the recall of personality trait words and abstract nouns while in a particular induced mood. After encoding a list of words comprised of pleasant personality trait words, unpleasant personality trait words, pleasant abstract nouns, and unpleasant abstract nouns in a neutral mood state, a musical mood induction was used to elicit either a positive or negative mood. While in their induced mood state, the subjects then participated in a free recall. The results revealed that pleasant words are more likely than negative words to be recalled when in a happy mood, whereas negative words are more likely than positive words to be recalled when in an unhappy or depressed mood. No differences were found between the recall of personality trait words and abstract nouns. This effect, however, was only shown in females; the amount of information recalled by males was not affected by the induced mood. Further research of Clark and Teasdale found that this effect can perhaps be attributed to the fact that, on average, women had higher usage ratings for the words that were used in the recall task. The findings of this study suggest that perhaps pleasant words are more likely to be recalled while in a pleasant mood state because the concepts associated with the words have been activated more frequently while in a positive mood state than in a negative mood state, while the same may be true for negative word recall while in a negative mood state.

The research of Watkins et al. (1996) explored the concept of a mood-congruent memory in which information consistent with an individual's mood is subsequently more accessible. Clinically depressed and nondepressed control participants took part in this

study. After being exposed to a list of words containing positive, negative, and neutral words, the participants were given word cues in which they were asked to come up with one-word associations. Overall, the results showed that the depressed participants had less priming for positive words and better priming for negative words compared to the nondepressed participants. These findings suggest that because negative information is more readily available to depressed patients, this mood-congruent memory helps to maintain a state of depression. The implications of these findings are that an overall negative mood can have an effect on the content of information that is remembered and that negative information is more likely to be recalled when in an unhappy mood.

Forgas et al. (2004) studied the correlation between affect and eyewitness testimony. Three studies were conducted in which after the induction of a positive, negative, or neutral mood, the participants were subjected to a particular event. The experiments presented the events through the use of pictures, real life events, and video clips, respectively. It was found in all three studies that people in a bad mood were more likely to accurately remember information pertaining to a particular incident. People in a positive mood, on the other hand, were more susceptible to have distorted judgments and actually had more confidence in their inaccurate recollection of events. This trend was found for both positive and negative events as well as for real life and recorded events. Specifically, people in a positive mood state were more likely to incorporate misleading information into their eyewitness account.

Kensinger and Corkin (2003) demonstrated that the presentation details of negative words are more likely to be remembered than the presentation details of neutral words. This is commonly demonstrated in flashbulb memories where individuals vividly

recall information, including that which is contextual, pertaining to a particular event that is emotionally significant. Prior research has shown there is a higher tendency for negative pictures to be recalled compared to neutral pictures (Ochsner, 2000). Kensinger and Corkin extended this research to see if this effect also applies to word stimuli. The results confirmed that not only are negative words more likely than neutral words to be remembered, but also that the presentation details of negative words (for example, color) are also more accessible.

Research has shown that even a weather induced mood can have an effect on the amount of information that can be remembered (Forgas et al., 2009). The study tested the memory recall of shoppers for abstract items that were placed around the check-out area in a shop. The mood was induced by either cloudy, rainy days or bright, sunny days and was reinforced by playing either sad or happy music in the shop, respectively. The results showed that the shoppers' recognition for the objects was much higher for those who were presented the stimuli on a cloudy, rainy day compared to the bright, sunny day.

Previous studies have successfully demonstrated that there is indeed a correlation between mood and memory, showing that positive information is more likely to be recalled when in a positive mood and negative information is more likely to be recalled when in a negative mood (Clark and Teasdale, 1985). Additionally, it has been shown that details associated with negative stimuli are more vividly and likely to be recalled than the details associated with positive stimuli (Kensinger and Corkin, 2003). The implications of the previous research on this subject are vastly important as it shows that our mood and, subsequently, our memory affects our day to day lives. Furthermore, as our mood state is subject to change numerous times during the day, consequently the

consistency of our memory is also prone to change. On a small scale, the implications of previous research are that simple daily tasks and information acquired during the day are perhaps more likely to be remembered on certain days or at certain times during the day, when the appropriate mood state is present. On a larger scale, professionals in the legal and forensic world rely specifically on memory and testimonies from eye-witness accounts. If perhaps a person was not in a mood state that was congruent with the information that was presented, then he/she would be less likely to recall for the information accurately.

The present research will explore the effects that mood has on memory, specifically on short term memory to determine if mood state has an effect on the amount of information recalled. Based on the findings of previous research that has shown that the type of information recalled is dependent upon mood, we expect that the amount of information recalled will also be dependent on mood. Consistent with several of the studies previously mentioned, including Forgas et al. (2009), it is expected that induced negative mood will yield a higher number of recalled words compared to induced positive mood.

It is first necessary to define the type of memory on which the present study focuses and the processes involved in its functioning. Short term memory refers to the memory with which we can only store information temporarily, typically lasting for only a few short seconds (Carlson, 2007). How much information can be stored in an individual's short term memory is debatable; however just from everyday life situations, it is easy to promote the notion that information is easily forgotten. It also necessary to define the term mood, as perhaps some would incorrectly use the terms mood and

emotion interchangeably. An emotion has a clear object, and is typically used to describe a condition that lasts for a limited amount of time, whether it is a few hours or even just a few minutes. A mood state also lasts for a varying amount of time, ranging anywhere between a few short hours or to the more extreme of weeks on end. Sometimes a mood state will act as an underlying low-intensity feeling that persists without the individual understanding why the certain mood is even being experienced. The difference between an emotion and a mood state is the fact that when an individual experiences a certain mood there is not object to it; we do not always understand why we feel a certain way. Furthermore, there may even be no explanation at all to why we feel a certain way outside the fact that our brain simply tells us to. Emotions, on the other hand, are associated with a particular thing, event, person, etc. For example, when a person feels an emotion of sadness there is a clear understanding for why the feeling exists whether it concerns the death of a loved one or a failure of some sort. (Oatley, 29-30). The present research will induce a particular mood through the use of either a positive or negative film clip in the hopes of consequently altering the amount of information that can be recalled by the individual.

There are three processes that together make up the way our memory works: encoding, storage, and retrieval. It is during the encoding process that the information is introduced to an individual's memory, either visually, acoustically, semantically, or through the sense of touch. How the information is actually organized and housed in the memory takes place during the storage process. Finally, the retrieval process is the means through which a person is able to recall information from memory (Willingham, 2004, 178-274). An inability to recall information may be due to the encoding or

retrieval processes. For instance, an effect termed *mood congruence* has put forward the notion that 1) an individual will be able to store more information that is consistent with their current mood, compared to information that is inconsistent, and 2) an individual is more likely to retrieve information that is consistent with their current mood compared to inconsistent information. Furthermore, an occurrence called mood state dependent retrieval has shown that an individual is more likely to retrieve information if their current mood matches the mood in which they initially had the experience. Consistent with the previous research done in the area of mood and memory, a problem in memory retrieval due to an environment that does not provide the necessary cues to gain access to the target memory can perhaps be attributed an inconsistency in mood states (Guenther, 1988).

Methods

Participants

Eighty-four undergraduate students from the University of Mississippi took part in the study. The participants were made up of 13 males (15%) and 71 females (85%), with ages ranging from 18-30 ($MN = 19$). Sixty-one of the participants were Caucasian (73%), 21 African American (25%), and 2 (2%) were Asian. Before participating in the study, the subjects were given consent forms which informed them of the nature of the study as well as the risks and benefits, costs and payments, confidentiality factor, and their right to withdraw from the experiment. The participants received one hour of credit to be applied towards a psychology class for participating in the study.

Materials

The participants were tested on computers using MediaLab software. All responses were recorded electronically. The words used in the memory recall task were obtained from the Overschelde, Rawson, and Dunlosky (2003) category norms. Fifty categories were selected from which the first word from each list was used in the word recall task. The mean word length for the first set of words was 6.28 letters, and the mean word length of the second set of words was 5.96 letters. A video clip, lasting approximately five minutes, was shown to participants on the computer through Windows Media Player and was used for mood induction. Subjects in the positive condition were shown a happy segment from *The Lion King* in which the characters sing a song called, "Hakunah Matata." Subjects in the negative condition were shown a negative segment from *The Lion King* in which a lion cub watches his father die during a stampede. Following the video clip, the Brief Mood Introspection Scale (BMIS; Mayer & Gaschke, 1988) was used to determine if the proper mood was induced. The participants were asked to rate how they felt (XX=definitely do not feel, X=do not feel, V=slightly feel, or VV=definitely feel) about sixteen adjectives (e.g., happy sad, loving, and fed up). In addition to the BMIS measure of mood, three general mood questions (e.g., "At the present moment, how happy are you feeling?") were added, to which the subjects would rank their intensity on a scale from one to nine.

In the second part of the study the participants were presented with three personality scales. These were only used for exploratory purposes and will not be discussed in the results section; however, we kept these scales because of the participants' scores to the attentiveness items. The Trait Meta-Mood Scale (TMMS;

Salovey et al., 1995) and the Toronto Alexithymia Scale (TAS-20; Bagby, Parker, & Taylor, 1994) are a measure of attention and clarity, while the Emotional Intensity Scale (EIS; Bachorowski & Braaten, 1994) is a measure of intensity. The TMMS consists of thirty statements to which the subjects are asked to rank how well they do or do not agree with them (e.g., “I don’t think it’s worth paying attention to your emotions or moods.”) by responding with strongly agree, agree, undecided, disagree, or strongly disagree (Salovey et al., 1995). Consisting of twenty statements, the TAS-20 also requires the participants to rank how well they do or do not agree with a particular statement, ranging from strongly agree to strongly disagree (e.g., “I prefer to find out the emotional intricacies of my problems rather than just describe them in terms of practical facts.”). This scale is further divided into 3 subcategories: difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking (Bagby, Parker, & Taylor, 1994). The EIS consists of 30 emotional scenarios in which the participants are asked to choose how they would usually feel (e.g., “it has little effect on me, satisfied, sad, extremely joyful—exuberant”) in response to the particular situations (e.g., “I receive positive feedback from a favorite professor.”) (Bachorowski & Braaten, 1994). The surveys included attentiveness items (e.g., “Please choose ‘a’ for the answer to this item.”) as a measure of whether the participants were actually reading the items, or just responding randomly.

Procedure

The present study was approved by the IRB before administration. The participants signed up for this study using an online system called PSPM; studies are posted to this database by graduate students and psychology professors and are available

to undergraduate students. Upon arrival for the study, the participants were asked to read over and sign a consent form. The computer lab where testing took place allowed for a maximum of eight participants at one time, and the participants who agreed to continue with the experiment were seated in the computer lab at the same time. Curtain dividers acted as a barrier between each computer so that the participants would not be able to see the progress of any of the other participants. After the instructions were read aloud by the experimenter, the participants were asked to click, "Continue" on the computer screen to proceed to the first memory recall task. A list of twenty-five neutral words arranged into five columns appeared on the screen for two minutes. During this time, the participants were instructed to commit the list to memory to the best of their abilities. After two minutes passed, the participants immediately engaged in a brief mathematical distracter task which lasted approximately thirty seconds. This task consisted of five basic mathematical problems (e.g., $27+73=$). Following the distracter task, the participants had two minutes to recall as many words from the previous list as possible. At the end of two minutes, the experimenter started the video clip (either positive or negative, depending on the condition) on each of the computers. Following the video clip each participant completed the BMIS where they rated how well they did or did not feel each of sixteen adjectives. Immediately after completion of the mood scale, the second recall task began. As in the initial task, a list of twenty-five neutral words was presented in a five column format for exactly two minutes. The participants then engaged in a second mathematical distracter task similar in format to the first distracter task, lasting for approximately thirty seconds. The two minute word recall period followed directly upon

completion of the mathematical task. As each participant finished this section, the experimenter was notified to begin part two of the study.

Participants were first asked to indicate their gender, age, and ethnicity prior to completing the personality scales. They then worked their way through and responded to the three personality measure: TMMS, TAS-20, and EIS. As each participant finished, they were given a debriefing slip and thanked for their time and effort.

Data Analysis

Data analysis began with 116 participants after initial data cleaning. Twenty-eight of these participants were eliminated based on the results from the attentiveness items, and 4 were eliminated because of an outlying score (1 on attention, 2 on clarity, and 1 on aim) leaving a final participant pool of 84. The twenty-eight participants were discarded because responding incorrectly to the attentiveness items is a potential indication that the participants were not putting forth effort into the study. Of the remaining participants, based on random assignment, 50 were from the positive mood condition and 34 were from the negative mood condition. The TMMS, TAS-20, and EIS were used only for exploratory purposes and those scores will not be discussed with the present research.

Results

The individual raw scores on the BMIS and general mood questions were calculated. Then, *t* tests for independent samples were used to determine whether the scores on the BMIS and general mood questions were significantly different, which would indicate that the appropriate mood was induced. The BMIS means and standard deviations are as follows: positive mood ($MN = 3.14$, $SD = .408$) and negative mood

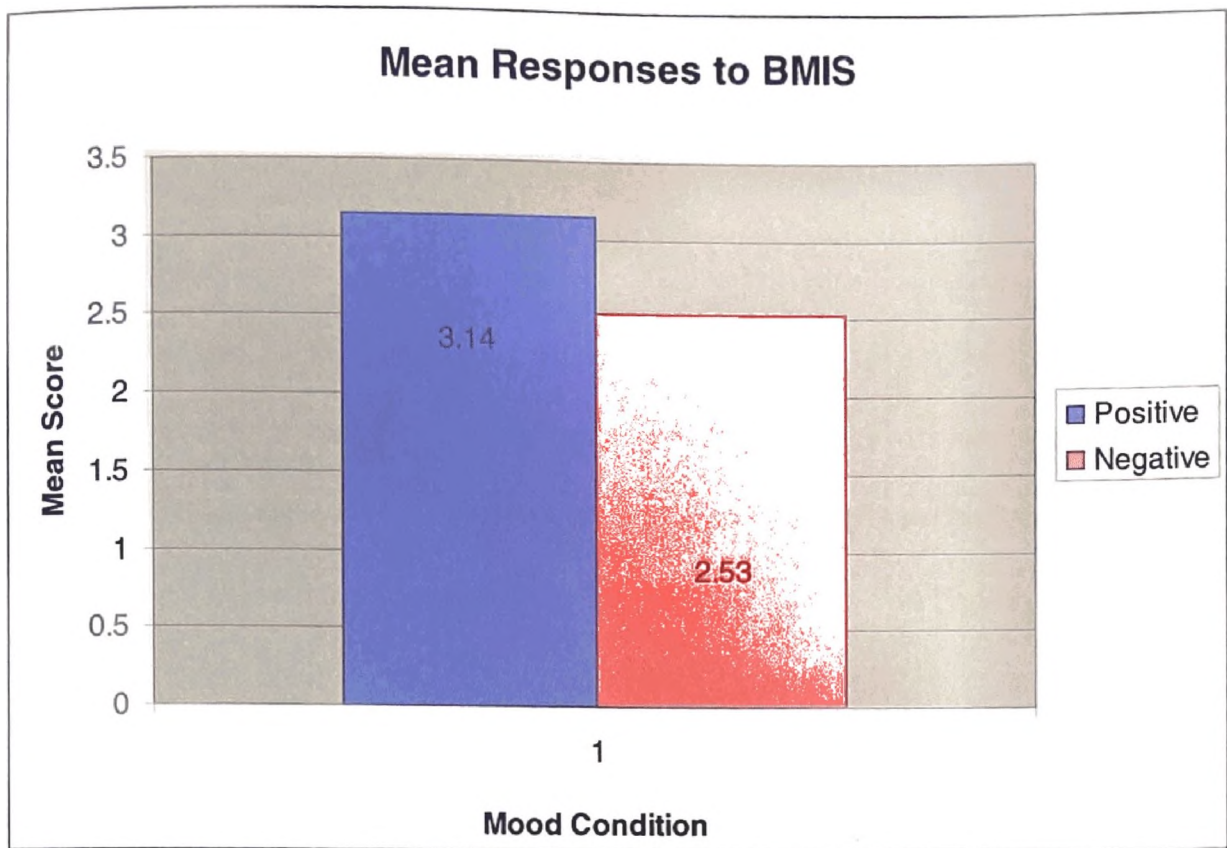


Figure 1. Based on the results from the BMIS, participants in the positive mood condition were in a significantly better mood than those in the negative condition $t(82) = 7.79, p < .000$.

($MN = 2.53$, $SD = .253$) (see Figure 1). A score closer to 4 indicates a pleasant mood, while a score closer to 1 indicates an unpleasant mood. Participants in the positive mood condition were in a significantly better mood than those in the negative condition $t(82) = 7.79$, $p < .000$.

The scores for the general mood questions were based on a scale from 1 to 9, with a score closer to 9 indicating a pleasant mood and a score closer to 1 indicating an unpleasant mood. The means and standard deviations are as follows: positive mood ($MN = 6.60$, $SD = 1.48$) and negative mood ($MN = 4.91$, $SD = 1.72$) (see Figure 2).

Participants in the positive mood condition were in a significantly better mood than those in the negative condition, $t(82) = 4.80$, $p < .000$. Thus, both measures demonstrated that the mood manipulation was successful.

The individual scores for the recall task were calculated by subtracting the amount of words recalled in Recall 1 from the amount of words recalled from Recall 2 (see Figure 3). A negative number indicates that more words were recalled in Recall 1, while a positive number indicates that more words were recalled in Recall 2. The means and standard deviations for the recall task are as follows: positive mood ($MN = 1.16$, $SD = 3.91$) and negative mood ($MN = -1.68$, $SD = 3.33$). A t test for independent samples was used to determine if the difference in the number of words recalled (Recall 2- Recall 1) was statistically significant. The results indicate that the difference in the number of words recalled was significant, $t(82) = 3.46$, $p < .001$. These results showed that the mood manipulation had significant effect on change in memory.

A t test was also used to determine if there was a statistically significant difference between the number of words recalled in the positive and negative mood

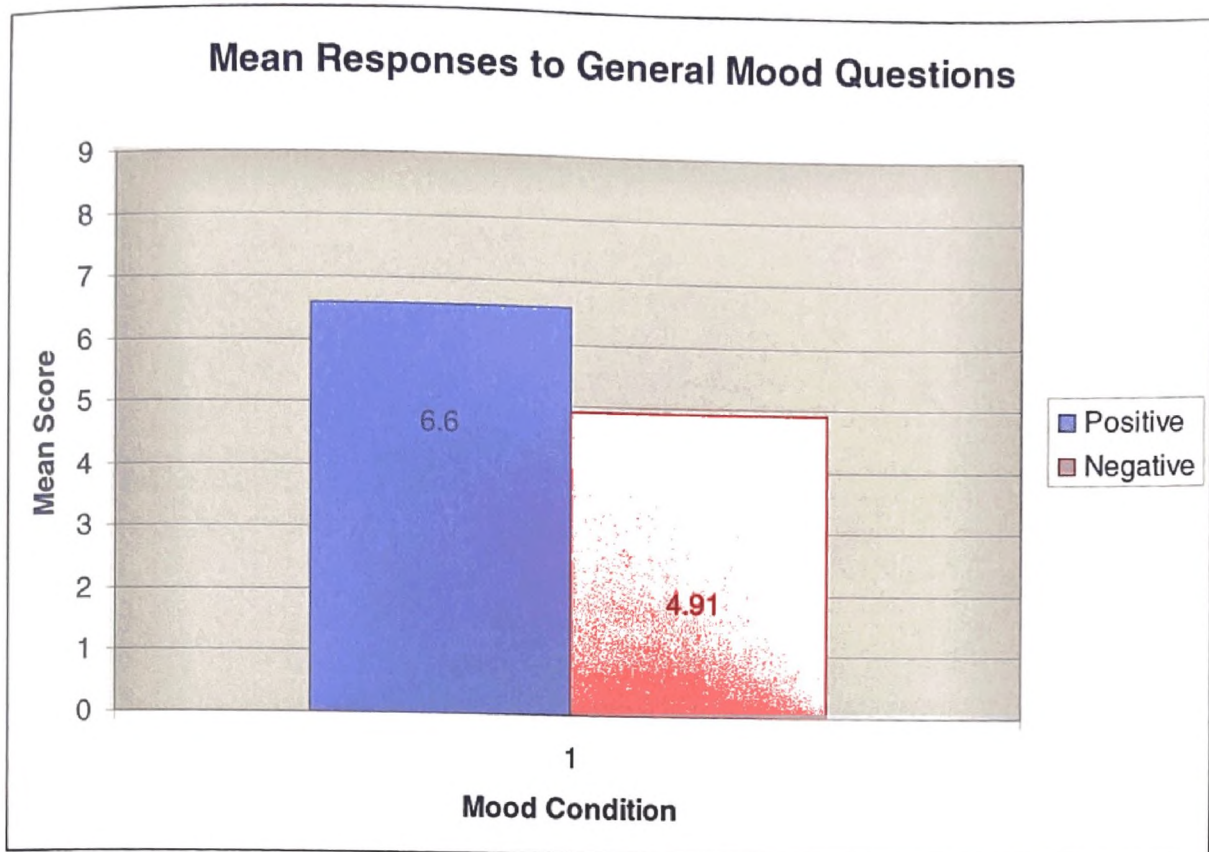


Figure 2. Based on the results from the general mood questions, participants in the positive mood condition were in a significantly better mood than those in the negative condition, $t(82) = 4.80, p < .000$.

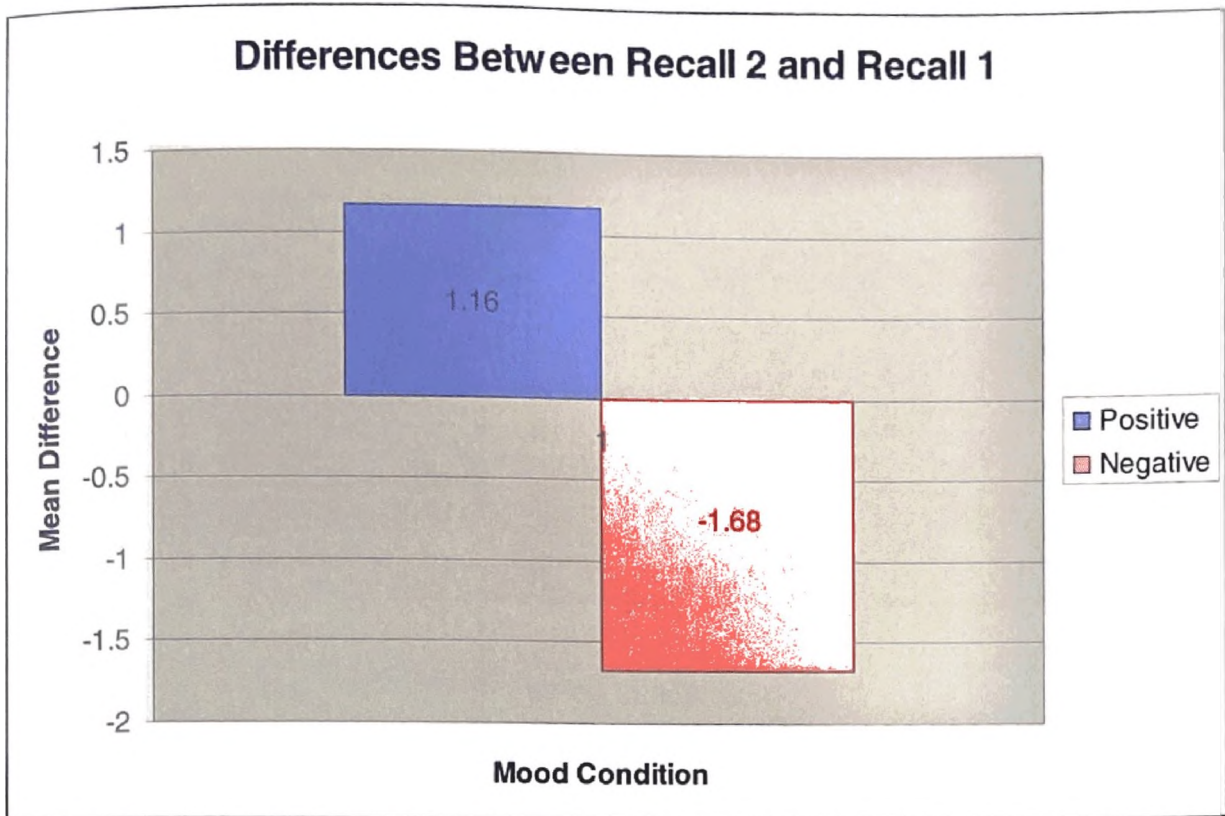


Figure 3. The individual scores for the recall task were calculated by subtracting the amount of words recalled in Recall 1 from the amount of words recalled from Recall 2. The results show that the mood manipulation had significant effect on change in memory, $t(82) = 3.46, p < .001$.

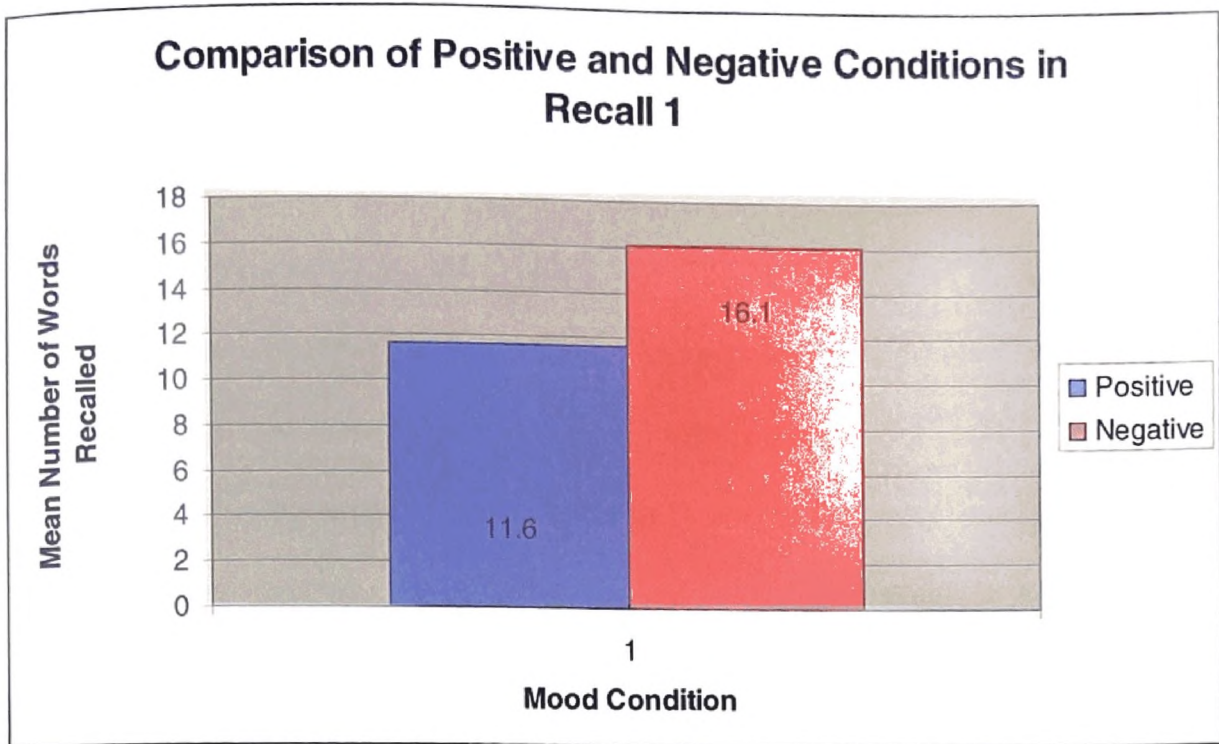


Figure 4. The number of words recalled for the positive and negative conditions in Recall 1 was examined. The results show that the difference between words recalled by participants in the positive and negative mood conditions from Recall 1 was statistically significant, $t(82) = -4.68, p < .000$.

conditions for both Recall 1 and Recall 2. That is, we were interested to see if a significant difference existed between the two conditions within each recall task separately. The results from Recall 1 are as follows: positive condition ($MN = 11.60$, $SD = 4.47$) and negative condition ($MN = 16.1$, $SD = 4.01$) (see Figure 4). A t test showed that this difference between words recalled by participants in the positive and negative mood conditions from Recall 1 was statistically significant, $t(82) = -4.68$, $p < .000$. Therefore, prior to any mood manipulation, participants in the negative mood recalled more words than participants in the positive mood; the subjects placed in the negative condition through the use of random assignment generally had better memories. The results from Recall 2 are as follows: positive condition ($MN = 12.76$, $SD = 4.66$) and negative condition ($MN = 14.38$, $SD = 3.77$) (see Figure 5). No significant differences were found between the positive and negative conditions in Recall 2. However, taking into account the results from the t test concerning Recall 2-Recall 1, we know that the participants in the negative mood condition remembered *less* after the mood manipulation while participants in the positive mood condition remembered *more*.

Finally, a t test was used to compare the pre-mood manipulation scores and post-mood manipulation scores of each condition (Recall 1 and Recall 2), positive and negative, separately. The mean and standard deviations for the positive condition are as follows: overall Recall 1- Recall 2 ($MN = -1.16$, $SD = 3.91$), Recall 1 ($MN = 11.60$, $SD = 4.47$), and Recall 2 ($MN = 12.76$, $SD = 4.66$). The mean and standard deviations for the negative condition are as follows: overall Recall 1- Recall 2 ($MN = 1.68$, $SD = 3.33$), Recall 1 ($MN = 16.1$, $SD = 4.01$), and Recall 2 ($MN = 14.38$, $SD = 3.77$). The results show that there was a significant change in recall scores for both groups; positive

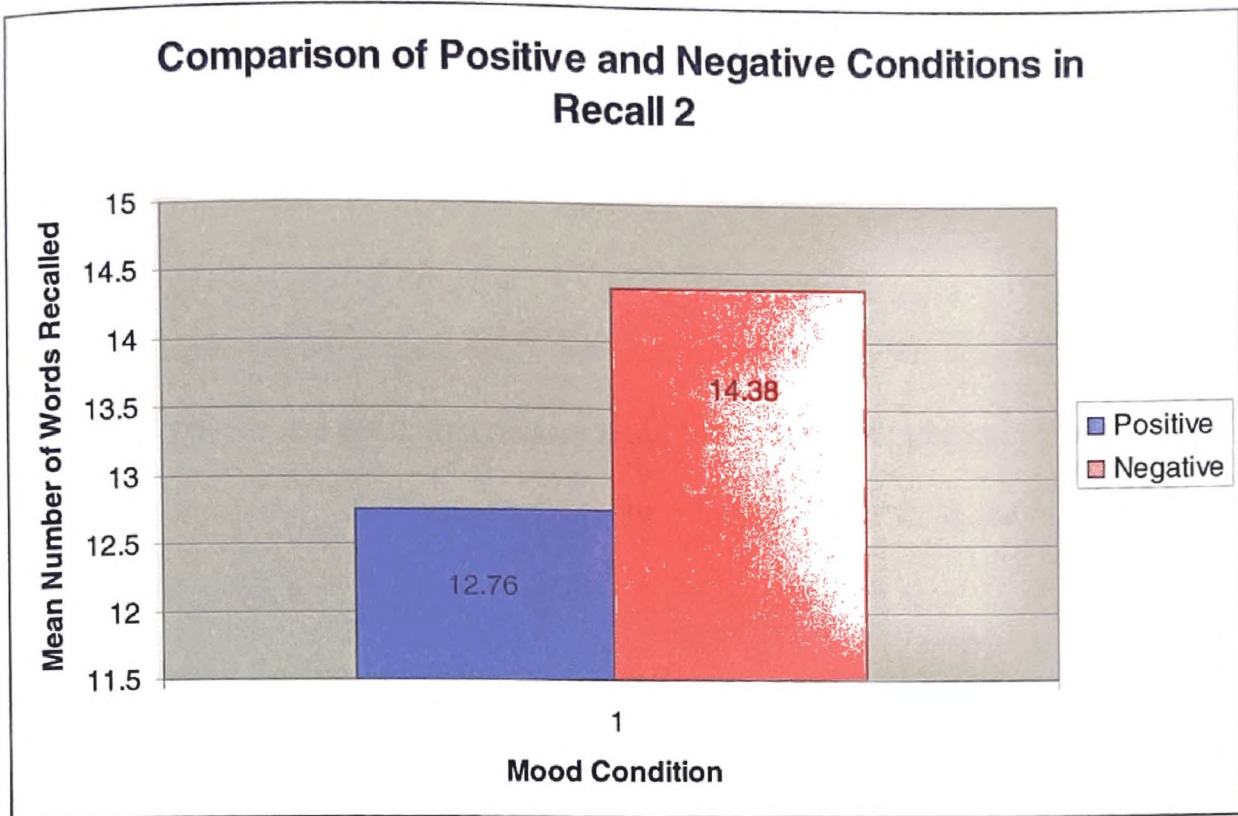


Figure 5. The number of words recalled for the positive and negative conditions in Recall 2 was examined. No significant differences were found.

condition $t(49) = -2.10, p < .05$, and negative condition $t(33) = 2.9, p < .01$. Therefore, participants in the negative condition recalled significantly fewer after the mood manipulation, whereas participants in the positive condition recalled significantly more after the mood manipulation.

Discussion

The results of the present study demonstrate that memory is effected by mood; specifically, people in a positive mood are more likely to recall information compared to people in a negative mood. These findings are in opposition to the initial prediction that people in a negative mood would recall more information. Past research has been done that may account for this difference.

The research of Moberly and Watkins (2008) shows that negative affect is positively correlated with ruminative self focus. In their research, participants recorded their level of rumination and affect at eight intervals during the day for a period of one week. The negative affect ratings were consistent with the level of ruminative self focus, that is, not only were the two variables positively correlated, but it also was found that a state of ruminative self focus was able to predict negative affect. Furthermore, their results reveal that rumination increases with degree of affect, and is therefore influenced by context. The implications of their research could be a potential explanation for the outcome of the present study. That is, post mood manipulation, the participants in the negative mood had an increased likelihood of becoming subject to ruminative self focus. It is a possibility that after viewing the negative film clip in which a lion cub witnesses the death of his father that the participants reflected on experiences in their life that were emotionally similar. For example, if a participant had once experienced something

emotionally strenuous, viewing a film clip that is very poignant may have led to an increased awareness of that emotionally distressing event. In turn, this increased awareness could potentially lead to an overall distraction which would result in a decreased amount of words remembered in Recall 2. Especially if it were the case that a participant had recently experienced some sort of loss in their life, the ruminative self focus and resulting distraction, as an overall result of the negative mood manipulation, would be great. Additionally, it may have been the case that a participant had built some sort of association with *The Lion King*. For example, if *The Lion King* was the first movie that a participant ever watched with his/her childhood best friend the induced negative mood, in theory, would therefore lead the participant to reflect on memories associated with watching *The Lion King* with his/her childhood best friend.

Previous research has shown that people in a negative mood are more likely to recall negative information, whereas people in a positive mood are more likely to recall positive information (Watkins et al., 1996). This could also be a possible explanation as to why participants in the negative mood condition recalled significantly *less* after the mood manipulation. Prior to any mood manipulation, participants are recalling information in the mood state in which they enter the lab. Hopefully this is a neutral mood state; the experimenters speak neutrally and try to avoid putting the participants in any mood state before the experiment begins. After viewing the negative video clip, negative information (in the form of memories and past experiences) became more accessible and therefore led to an increased distraction during the second recall task. The implications of this study are that, consistent with the findings of Moberly and Watkins (2008), negative mood increases the likelihood of recalling negative information (for our

purposes, negative memories and experiences) as well increases an overall ruminative self focus state. That is, after the negative mood induction the participants are in a ruminative self focus state and reflect on the negative experiences that have now become more accessible due to the negative mood. The positive film clip is silly and not at all distressing to view; participants upon watching this clip can easily move on with Recall 2 without being distracted by what they just viewed. The negative film clip, as mentioned previously, can be quite distressful and it may be harder to move on with the second recall task without being distracted by the emotions, memories, or experiences that come to mind upon viewing this film clip.

The research of Bower (1981) also promotes the concept of a mood-congruent memory; that is, participants after being hypnotically induced into a particular mood state recalled information that was congruent with the state they were in. Specifically, participants were asked to recall instances from their childhood. It was found that when in a negative mood state participants described sad and negative episodes while participants in a positive mood state described more pleasant and happy episodes. In conjunction with the research that shows rumination is positively correlated with negative affect, the research of Bower (1981) can be used as evidence to support our findings that participants in a negative mood recalled less information. In the ruminative self focus state that results from being in a negative mood, participants may recall negative past experiences in response to viewing the video clip. As suggested previously, this leads to a distraction that ultimately leads to the decline in memory following the mood manipulation.

In conclusion, previous studies have demonstrated that a negative mood can ultimately lead to a ruminative self focus state (Moberly & Watkins, 2008) in which the person affected is more likely to draw upon and reflect upon negative experiences that are emotionally similar to their current mood state (Watkins et al., 1996). That is, the findings of the current study may be attributed to the concept of a ruminative self focus that results from a negative mood. This ultimately leads to an increased distraction which, in turn, impedes the number of words recalled while in a negative mood state.

The implications of the present study show that our day-to-day lives can be tremendously affected by our mood state. Memory plays a vital role in our lives, and the fact that it can be obstructed or improved by a person's mood is a valuable finding. A person's mood is dependent upon and easily altered by many variables; that is, a person's mood state is subject to change at many points during any given day. Taking into consideration the findings of the current study, a continuously changing mood leads to a continuously fluctuating memory. This effect can have small as well as large consequences on our lives, which can range from forgetting to buy milk on the way home from work to misplacing a wallet as a result of increased distraction caused by an overall negative mood. Although the results of this study are on a small scale, future research can be done to measure the effects of mood on other dimensions of memory (e.g. long term memory) to determine if the same effect will occur.

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