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Effectiveness of Emotions as Retrieval Cues

Mauri Linero²

This article describes an experiment that was conducted in order to determine the effectiveness of emotions as retrieval cues. Whenever someone is in the same state of consciousness while encoding and retrieving an experience or information, the person is able to recall a greater amount of information; this phenomenon is called state dependent memory. For this study the state of consciousness used was emotional state. The participant was shown a video that induced either positive or negative emotions during the encoding process followed by a study material for participants to read. Once again the participant was induced with a positive or negative emotion through another video during the retrieval process, and then was provided with a memory test about the study material. It was hypothesized that the group of participants who experienced the same emotion in the encoding and retrieval processes will do better in the memory test than the group of participant who experienced different emotions during the encoding and retrieval processes. The videos were effective in inducing the desired emotional state; however, analysis of the results showed no significant difference between the two groups.

State dependent memory is a phenomenon through which humans are able to recall information to a greater extent whenever the state of consciousness matches the one we are in when encoding the experience or information (Ashby, Isen, & Turken, 1999; Bower, 1981). To better understand state dependent memory, picture the following scenario: Jeffrey and Megan are in the same math class; they are both good students, and they usually get similar scores on their math exams. They were both studying for the exam they had next morning. After Jeffrey finished studying, some friends called him to invite him to a party. He knew that his exam was the next morning, but since he felt prepared, he agreed to go to the party. The next morning he was slightly intoxicated, and he almost failed the exam. Megan

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was also invited to the party, but she decided not to go, so she took her exam sober and got a very high score. If Jeffrey and Megan usually get the same scores, why did they earn different scores this time? A possible explanation is that Megan's state dependent memory helped her succeed. She was sober while encoding the information and was in the same sober state while retrieving the information in the exam. On the other hand, Jeffrey was sober while encoding the information and intoxicated when retrieving the information.

The same phenomenon happens with emotions and moods. If a person is encoding information in a specific emotional state, it would be easier for the person to recall the information if he or she is in the same emotional state that he or she is in when encoding it (Bower, 1981). The amygdala connects emotional events and stimuli, making it an essential component for our memory system. During the memory consolidation process, the amygdala makes an association between the individuals' emotional state and the memory (Ashby et al., 1999).

The amygdala responds differently depending on the mood. Feelings of sadness activate the amygdala to a greater extent than feelings of happiness (Ashby et al., 1999). Storbeck and Clore (2005) studied the impact of feelings in memory. They found that individuals whose negative emotions were induced were more likely to encode more detailed information and therefore have more accurate information in their retrieval process. On the other hand, participants whose positive emotions were induced were more likely to encode with more rational processing and therefore have false memories.

Other researchers who studied emotions and memory are Teasdale and Fogarty (1979). They studied the accessibility of memories on depressed moods and their results also supported the state-dependent learning. In their study, participants that were depressed took significantly more time to recall pleasant memories than the unpleasant ones. Burt, Zembar, and Niederehe (1995) also investigated the effects of a depressed mood over memory. They conducted an archival study to investigate if depression is directly associated with impairment in memory formation. They found that there was a significant association between memory impairment and depressed moods.

All the studies mentioned above used adults as participants. This means that studies support the presence of state dependent memory in adults; however, it should not be assumed that humans possess state dependent memory since an early stage in life. Bartlett and Santrock (1979) studied this phenomenon among 5-year-old children to investigate if it works the same way as in adults. The experimenter manipulated the tone of voice when narrating a story and when asking for specific words about the story. Whenever the voice and experimenters behavior matches the mood of the story at the encoding and recalling process children were able to recall more words than when the tone of voice in the narration did not match the voice used when asking the questions. Bartlett, Burleson, and Santrock (1982) worked again with children to prove the existence of state dependent memory in young children. The researchers recruited children attending preschool/kindergarten and third-grade. They used a list of words as study material. In the experiment 1, the children were put to study the list and before trying to recall the lists they were put into relaxation exercises. In the experiment 2, the children were put to study

the list and then asking them to recall the list of words, omitting the relaxation exercises. The results show that children do experience state dependent memory; the scores in experiment 2 were significantly better than the ones in experiment 1, where the states of consciousness did not match due to the relaxation exercises provided.

The hypothesis for the present study was formulated based on the results of studies suggesting that emotions and moods have a significant impact on memory and that we experience state dependent memory. It was hypothesized that participants who have the same emotional state during the encoding and retrieval process will do better on the memory test than participants who experience different emotional states during the encoding and retrieval processes. The purpose of this research is to investigate the effectiveness of emotions working as retrieval cues.

Method

Participants

A total of 29 participants took part of the present experiment. There were 23 female participants and 6 male participants. Participants were randomly assigned to one of the four groups. The age of participants ranged from 19 years to 28 years, with a mean age of 20.34 and a standard deviation of 1.86. Participants were students at Lindenwood University who learned about the study through the Lindenwood Participant Pool (LPP) or through flyers placed in some buildings of Lindenwood University advertising the study.

Participants recruited through the LPP received extra credit for one of the courses they decided who were eligible to earn LPP bonus points. Participants who learned about the study through the flyers did not receive any extra credit or incentive. Participants' academic majors also varied and included mostly psychology, followed by criminal justice and biology.

Materials

The main materials for this study included a demographic questionnaire, a self-created text to use as study material, a self-created memory test, and a mood survey. The demographic questionnaire asked participants for their age, gender, and academic major with the purpose of learning some information about the participants who took part of the study (see Appendix A). A memory test was provided to participants. The test was created by the Principal Investigator to assure that participants were not familiar with the test. The memory test consisted of two parts. For part 1 (see Appendix B), participants needed to read a text and try to memorize what they can, and for part 2 (see Appendix C), participants were asked to answer 10 written questions about the text.

Four essential videos were used for this study. Two videos were intended to evoke negative emotions and the other two intended to evoke positive emotions to participants. One of the positive emotion video was 3 min 7 s long; the video consisted on a compilation of babies laughing with another baby, with their parents, or by themselves (Funnyplox, 2013). The other positive video lasted 3 min 4 s and consisted on a compilation of pictures that demonstrate acts of kindness with slow background music. (Seven, 2012). One of the negative emotion videos lasted 3 min 36 s; this video showed a single

baby crying the entire video (Mybabyhascolic, 2011). The other negative emotion video was 2 min 22 s long; this video was a compilation of pictures with a sad story behind, which was being narrated in the video while the pictures were shown (Plethrons, 2016).

Depending on the group to which the participants were randomly assigned to, participants watched two of the four videos. In addition, the order of the video seen by participants of each group varied. For example, the first person from Group A saw two different positive videos in a randomly assigned order, and the second person from Group A saw the opposite order seen by the previous person; the same technique was applied to each group. A single question was asked after each video asking participants to report how the video made them feel emotionally (see Appendix D). The mood survey was given twice to each participant; however, for analysis purposes at the printing time the survey had a number in the title. Survey 1 was asking about the first video seen, and Survey 2 was asking about the second video watched by the participant.

Apart from the main materials, an informed consent form, a participant list, a receipt, and a feedback letter were used. The informed consent and the feedback letter were given to every participant. The participant list and receipt was only used with participants who signed up through the LPP for them to receive the bonus points.

Procedure

Participants that were recruited through the LPP were able to enter Sona Systems and sign up in any available timeslot. Participants who saw the flyer around Lindenwood's campus emailed the

Principal Investigator and agree on a time to meet. Once the assigned day and time came, the participant came to the respective lab room during their specified time. Next, the participant was greeted and given a consent form, which was explained verbally to avoid potential misunderstandings. After the participant signed the informed consent, he or she was put into the first part of the experiment.

The first part consisted on completing a demographic questionnaire. Once he or she finished the questionnaire, the second part of the experiment started, which consisted on having the participant watch one of the two videos depending on the group the participant was in. The Participant was assigned into the group depending in the order he or she sign up and show up. There were four different groups. For the first video, Groups A and C watched a positive emotion video, and Groups B and D watched a negative emotion video. After he or she watched the first video, they were given the part 1 of the memory test. The participant had a maximum of 5 min to read and memorize details of the text; after the 5 min or after he or she announced that he or she finished, the participant was asked to report how the video made him or her feel emotionally through a written survey.

After reporting his or her emotional state, the participant watched the second video. This video also depended on the group the participant was assigned to previously. In this part of the study Group A watched a different positive video, Group B watched a different negative video, Group C now watched one of the negative videos, and Group D now watched one of the positive videos. After the participant finished watching the second video, he or she was asked to proceed with the part 2 of the memory test, which consisted on 10 questions about the text read. The last part of the study was survey 2, which

asked the participant to report how the second video made him or her feel emotionally. If the participant signed up through the LPP, he or she was asked to sign up a participant list and a receipt to hand in to an LPP officer. Once the participant was done with the study, the researcher explained to him or her that there were different groups and they learned in which group they were in and why. The participant was thanked and given a feedback letter.

Results

For analysis purposes, data from Groups A and B and Groups C and D were pooled as the Same Emotion Group and the Different Emotion Group, respectively. Scores earned in the memory test were analyzed using an independent samples *t*-test to identify whether there was a significant difference between the Same Emotion Group and the Different Emotion Group.

The mean score on the memory test for the Same Emotion Group was 6.733 ($SD = 1.579$), where the Different Emotion Group had a mean score of 6.643 ($SD = 1.499$). The independent samples *t*-test revealed that the differences between the Same Emotion Group and the Different Emotion Group are not statistically significant, $t(27) = 0.158$, $p = 0.876$.

The videos were effective in evoking the desired emotional response from the participants, with the exception of two participants. One participant experienced a positive emotion after watching the negative emotion video of the baby crying for 3 min 36 s, and the other participant felt happy and sad after watching the positive video of the compilation of images.

Discussion

The results from the present study differ from those found in previous studies, which suggested that emotions and moods have a significant impact on memory, and that we experience state dependent memory. Results from previous studies show a significant statistical difference between the scores earned by participants who experience the same emotion during the encoding and retrieval process to those who experience different emotions.

The differences between the present experiment and previous studies might be because the memory test provided to participants in this study was not a pre-existing standardized memory test. The study material and memory test were self-created. In addition to that, the sample size may not have been large enough to accurately represent the population being studied. It is also important to take note of the gender bias in the pool of participants, given that the majority were female participants. Individual differences and the willingness the person had to participate in the study may also have impacted the results. Participants who did not received any extra credit for their participation showed more interest to the study by asking more questions and explanations about the study; however, participants who were recruited through LPP seemed less interested in the study. The interest that participants had in the study may have altered the results. Some participants just answered the multiple-choice questions, leaving in blank all the free recall questions. Given that, there is the possibility that some participants did not read the text and guessed the answers from the questions asked in the memory test.

Improvements to this experiment might be made by using a standardized memory test, by having a longer period for recruitment of participants in order to obtain a bigger sample size and a more diverse sample composition, and by trying to have participants who are truly interested in the research by avoiding using extra credit as an incentive. If these suggestions are implemented in a future replication of this study, the slight difference shown in the present study between the mean scores of the Same Emotion Group and the Different Emotion Group may be seen as a significant difference that supports the existence of the state dependent memory.

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Appendix A

Demographic Questionnaire

1. How old are you? _____

2. Identify your gender: _____

3. Identify your major: _____

Appendix B

Memory Test Part I

Part 1. Read the text below.

Cindy just earned a master's degree in Industrial and Organizational Psychology from Maryland University. She currently lives in a quiet neighborhood with her husband and works at a very recognized company.

Sarah, Cindy's coworker from the financial department, is having issues with her boyfriend. Sarah desperately asks Cindy to help them find a solution. Cindy agrees to help them, so they plan on having couple therapy for Sarah and her boyfriend after work.

The next day, Cindy has an important and confidential meeting at work about a process of an ongoing project. Cindy for the first time decides to record the meeting. She does not know if she is allowed to record, but because she does not want to interrupt the meeting, she decides to start recording.

When she got home that day, Cindy's husband, Kevin, surprised her with some family members. They ate dinner and then went to the living room to talk. As Cindy needed to do some work related to the meeting, she decides to listen to what she recorded at that meeting. She starts writing an essay about her work and after a while she decides to look for some online information. She took some ideas from the source and continued writing without giving credit to the online source.

Appendix C

Memory Test Part II

Part 2. Answer the questions below.

1) What is the name of the main character? _____

2) The main character has a Master's degree in _____

3) From which university did the main character obtain her highest degree?

4) Which word best describes the neighborhood that the main character lives in?

a) Quiet

b) Dirty

c) Loud

5) What was the name of the main character's coworker? _____

6) With whom does the coworker have problems?

a) Mother

b) Girlfriend

c) Father

d) Boyfriend

7) The main character always records the meetings she attends.

a) True

b) False

8) Does the main character have permission to record the meetings?

a) Yes

b) No

9) What was the name of the main character's husband? _____

10) What does the main character start writing?

a) Article

b) Essay

c) Outline

Appendix D

Survey

1. How did the video made you feel?

- a) Fearful
- b) Sad
- c) Disgusted
- d) Angry
- e) Happy
- f) Surprised
- g) Other. Specify _____