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Mood Manipulation Effects on the Characteristics and Retrieval of Involuntary and Voluntary

Autobiographical Memory

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Abstract

The current research examined the effect of a positive and negative mood manipulation on the characteristics of involuntary and voluntary autobiographical memory retrievals elicited through a laboratory based methodology with the hope to find further support for the self memory system (SMS) model. As predicted, it was found that involuntary memory recalls displayed mood congruency whereas voluntary memory retrievals did not show a mood congruence effect. The study also found that involuntary memory retrievals were significantly more vivid, containing more details, than voluntary memories. No significant differences were found for the involuntary and voluntary retrievals for the age of the memory or specificity. This may suggest that involuntary and voluntary autobiographical retrievals go through the same retrieval process to be recalled. There were no mood effects found for the vividness, age of memory, or the specificity. Future findings using these laboratory methods for eliciting involuntary memories may have implications for the development of treatments for post-traumatic stress disorder, psychosis, and depression.

## Mood Manipulation Effects on the Characteristics and Retrieval of Involuntary and Voluntary Autobiographical Memory

Autobiographical memory “forms one’s personal life history” (Thompson, Skowronski, Larsen, & Betz, 1996). It contains an individual’s personal recollections about general events (e.g., eating dinner with your family) and specific events (e.g., going to senior year spring formal with your sorority). These memories contribute to an individual’s sense of self and help them maintain focus on their goals (Williams, et al., 2007). Barclay and Smith (1992) theorized that autobiographical memory might even play a role in regulating emotions by stabilizing current mood and minimizing oscillations not in line with current goals.

Conway and Pleydell-Pearce (2000) created the Self Memory System (SMS) Model that proposes that autobiographical memory is stored in a network of interconnected nodes. At the top of the structure are nodes that identify life-periods (e.g., high school). Next, are general event nodes (e.g., high school football games), and at the bottom are specific event nodes (e.g., riding on the senior class float at the homecoming football game). It is also noted that the nodal network may be further broken down and organized as a function of the emotional valence associated with the experience (Barnier, Hung, & Conway, 2004; Schulkind & Woldorf, 2005). Specific event nodes may connect more than one general event node that can pertain to many lifetime period nodes (Conway & Pleydell-Pearce, 2000). It is thought that specific events are stored with much of their sensory content.

Activation is constantly unconsciously occurring as individuals interact with cues causing an upward or downward spread throughout the network connections. Although many memories will be activated, only a few that satisfy the current working goals or intentions will reach conscious awareness. The executive control mechanism monitors this process. If the executive

control is unfocused, an activated memory unrelated to an individual's goals or intentions may reach consciousness unexpectedly. This will occur when features of a cue match a characteristic of the experience in the memory (Conway & Pleydell-Pearce, 2000). These autobiographical memories can be retrieved from this structure voluntarily or involuntarily.

The distinction between voluntary autobiographical and involuntary autobiographical memory was first mentioned by Ebbinghaus in 1885/1913. Voluntary memories are searched for and brought to consciousness with intention by an individual. Ebbinghaus described involuntary memories as mental states that "once present in consciousness return to it with apparent spontaneity and without any act of the will" even after years (Ebbinghaus, 1885/1913). Involuntary memories are occurrences when personal experiences pop unexpectedly into conscious awareness without any attempt to actively retrieve them. These memories have even been documented in literature as Marcel Proust, a French author, wrote about how the taste of a Petite Madeleine cookie dipped in tea suddenly reminded him of memories from his childhood (Proust, 1928). Miller (1962/1974) recommended that psychologists not "study such 'fragile' and uncontrollable phenomena".

Involuntary memories have been observed in clinical populations as symptoms in a range of conditions such as posttraumatic stress disorder (Berntsen & Rubin, 2002). Steel and Holmes (2007) also found that an increase in involuntary memories is associated with an onset of psychosis. In 1988, Spence argued that involuntary autobiographical memories may serve as defense mechanisms to prevent more threatening memories or to conceal distressing aspects in a current surrounding. Without empirical research, theories on involuntary memories could not be tested.

The field of cognitive psychology neglected the study of involuntary autobiographical memories until the 1990's. Berntsen (1996) conducted the first major empirical study to investigate this memory phenomenon. She found that participants estimated experiencing 5 to 6 involuntary memories in a day. These findings suggest that involuntary memories are quite common experiences even in non-clinical populations. Involuntary memories do not seem to solely be caused by emotionally disturbing events (Berntsen, 1996).

Diary studies were the first method used to study the characteristics and cues that cause involuntary memories to arise in a naturalistic setting. Participants are given a description of involuntary memories and then required to record their occurrence and a brief memory description in a notebook. Berntsen (1998) compared involuntary memory data from a diary study with voluntary memory data collected by the same participants using verbal cues provided by the experimenter. Significant differences were found between involuntary and voluntary memories. Berntsen (1998) found that involuntary memories significantly more often referred to specific events than voluntary memories supporting Conway and Pleydell-Pearce (2000) who suggest that involuntary retrievals can elicit direct memory retrievals of event specific information without going through the top down retrieval search process that voluntary (generative) retrievals require. She also found that voluntary memories were rehearsed more frequently than involuntary memories, voluntary memories were significantly less emotionally positive than involuntary memories, and voluntary memories were significantly less recent than involuntary memories.

Although being able to examine involuntary memories as they occur in everyday life undistorted by a laboratory has good ecological validity, this methodology has limited experimental control and does not allow the researcher to manipulate variables of research

interest. The findings from diary studies that compare voluntary and involuntary memories could be due to differences in the degree of experimental control in the two settings as alluded to by Berntsen (1998) herself. For example, the diary method informs the subjects of what they are being asked to record in advance and this information could possibly place demand characteristics on the participant to guess the research goals and report involuntary memories that satisfy those goals. In addition, the range of cues available in natural settings are much more varied than is possible with simple verbal word cues. The context of memory retrievals in natural settings is much richer than that provided by a laboratory setting. All of these factors could influence the types of memories retrieved in the two settings beyond whether the memory was retrieved voluntarily or involuntarily.

As such, it is still unclear what differences may exist between involuntary and voluntary autobiographical retrievals and what these differences may reflect for our understanding of autobiographical memory organization and processing. One way to better understand these differences is to examine whether experimental effects reported for voluntary retrievals also result for involuntary retrievals. The memory phenomenon I will examine in this thesis is the well documented mood congruence effect.

An individual's current mood state can bias an individual's autobiographical memory recall. Mood congruency suggests that individuals will retrieve memories that are congruent in affect with their current mood state more easily than memories that are mood incongruent (Ellis & Ashbrook, 1989). For example, an individual in a negative mood state would be expected to more easily recall negative or unpleasant memories. It has been shown in a previous experiment by Clark and Teasdale (1982) that an individual in a negative mood recalls negative events faster than positive events. The mood congruence effect is well-documented in memory literature

(Blaney, 1986; Bower & Mayer, 1985; Brown & Taylor, 1986; Miranda & Kihlstrom, 2005; Nasby & Yando, 1982). Though these studies identified the mood congruence effect, it was only when using a cue word that matched the valence of the mood manipulation. In studies using neutral words as cues, the mood congruence effect was not found with voluntary retrievals of autobiographical memories (Wetzler, 1985; Haaga, 1989; Bower & Mayer, 1989; Bower, Gilligan, & Monteiro, 1981).

So far little is known about mood effects on involuntary autobiographical memories as it is difficult to examine using solely diary studies. Participants in a diary study have rated the emotional content of involuntary memory retrievals in a way that correlated with their ratings of current mood (Berntsen, 1996). It is still unclear whether involuntary memory retrievals will demonstrate mood congruency in the same manner as voluntary memory retrievals obtained in the laboratory using neutral cues.

Considering some of the weaknesses in using diary studies to examine involuntary memories there has been a push by some researchers to develop laboratory based methods. The lack of research conducted thus far might be due to the inability to create a laboratory-based methodology for studying involuntary memories (Ball, 2007). One major motivation for developing laboratory based methodologies is to provide a better understanding of the differences between involuntary and voluntary retrieval processes (Mace, 2007). There are three recently developed methods for eliciting involuntary memories in the laboratory: the vigilance task (Kvavilashvili & Schlagman, 2008), the memory chaining task (Mace, 2005), and the word association task (Ball, 2007).

The aim of the vigilance task is to elicit involuntary memories as a participant performs a relatively monotonous and repetitive task. A boring task leads to a diffuse state of attention in

the participant that is known to be conducive for involuntary memory retrievals (Berntsen, 1996). The vigilance task involves the presentation of 600 three second slides with a word or phrase displayed near the center of the computer screen and surrounded by horizontal or vertical lines. Eleven of the slides, the target slides, have vertical lines. When the participant sees this low frequency vertical line pattern they are told to respond. If during the vigilance task, the participant realizes that a memory from their past has spontaneously come to mind then they are required to press the spacebar. This stops the program and the participant is asked by the experimenter to give a description of the memory content and the cue that may have elicited the memory retrieval. The participant then returns to the vigilance task. After the program finishes, the participants are given back their memory responses and required to further rate various characteristics of the involuntary memories recorded.

Mace (2006) designed the chaining method that allows for involuntary and voluntary memories to be tested in a similar and easily comparable manner. In both the involuntary and voluntary conditions, the same phrase cues are given and participants are asked to recall a specific memory from their high school years. The participants in the voluntary condition were asked to recall one additional memory from any period for each retrieved memory. Participants in the involuntary condition are given a description of an involuntary memory and told that if they experience one then they should write a brief memory description. In an effort to control for demand characteristics in the involuntary condition, the participants were told that there was no reason to expect that one of these memories should come to mind. Forty percent of voluntary memories triggered an involuntary memory (Mace, 2006). In both conditions, participants were required to go back through their memories and rate them for specificity.

In both the memory chaining task and the vigilance task participants are explicitly given a description of involuntary memories in advance, perhaps creating demand characteristics to recall memories during the task. The vigilance task is “cognitively undemanding and requires low levels of concentration”; however, the task lends itself to purposefully beginning to think about other things voluntarily while still looking for the vertical lines (Berntsen, 1998). In both tasks participants may mistakenly report voluntary memories as involuntary memories as it may become difficult to distinguish the difference (Mace, 2007). However, Kvavilashvili and Schlagman (2007) used the vigilance task and found that “laboratory involuntary memories did not differ from naturalistic involuntary memories recorded in a diary by the same participants”. Given the potential weaknesses of the memory chaining task and the vigilance task, the continuous word association task was selected for use in this study.

Unique to the continuous word association task, participants are not told before completing the task what involuntary memories are or that they will need to report having any such experiences. Originally, involuntary autobiographical memories were thought to be caused by “sensory experiences that were peripheral features of the actual memory content” (Ball, Mace, & Corona, 2007). However, in a diary study by Mace in 2004, it was found that 68% of the cues were linguistically based, hearing words in conversations, or thoughts. The method uses verbally given cue words for both the voluntary retrieval task and the involuntary retrieval task, making them easily comparable. In a study by Ball (2007) that used the continuous free association task, nearly 90 percent of participants retrieved involuntary memories. The task is also very simple and takes only thirty minutes to complete both the involuntary and voluntary retrievals. The method will be described in more detail as it is used in this study.

Using the word association task method, it will be possible to test mood manipulation effects using music on both involuntary and voluntary retrievals. This will allow different theories about mood and memory to be tested.

The self-schema model indicates that if a mood induction activates a person's negative or positive self-evaluations, then the access to positive or negative memories will be facilitated (Fitzgerald, 1991). An individual's self schema is an organized lasting view of their self. In a study by Linton (1986) fewer than 13% of autobiographical memories were negatively toned. This can be explained given that most individuals evaluate themselves in a positive light (Fitzgerald, 1991). It is held that the use of a musical mood manipulation will not activate an individual's negative or positive self-evaluations. Thus, there should not be mood congruence through using this mood manipulation in either the voluntary or involuntary memory retrievals.

In support of the SMS model, Ball and Hennessey (2009) suggest that if a cue-word is not associated with the same affective state as the prime, than the executive control system would attempt to suppress the memory. This would be due to the fact that they do not relate to the current goal of retrieving a memory related to a neutral cue word.

This study aims to manipulate a participant's mood and use neutral cue-words with the continuous word association task to examine the effects on the retrieval and characteristics of voluntary and involuntary autobiographical memory. The purpose of this study is to find further support for the SMS model. It is predicted that voluntary autobiographical memories will not demonstrate mood congruence while it is predicted that involuntary autobiographical memory retrievals will display mood congruence. According to the self-schema model, voluntary and involuntary autobiographical memories should not be mood congruent with a musical mood manipulation as it has not activated the negative self-evaluations. According to the self memory

system model, voluntary autobiographical memory should not be mood congruent if neutral cues are used. Involuntary memories will be mood congruent as the executive control system, which inhibits non-goal related memories from surfacing, will allow the memories that have been primed by the musical mood manipulation to pop into mind unexpectedly. It is predicted that involuntary and voluntary memories may not go through the same retrieval process as the SMS model dictates that involuntary memory can jump straight to event specific memories without going through a top-down retrieval.

## Method

### **Participants**

The participants used in this study were undergraduate students at the College of William and Mary ranging in age from 18 to 23 (mean age = 18.55 years). The subjects received course credit for their participation. There were a total of 56 participants, 5 males and 51 females.

### **Apparatus**

The mood manipulation involved two positive music selections (Eine Kleine Nachtmusik by Mozart and Divertimento 136 by Mozart) and two negative music selections (Adagietto by Mahler and Adagio for Strings by Vivaldi). Past research has found these music pieces to effectively induce positive or negative mood manipulations (Storebeck & Clore, 2004; Cahill et al., 2007). Musical mood manipulation was selected as recently it has been found that that mood induction might be more pronounced and longer lasting than a verbal mood induction procedure (Stein, Goldman, Del Boca, 2000).

A CD player was used to play the music located on the desk about 2 feet in distance from participant. The CD repeated the two musical pieces assigned to the participant for the entire thirty minute duration of the experiment. The volume of the music was set to the equivalent of

someone speaking to maintain the same sound level between the negative and positive mood conditions.

Pilot testing was conducted on forty nouns that were selected from previous research using neutral word cues (Calvo, Castillo, & Fuentes, 2006; Koster, Raedt, Goeleven, Franck, & Crombez, 2005; Doninger & Bylma, 2007). The forty words were given to 33 undergraduate students at the College of William and Mary who rated them on the emotional valence they associated with each noun (-3 = “*negative*” to 3 = “*positive*”). The full list of nouns is provided in Appendix A. The mean ratings were calculated for each noun and the 24 nouns that provided ratings nearest to the neutral mid-point of the scale were selected for this experiment. Two lists of 12 nouns were created and these consisted of (1) cabin, keyboard, clock, fall, bridge, truck, pilot, note, anchor, pencil, bread, pulse and (2) potato, wagon, paper, gate, harbor, morning, thumb, pavement, liquid, crane, branch, plate. These nouns formed the cue-words for the voluntary memory test and the starting words for the involuntary memory test.

The Brief Mood Introspection Scale was used as a mood manipulation check (Mayer & Gaschke, 1988). The scale has been used in several studies to examine mood (Muraven, Collins, & Nienhaus, 2002; Kokkonen & Pulkkinen, 2001; Halberstadt, Niedenthal, & Kushner, 1995; Hall & Baum, 1995). The scale can be scored on pleasant-unpleasant mood, arousal-calm mood, positive-tired mood, negative-relaxed mood, but in this study it will only be used to evaluate pleasant-unpleasant mood. A copy of the Brief Mood Introspection Scale can be seen in Appendix B. Participants also rated their overall mood on a scale (-10 = “*very unpleasant*” to 10 = “*very pleasant*”).

## **Procedure**

The experiment was conducted in a dimly lit, quiet room and the participant was requested to sit at a table facing the wall. The experimenter sat at another desk about three feet away to their side.

The participant was given an informed consent form to read and sign. Each participant was randomly assigned to either the positive or negative mood condition. The list of nouns and the memory test order were counter-balanced across the participants.

The participant then completed the Brief Mood Introspection Scale and provided an overall mood rating. After which the positive or negative music was turned on, and the participants were given the following instructions adapted from previous studies (Stein, Goldman, & Del Boca, 2000; Cahill, 2007).

For the next two minutes, you will be asked to listen to a piece of classical music that is designed to put you into a positive/negative mood. However, the music alone cannot create the desired mood, so you should try to concentrate on the feelings that the music is trying to convey. It also might be helpful for you to think about personal experiences or memories from your past that are positive/negative.

At the end of two minutes, the participant completed the Brief Mood Introspection Scale and an overall mood rating again. This provided us with pre-test and post-test comparisons of the successfulness of the mood manipulation.

Each participant completed both an involuntary memory test and a voluntary memory test, although the order of the tests was varied across the participants.

The involuntary memory test (Continuous Word Association Task) was developed by Ball (2007) and requires the participant to make continuous word associations where each word is associated to the previous one. The starting word for the associations is provided by the

experimenter, who also controls when the participant completes the associations for each word trial.

The experimenter provides a practice trial by asking the participant to state the first thing that comes to mind that they associate with the word “tree”. After the participant provides their association, the experimenter then asks the participant to provide the first word they now associate with their past answer. The participant is then instructed to continue giving associations in this same manner until requested to stop by the experimenter after about 6-7 associations. If the participant understood the continuous word association procedure, the first neutral noun was provided for the first set of associations.

The participant provides continuous associations out loud for approximately 20 seconds. During this time, the experimenter records the participants associations. At the end of 20 seconds, a bell sounded signifying the participant to stop continuously free associating and wait for the next word. The participant continued this procedure for the 12 neutral nouns assigned to the participant.

After completing the associations, the experimenter read the participant the following instructions and description of an involuntary autobiographical memory:

It is possible that a past personal experience might have unexpectedly come to mind while you were providing these free associations. The memory may vary in detail or refer to a specific or general event. It could be many years old or only a few hours old. If you remember this happening, when I read out the list of associations, I would like you to stop me at the word where you started to have the memory.

The experimenter then read out aloud the associations provided by the participant for each noun. For each involuntary memory reported, the participant provided a brief description of the

memory and rated the memory on the following dimensions (1) specificity (1 = “*specific event*” to 7 = “*general event*”), (2) amount of detail retrieved (1 = “*vague: general gist*” to 7 = “*very clear and detailed*”), (3) emotional valence (-3 = “*very unpleasant*” to 3 = “*very pleasant*”), and (4) the age of the memory (1 = “*very recent/last 24 hours*” to 7 = “*very old/years ago*”). Only the first involuntary memory was recorded for each set of associations and the experimenter also recorded how many associations had passed before this memory came to mind. Each participant completed 12 trials of this task.

The voluntary memory test requires the participant to voluntarily retrieve a specific personal experience to a cue-word (neutral noun) provided by the experimenter. Once the memory came to mind they were told to say “stop”. The time taken from the delivery of the cue-word and when the participant responded ‘stop’ was recorded by the experimenter. The participant then was asked to give a brief description of the memory and rate the memory on the following scales (1) specificity (1 = “*specific event*” to 7 = “*general event*”), (2) amount of detail retrieved (1 = “*vague: general gist*” to 7 = “*very clear and detailed*”), (3) emotional valence (-3 = “*very unpleasant*” to 3 = “*very pleasant*”), and (4) the age of the memory (1 = “*very recent/last 24 hours*” to 7 = “*very old/years ago*”). Each participant completed 12 trials of this task.

After completing the memory tests, the participant then completed another Brief Mood Introspection Scale and provided an overall mood rating. The third set of mood scores allowed the experimenter to evaluate the mood of the individual during the memory testing.

## Results

The mood manipulation in the experiment was successful. There was a strong correlation between the overall mood score and the Brief Mood Introspection Scale scores, so only the overall mood scores are reported. At time 1 (before the mood manipulation), the negative group

( $M = 4.89$ ,  $SD = 2.68$ ) and the positive group ( $M = 4.76$ ,  $SD = 3.46$ ) did not significantly differ in initial mood levels from each other,  $p > .05$ . The negative group ( $M = 1.33$ ,  $SD = 3.36$ ) and the positive group ( $M = 5.69$ ,  $SD = 3.18$ ) significantly differed from each other at time 2 (directly after mood manipulation), ( $t(54) = -4.99$ ,  $p \leq .001$ ). At time 3 (after the memory tasks), the negative group ( $M = 3.33$ ,  $SD = 3.13$ ) and the positive group ( $M = 5.21$ ,  $SD = 3.33$ ) also did significantly differ ( $t(54) = -2.17$ ,  $p = .035$ ). A graph can be seen of the average overall mood ratings gathered at the three time points from the Brief Mood Introspection Scale for the negative and positive groups in Figure 1. However, some participants did not show a change in mood and a few even showed the opposite effect. These 20 participants were dropped from further statistical analyses.

On 55% of the trials participants recalled an involuntary autobiographical memory ranging from 0 to all 12 trials. Only one participant did not recall an involuntary memory on any trial during the experiment and their data was not included in further analyses. All participants retrieved specific autobiographical memories to the 12 cue-words that were presented to them. There were no order or list effects for the voluntary and involuntary retrievals,  $p > .05$ . There were no significant differences on the age of the memories recalled between involuntary memories ( $M = 3.52$ ,  $SD = 1.1$ ) and voluntary memories ( $M = 3.66$ ,  $SD = 1.19$ ),  $p > .05$ . There were also no significant differences in the amount of time it took for participants to recall a memory between the involuntary memories ( $M = 3.64$ ,  $SD = 1.3$ ) and the voluntary memories ( $M = 5.66$ ,  $SD = 2.44$ ),  $p > .05$ . For the specificity of the memories, there were also no significant differences between the voluntary memories ( $M = 2.97$ ,  $SD = .85$ ) and the involuntary memories ( $M = 3.1$ ,  $SD = 1.11$ ),  $p > .05$ . A repeated measures ANOVA was performed with within subject factors of involuntary and voluntary memory amount of details and between subject factors of

negative and positive music type. There was almost a significant difference in the amount of details recalled between the voluntary memories and the involuntary memories ( $F(1,52) = 3.87, p = .055$ ). The involuntary memories were more detailed ( $M = 4.6, SD = 1.02$ ) than the voluntary memories ( $M = 4.35, SD = .91$ ). The age of the memory, amount of time for recall, specificity, and amount of detail were not significantly different as a function of mood,  $p > .05$ .

There was a significant mood congruency effect for the involuntary memory test, ( $t(33) = -2.25, p = .031$ ). The negative group ( $M = .41, SD = 1.15$ ) rated their memories as significantly less pleasant than the positive group ( $M = 1.2, SD = .81$ ). There was not a significant mood congruency effect for the voluntary autobiographical memories as the negative group ( $M = .78, SD = .84$ ) did not significantly differ from the positive group ( $M = .87, SD = .6$ ) in their ratings of pleasantness,  $p > .05$ .

### Discussion

The current study required participants while undergoing a positive or negative mood manipulation to recall twelve voluntary autobiographical memories from a cue word and attempted to elicit up to twelve involuntary memory retrievals from a continuous word association task. Participants provided a memory description and ratings of the characteristics on specificity, amount of detail, pleasantness, and age of the memory. The mood manipulation in the study was successful in increasing the mood and decreasing the mood for the positive and negative condition respectively. Mood congruency was not found for the voluntary memory retrievals using neutral cues as hypothesized, which holds with the predictions of the self-schema model, the self memory system model, and previous research (Blaney, 1986; Bower & Mayer, 1985; Brown & Taylor, 1986; Miranda & Kihlstrom, 2005; Nasby & Yando, 1982). Mood congruency was found for the involuntary memory retrievals.

The mood congruency for involuntary memory retrievals lends support to the self memory system model when taking into account a weakened executive control system. It states that the executive control system stops non-goal related memories from reaching consciousness. If an individual is in a diffuse state of attention and the executive control is relaxed then perhaps non-goal related material will spontaneously pop into mind as involuntary memories. Participants that were thinking of positive and negative memories during the two minute mood manipulation period could have created a spreading activation for positive or negative memories. It has been found that after doing a laboratory recall session about a certain time period, subjects that then complete a diary study record more involuntary memory retrievals related to that time period than control groups (Mace, 2006). The current study in addition to other research lends support that priming participants can influence involuntary memory production, thus causing a spreading activation throughout the autobiographical memory structure (Kvavilashvili & Mandler, 2004; Mace, 2007).

The self-schema model was not supported as it predicts that mood congruency should not be found for the involuntary memory retrievals as the negative and positive memories will not be primed by the musical selections as they do not activate negative or positive self-evaluations. The model holds that the trigger must make the participant feel negative or positive about themselves in order to find mood-congruency (Fitzgerald, 1991).

In general, negative memories were recalled less frequently than positive memories with all of the mean pleasantness ratings for the negative groups being slightly positive. Matlin and Stang (1978) proposed the Pollyanna Principle stating that negative memories do not remain active features of the memory contents. Content that individuals recall is generally showing a cheerful view of their life. Taylor (1991) proposed the short-term mobilization and long term

minimization hypothesis, which holds that individuals cushion themselves from the negative impact of events. Individuals will minimize negative emotions associated with events rather than the actual memory of the event. This means that negative memories are not recalled less often than positive memories just that the negative emotion associated with the event fades rapidly over time. In Taylor's study (1991), they were unable to account for the reduction of emotion content by differences in numbers of memories for pleasant and unpleasant events.

In the current study, no significant differences were found in the age of the memories recalled between involuntary and voluntary memories. The memories were found to be approximately 3.5 on a 7-point scale with 1 being a rating of the memory being in the last 24 hours and a 7 being years ago. This seems to support findings from diary studies that involuntary memories are mostly from recent years (Schlagman, Kvavilashvili, & Schulz, 2007). The concept has been termed the recency effect, but it has only been found in studies using young adults as participants. In young adults, the distribution of the age of involuntary memories looked very similar to the age distribution of voluntary memory retrievals. When using older adults, ranging in age from 64 to 80, the number of memories in the most recent decade did not significantly differ from the number of involuntary memories recalled from when the participants were in their twenties. The idea that older adults have a large number of memories from their twenties has been termed the reminiscence bump. It may be an interesting area for further research to compare participants across a wide range of ages using laboratory based methods for retrieving involuntary memories and voluntary autobiographical memories.

This study found that involuntary memories were almost significantly more detailed than the voluntary memories. Perhaps the executive control system limits the amount of detail recalled to only the amount necessary to achieve the goal of the search through memory. As the

goal was simply to retrieve a memory and give a brief description it is possible that individuals truncated the search early before they had retrieved all the details they could have potentially recalled. Involuntary memories, however, were not searched for intentionally and came back unexpectedly possibly when the executive control system was weakened. Hence, the goal directed filter was not present to control unneeded details allowing a more vivid memory to come into consciousness.

In this study, there was not a significant difference in the specificity between the voluntary and involuntary memories contrary to the findings of Berntsen (1998) from diary studies. Voluntary and involuntary memory retrievals in this study were both only very slightly on the specific side of the scale. This is contrary to a past diary study findings. Berntsen (1998) found that involuntary memories were significantly more specific than voluntary memories (Berntsen, 1998). Ball and Little (2006) also found that 83% of involuntary memories were specific memories. This may suggest that specific and general memories are equally as accessible in the memory system, or the difference in findings could be due to differences in coding for the specificity of the memories.

In this current study, participants rated how specific or general their memory was on a 7 point scale. The study by Ball and Little (2006) gave two independent coders participant's involuntary memory descriptions and allowed them to rate whether these memories were specific, general, or from a lifetime period. Berntsen (1998) asked participants to record if the involuntary memory referred to a one time occasion, specific episode, or a summary representation of similar occasions, summarized event. In the future it might be useful to use similar scales between multiple methods for eliciting involuntary memories to allow a better comparison of specificity.

In addition to adjusting the scales on the memory questionnaire for future research, the imbalance between the number of males and females in this study should be addressed. It was found in a study by Clark and Teasdale (1985) that the mood congruence effect was found when using affective cue-words with a mood manipulation in females but not in males. This may be due to the fact that males and females process certain information differently. In addition, females use certain information more than males and thus may have that information better integrated into their memory system. As there were only 5 males and 51 females used as participants in this study, it is possible that the results could be different with more male participants. Further research should be conducted on possible gender differences in autobiographical memory recalls.

Another concern is the possibility that participants may have difficulty teasing out when exactly during the experiment the involuntary memories occurred. There may be confusion as to whether the memory popped into the participant's mind while the experimenter was reading back the list of words or when the participant was listing the free associations originally. If the participant was remembering the involuntary memory while the experimenter was reading the word list back, then the participant may be under the demand characteristic of knowing the experimenter would like them to retrieve involuntary memories. To attempt to minimize the effect of this, participants are specifically told that they are only to report memories that popped into their minds while they were originally free associating.

With different methods now developed to study involuntary memories in the laboratory, it would be useful to do a study comparing the methods using questionnaires and rating scales that were as similar as possible. This would allow a comprehensive comparison of the characteristics of involuntary and voluntary memories gathered from all the methods. It would

be helpful if using comparable methods produced involuntary memories that were not significantly different from each other. If each of the methods produced involuntary memory retrievals with different characteristics then this would create more questions about the validity of the laboratory based methods in eliciting true involuntary memories, which still needs to be verified. Considering the differences in the range of cues used in each of the different methods to elicit involuntary memories, it might be more suitable to examine if the parts of the brain being activated when recalling involuntary and voluntary autobiographical memories are different.

Recent research from the field of cognitive neuroscience speculates that it could be possible to differentiate the parts of the brain activated when voluntarily and involuntarily retrieving memories using an EEG (Ball, 2007). Ball (2007) says that the word-association task, used in this study, is currently being adapted to test participants while determining which brain areas are activated when the participants are completing the task. If the EEG demonstrates that there is a difference in the part of the brain being used when having an involuntary memory then this may lend support that the participants are indeed having involuntary memories rather than voluntary memories.

In addition to opening up a wide range of possibilities for future studies, the laboratory method for eliciting involuntary memories has implications for the development of treatments and theories about post-traumatic stress disorder, psychosis, as well as depression (Brewin, 2005). Depressed individuals are more often in negative mood states than non-depressed individuals and more likely to retrieve negative experiences. Wegner (1994) suggests that attempts to avoid thinking of a memory actually may lead to more instances of recall as an individual must be aware of the memory they are trying to keep out of mind, thus the memory

always remains activated and ready for recall as soon as the executive control mechanism is weakened.

The field of autobiographical memory, studying the differences between involuntary memory and voluntary memory, has not reached its full potential. There should be a continued focus on finding and validating a method for retrieving involuntary memories in the laboratory setting. With a validated method for retrieving involuntary memories in the laboratory established this could pave the way for more research to be completed in this growing field.

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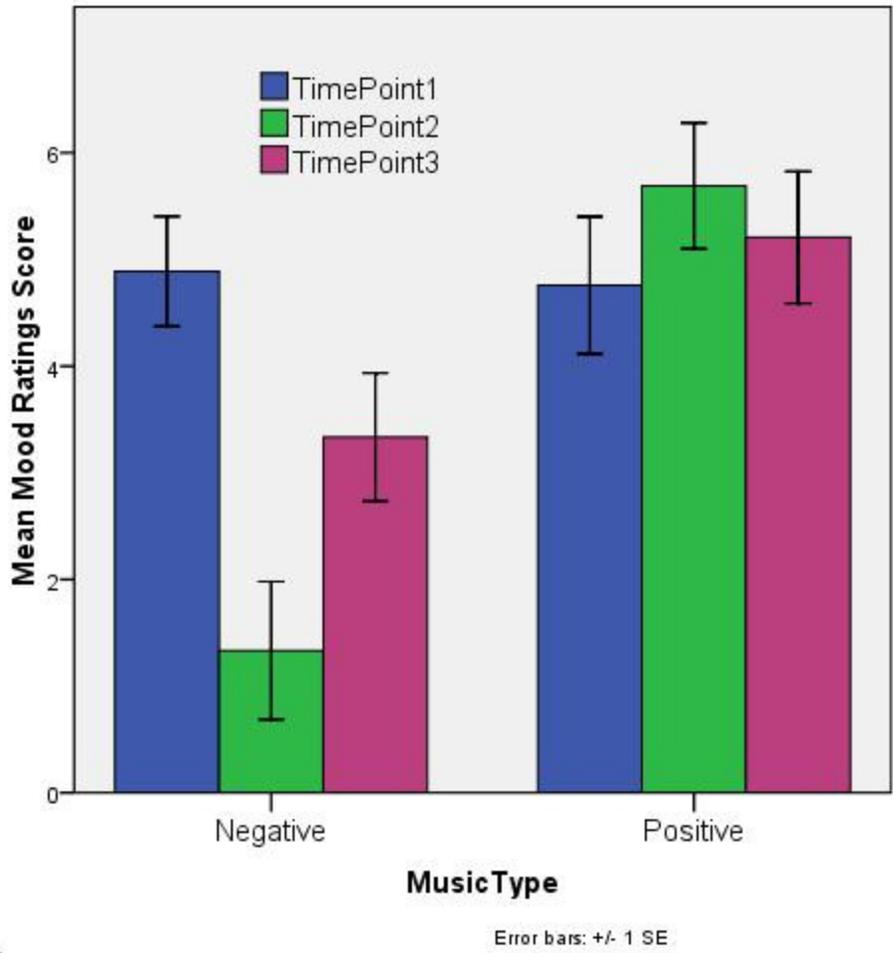
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Figure Caption

*Figure 1.* Mean overall mood rating scores for the positive and negative mood manipulation groups at the beginning of the study, after mood manipulation, and at the end of the experiment.



ii

Appendix A: *Forty Nouns used in Pilot Testing*

Note  
Thumb  
Clock  
Gate  
Field  
Pulse  
Pilot  
Barrel  
Cabin  
Wire  
Anchor  
Fall  
Shop  
Navel  
Senior  
Plate  
Branch  
Park  
Truck  
Potato  
Bread  
Wagon  
Bridge  
Harbor  
Theatre  
Path  
Morning  
Mountain  
Brick  
Broom  
Keyboard  
Pavement  
Message  
Liquid  
Crane  
Paper  
Office  
Paperclip  
Pencil  
Dictionary

Appendix B: *Brief Mood Introspection Scale*

INSTRUCTIONS: Circle the response on the scale below that indicates how well each adjective or phrase describes your current mood.

	<b>definitely do not feel</b>	<b>do not feel</b>	<b>slightly feel</b>	<b>definitely feel</b>
<b>Lively</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Drowsy</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Happy</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Grouchy</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Sad</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Peppy</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Tired</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Nervous</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Caring</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Calm</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Content</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Loving</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Gloomy</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Fed up</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Jittery</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>
<b>Active</b>	<b>XX</b>	<b>X</b>	<b>V</b>	<b>VV</b>

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Overall, my mood is

**Very unpleasant** **Very pleasant**  
 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10