The Effects of Mood Valence and Mood Arousal on False Memory

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Abstract

False memory, remembering things that did not actually happen, often occurs in our everyday life. Mood is one factor that affects the formation of false memory. This study aims to examine the influence of two dimensions of mood (i.e., mood valence and mood arousal) on false memory. 42 college students in emerging adulthood age participated in the study. The study used a 2 (mood valence) x 2 (mood arousal) experimental design and was analyzed using Chi-square. Participants’ mood valence and mood arousal were manipulated using Indonesian film footages to elicit four different moods that represent the two dimensions of mood, i.e. happy, sad, serene, and fear. False memory is measured using DRM Paradigm. The result suggests no influence of mood valence and mood arousal on the formation of false memory in emerging adulthood.

Keywords— emerging adulthood; false memory; mood arousal; mood valence

1. Introduction

False memory can be found in everyday life, from remembering someone’s name incorrectly to remembering a culprit who may have stolen your purse. The phenomenon occurs when an individual “remembers” an event that never happened, or remembers the event differently from what actually happened (Roediger & McDermott, 1995). Studies of false memory date back from the 1980s and are still regularly conducted today (Kamal & Berry, 2015). Several factors that contribute to the formation of false memory are age (Brainerd, Reyna, & Ceci, 2008; Jacoby & Rhodes, 2006), gender (Bauste & Ferraro, 2004; Dewhurst, Anderson, & Knott, 2012), depression (Moritz et al., 2005 in Howe & Malone; Joormann, Teachman, & Gotlib, 2009), and mood (Wright, Startup, & Mathews, 2005; Storbeck & Clore, 2005). In this experimental study, because gender and age cannot be manipulated through the experimenters’ intervention, mood was chosen as the factor to be manipulated.

A. The Influence of Mood on False Memory

Mood is an important factor that can affect false memory, as demonstrated by many studies done to investigate the relationship between mood and false memory (Clark, 2005). Mood is a psychological condition, either customized or temporary, that occurs in individuals (Clark, 2005). Mood can affect health, confidence, individual’s perception of the world and the surrounding environment, and behavior based on such perception, in addition to being associated with a hobby or feelings as well as humor (Clark, 2005). Mood indicates whether a person is feeling happy, angry, sad, anxious, or agitated. If mood changes occur in a rapid succession (mood swings) and in a chronic manner, then mood may be used as an indicator of a psychological disorder (Clark, 2005).

Previous studies of mood and false memory have yielded contradictory results. Otgaar, Howe, Brackmann, and Smeets (2016), for example, stated that an emotional event frequently increases memory accuracy and protects individuals from forming false memories of arousing and negative events. On the other hand, several findings indicated that negative mood increases the probability of forming false memories (Howe, 2007; Howe, Candel, Otgaar, Malone, & Wimmer, 2010; Otgaar, Candel, & Merckelbach, 2008; Porter, Spencer, & Birt, 2003, cited in Otgaar, Howe, & Smeets, 2016). Furthermore, Storbeck and Clore (2005) suggested that emotion can affect the formation of false memory, and people experiencing negative moods tend to remember critical lures more than those experiencing positive moods.

B. The influence of Mood Valence and Mood Arousal on False Memory

Dimensions of mood are usually divided into mood valence and mood arousal. Mood valence is the level of excitement generated when a stimulus is given a code that ranges from very negative to very positive (Gomes,
Someone who experiences negative moods tends to have false memory if the person is instructed to recall the memory as much as possible (Wright, Startup, & Mathews, 2005). On the other hand, mood arousal is defined as the activation level generated by a stimulus that varies in its level of arousal, ranging from low to high. Memory performance has been found to be better when mood arousal is high than when arousal is low (Buchanan, Etzel, Adolphs, & Tranel, 2006; Cahill, Babinsky, Markowitsch, & McGaugh, 1995; Cahill & McGaugh, 1995, in Gomes, Brainerd & Stein, 2013).

Porter, Spencer, and Birt (2003) compared mood valence (neutral, positive, and negative) with mood arousal (neutral, low, and high) to investigate which of them contributed to false memory formation. In the study, it was found that mood arousal affects the suggestions that are often associated with the formation of false memory, leading to the conclusion that the effect of mood on false memory was due to the role of mood arousal rather than mood valence. In particular, high levels of mood tended to cause errors in the process of memory recall and recognition than did low mood levels.

C. The Aim of Study

Based on these findings, the current study focused on the effect of mood valence and mood arousal on the formation of false memory. The study sought to determine the true effect of mood on the formation of false memory. Our first prediction was that there would be a significant difference in the formation of false memory between high arousal moods and low arousal moods. Secondly, we predicted that there would be a significant difference in the formation of false memory between positive valence moods and negative valence moods. Prediction regarding the influence of mood on the formation of false memory was formulated as a two-tailed hypothesis because there still seems to be some debate regarding the direction of the influence of mood dimension on false memory.

2. Methods

A. Design

A randomized 2 (positive vs. negative mood valence) x 2 (high vs. low mood arousal) experimental research design was employed in the current study. In total, 4 combinations of mood were used: positive-high arousal, negative-high arousal, positive-low arousal, and negative-low arousal. Mood valence and mood arousal were manipulated using Indonesian film footages that were previously verified for their ability to successfully induce the specific moods that represented the mood dimensions of interest.

B. Participants

55 people participated in this experiment. However, only 42 participants' moods were successfully induced using the film footages. 13 of the participants had no change in mood following presentation of the film footage, as indicated by their BMIS (Brief Mood Inspection Scale) scores. Thus, data from these 13 participants were excluded from the final analysis. The 42 participants whose data were used in the research were undergraduate students belonging to the young adult age group. Their ages ranged between 18 and 25 years (M= 19.5 years, SD= 0.93). 30 of the participants (71.4 %) were female, while the remaining 12 (28.6 %) were male.

A total of 4 groups were formed, with every group representing each combination of mood valence and mood arousal. The happy group represents positive valence and high arousal (13 participants: 6 male, 7 female), the sad group represents negative valence and low arousal (11 participants: 2 male, 9 female), the serene group represents positive valence and low arousal (11 participants: 2 male, 9 female), while the fear group represents negative valence and high arousal (6 participants: 2 male, 4 female).

C. Materials and Apparatus

1) Deese-Roediger-McDermott (DRM)

False memory was measured using the DRM (Deese–Roediger–McDermott) paradigm, one of the most popular and powerful techniques to measure false memory (Wade et al., 2007) featured by Deese (1959) and Roediger and McDermott (1995). The paradigm involved the initial presentation of a list of 15 words (nurse, sick, lawyer, medicine, health, hospital, dentist, physician, ill, patient, office, stethoscope, surgeon, clinic, cure). A critical word (i.e., doctor) that was absent from the original list but has strong links with the words on the list was then presented and used to measure the formation of false memory (Russell & Jenkins, 1954). The critical word has a strong link to the words presented since participants also have experience and knowledge in their lives related to false memory has been remembered, as well as the correct words. (Sherman & Moran, 2011). Past studies (Schacter, Verfaellie & Anes, 1997; Sommers & Lewis, 1999; Watson, Balota & Roediger, 2003, in Gallo, 2010) have claimed that the recall or recognition of a word can be constituted by orthographic confusions (e.g., word spelling) and/ or phonological confusions (e.g., word structure and word sound).

2) Brief Mood Inspection Scale (BMIS)

Manipulation check was done using BMIS, which was administered in accordance with the guidelines detailed by Mayer and Gaschke (1988). BMIS was administered both prior to and following the presentation of film footages. The BMIS consists of two parts for participants to fill in. The first part requires participants to indicate, using a four-scale measure, how well certain adjectives or phrases describe their mood. The adjectives or phrases that was used in the BMIS were the same as in the second part asks participants to rate their moods from a minus ten (to signify a very unpleasant mood) to a ten (indicating a very pleasant mood). Recall also that in the current study, a total of four mood states (happy, serene, fear, sad) were used. To obtain a general picture of the participants' overall moods, the participants were then asked to rate each of the four mood states on a four-point scale, with 1 representing the mood least experienced and 4 representing the mood that is most experienced.
3) Film Footages
In total, there was 4 different film footages used, one for each mood that needed to be elicited. To elicit happy mood (high arousal-positive valence), a footage of Marmut Merah Jambu (2014), a film about a high school student's adaptation process in a new school, was presented. Footage of the film Rectoverso (2013), which portrayed the unrequited love of a man who suffered from autism, was presented to induce sad mood (low arousal-negative valence). To induce serene mood (low arousal-positive valence), footage from a documentary titled The Serenity of Papua (2012) about a trip to the renowned Raja Ampat islands in Papua was shown. Lastly, to induce fear (high arousal-negative valence), the researchers used footage from the Indonesian horror movie Mirror (2005), which told the story of a high school student with the paranormal ability to see others' deaths by looking into a mirror. All of the footages used in the experiment were obtained from Indonesian films, with each footage lasting between 7 and 20 minutes.

D. Procedure
A pilot study was carried out prior to the start of the actual experiment. The pilot study was meant to verify the effectiveness of the film footages in inducing each of the four moods being studied. Results from the pilot study confirmed that each of the four film footages was able to induce the corresponding mood. Next, an online form was distributed to recruit participants matching the characteristics required of the study and who were willing to participate in the experiment. After all online forms were completed, participants were asked to choose an experimental schedule out of a total of six sessions carried out over three different days, with two sessions on each day.

Before the experiment began, participants were randomized into the four mood groups: happy, sad, serene, and fear. The experiment was done in groups of four to twelve people. In the initial phase, an informed consent form was distributed, followed by the BMIS as part of the manipulation check. This manipulation was necessary to determine whether the change of mood was caused by the manipulation. Next, a film footage was displayed in a controlled condition (i.e., same room, volume level, instrument, and range of time), following which participants were given another BMIS.

Upon completion of the BMIS, the DRM procedure was initiated. Researchers presented 15 words from a DRM False Memory list (excluding the critical word: doctor) related to health, hospital, and occupation. Without changing the order of the words, each word was shown on a PowerPoint slide for 2 seconds before it automatically transitioned to the next word on the list. The participants were then asked to circle the words they remembered from a copy of the complete DRM False Memory list they had in front of them, which consisted of 16 words that included the 15 words that were originally displayed as well as one critical word (i.e., doctor) that was not displayed in the slideshow. If the critical word was circled, it was marked with a 1 (to indicate false memory), as opposed to a mark of 0 if the critical word was not circled.

After the participants were finished, they were debriefed about the purpose of the research. Data that were discovered not to reflect a change in the participant's mood as a result of watching the film footage were eventually excluded from the analysis. The remaining available data was then analyzed using the Chi-square test for independence.

3. Result and Discussion

A. Result
The frequencies of false memory for each mood group, separated by gender, are presented in Table 1 below.

Table 1. Frequency of false memory in each mood. False memory score based on each mood dimension

<table>
<thead>
<tr>
<th>False Memory</th>
<th>Mood Valence</th>
<th>Mood Arousal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>m</td>
<td>f</td>
<td>m</td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>No</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

*m is for male and f is for female

1) Influence of mood valence on false memory
The results of the Chi-square test for independence showed that the effect of mood valence on false memory was not significant ($\chi^2 (42) = .075, p>0.05$, two-tailed). As can be seen from Table 1, the false memory scores of participants in the positive-valence group (n=14) were relatively comparable to the scores of participants in the negative-valence group (n=14), suggesting no influence of mood valence on false memory and thus failing to provide support for the first hypothesis.

2) Influence of mood arousal on false memory
No effect of mood arousal on false memory ($\chi^2 (42) = .662, p>0.05$) was found. The false memory scores of the high-arousal group (n=6) were also relatively comparable to the low-arousal group (n=8) (see Table 1). The result indicated that there was no influence of mood arousal on false memory, and the second hypothesis was therefore not supported.

B. Discussion
Result of the present research indicates that false memory is influenced neither by mood arousal nor by mood valence. The findings of the present study contradict the findings of Porter, Spencer, and Birt (2003), in which mood arousal was demonstrated to trigger false suggestions that correlate with false memory. This result is also inconsistent with the findings of Storbeck and Clore (2005), who discovered a difference in remembering critical lures between persons experiencing negative mood and those with positive mood. Additionally, in their study, the researchers assumed that high arousal mood were more likely to result in false
recall and recognition compared to low arousal mood. On the other hand, Corson and Verrier (2007) proposed that a person with high arousal mood tends to experience false memory, regardless of the mood valence. This effect of mood arousal on false memory has been explained by the theory that positive mood activates memories of critical lures due to its ability to increase attention to the critical lures, although such a process is believed to depend on mood arousal. As such, Fiedler and Stroebel (1968, in Corson & Verrier, 2007) claimed that arousal enhances the representation of the information previously encoded. In a similar manner, Swart (1975, in Corson & Verrier, 2007) attempted to explain the effect of mood arousal on memory by proposing that low arousal is associated with a shallow level of encoding, while high arousal entails elaborative encoding and direct access to information.

The results of the current experiment can be explained using two rationales. First, due to the use of a single DRM list for all participants instead of a variety of DRM lists, the results may not have significantly predicted false memory because the particular list that was used may have facilitated participants' recall of the original words and hindered recognition of the false word. Secondly, the unbalanced proportions of the participants' gender, in which there were more female than male participants, resulted in each treatment group being dominated by female participants. Therefore, gender may well have acted as a confounding variable that could have impacted the results.

Female participants were additionally found to be more likely to form false memory than male participants. While this resonates with Dewhurst, Anderson, and Knott's (2012) claim that females tend to recall negative lures more than males, it must also be acknowledged that the current research does conflict with several earlier studies. For example, a study by Bauste and Ferraro (2004) demonstrated no differences in the formation of false memory between male and female when neutral critical lures were used. However, this discrepancy in findings may have been caused by the unbalanced proportion of gender in the sample of the current study, which as mentioned before, resulted in a larger proportion of female than male participants.

4. Conclusion

Based on the results of the present study, it can be concluded that mood does not influence the formation of false memory among those in emerging adulthood age, as neither mood valence nor mood arousal was found to influence the formation of false memory. Nevertheless, some limitations of this study, which may have contributed to the failure to produce support for the hypotheses, can perhaps be addressed in future studies. First, in the current study, the majority of participants were females. To overcome this potential confounding effect of gender, future studies could strive to ensure that the sample is comprised of a more balanced ratio of female to male participants. The second limitation of the current study concerns the procedure used to measure false memory. As the present experiment utilized only one out of the many available DRM False Memory lists, the use of the particular list may have affected participants' ability to remember the words in a way that minimizes the probability of forming false memory. Alternatively, future research could use a combination of a minimum of four lists to better portray the probability of forming false memory. Another limitation of the study has to do with the number of research participants. With a limited sample size, such as that included in the present research, the interaction between mood valence and mood arousal on the formation of false memory may not have been adequately reflected in the obtained data. Such a shortcoming can possibly be overcome by including more participants in future studies.

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References


