

The Effects of Mood and Valenced Information on Semantic Memory Retrieval

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Abstract. Memory has been an important scientific research project in the world for many years. Previous studies have shown that negative emotional states, such as pre-test anxiety, can lead to memory loss. However, this emotional state is only temporary, and the effects of psychological diseases on the human body will be long-term. The purpose of this study was to explore whether mental illness affects the short-term memory ability of patients. In order to investigate the effect of mental illness on the short-term memory of patients, two experiments on 30 adults with different mental states were conducted, controlling for other variables. Participants were asked to remember as many images as possible and fill in the memorized content on subsequent tests. The results showed that individuals with Mania or depression had worse memory than the general population, but the difference was not significant.

Keywords: Mental illness; Short-term memory; Mania; Depression.

1. Introduction

Different areas of the brain are used by brains to manage various memory types. The two main types of memory are long-term memory and short-term memory. Short-term memory seems to be more prone to forgetting or neglecting things. The capacity for long-term memory spans from days to years. When patients have memory loss, they lose the ability to recall details about the past or present. People do not lose their memory; nevertheless, their brains are unable to access it. Amnesia is the pathology of amnesia. A few signs of memory loss include regularly missing personal belongings, asking the same questions in conversations, repeating stories, or forgetting whether people accomplished anything, among many other things. Mental and behavioural states may affect a human memory loss or decline. Cognitive dysfunction, sadness, and mania are the three main factors that we investigate.

Short-term memory (STM) is the second category of the Atkinson-multi-store Shiffrin memory model (STM). STM has a capacity of almost 7 objects and seems to last between 15 and 30 seconds.

The majority of short-term memory is composed of three things. The memory-constrained storage capacity, which can only hold about 7 things, is the first concern. The second justification is that memory has a very limited shelf life. Information may be forgotten with time or with distraction because short-term memory storage is so brittle. The third incorporates sound encoding or even the translation of visual data toward the sound.

Capacity can be assessed in two different ways: by span and by recency effect. The magic number 7 suggests evidence for short-term memory (plus or minus 2). The range of a typical person's short-term memory is five to nine items. This notion was put forth by Miller, who called it the "magic number 7". He reasoned that since there were only so many slots in short-term memory available for object storage, this would only hold seven (plus or minus 2 items). However, Miller didn't specify how much material could fit in each slot. People would be able to keep more knowledge in their short-term memory if the information could somehow be stored in chunks.

Short-term memory lasts for 15 to 30 seconds, according to Atkinson and Shiffrin. Acoustic decoding, or practicing things aloud, can assist people to improve their short-term memory. The Brown-Peterson technique restricts the potential of retrieval by asking participants to count backward in threes.

Peterson & Peterson demonstrated that information retention declines with lengthening delay. Because information is lost quickly from memory when practice is interrupted, it is thought that short-term memory has a limited lifespan.

Working memory is a different short-term memory paradigm that Baddeley and Hitch developed in 1974. Depression is a typical mental disorder. An estimated 5.0 percent of individuals worldwide are thought to experience depression. Not only is depression a leading cause of chronic, but it also significantly increases the overall burden of sickness on the planet.

During a manic episode, a person's mental and emotional state experiences a significant swing between tremendous highs and lows. A person may find it challenging to perform at home, at work, and in school as a result of these changes, which can also negatively impact their relationships. Mania is most usually associated with bipolar I, or more specifically, bipolar I.

Mania is characterized by periods of elevated mood or euphoria, racing thoughts, rapid speech, increased risk-taking, an inflated sense of oneself, and a decreased desire for sleep. For these symptoms to be considered present, a manic episode must endure at least one week. Mania is defined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), which was created by the American Psychiatric Association. It's important to remember that each person's symptoms may manifest themselves differently.

Mood changes might be rather pronounced. According to a review of studies that concentrated on mania symptoms, manic can impair a person's capacity to sleep, make wise choices, and sustain high levels of energy and activity. Understanding the symptoms and warning signs of a manic episode may make it easier for people to identify the issue and seek help when they do. Mania is characterized by intense emotions or an effortless feeling of elation.

Adolescents with manic episodes could sleep less. Because someone going through a manic episode could feel as though they need much less sleep than usual or none at all. This could be dangerous because sleep is an essential physiological and mental function. Patients are capable of performing multiple tasks at once. Due to their high amounts of energy, manic individuals may multitask and engage in multiple major target tasks. These responsibilities are frequently impossible to complete, though, and they can find it difficult to follow through. Patients occasionally speak loudly and hastily. Speaking under duress or speaking more frequently and quickly than usual are also signs of mania.

Being more easily distracted or lacking the ability to focus on a task or notion is a problematic aspect of mania. While manic, they are more likely to engage in risky behavior. While engaging in high-risk hobbies like gambling, sex, frittering away money, and drinking may have negative consequences, it is nevertheless possible.

Since it was established that short-term memory, where our memory is temporarily lost, is where people experience memory loss and forgetfulness, this aspect of mood and mental state was examined. The issue at hand is short-term memory loss's root cause. The examination revealed that memory loss can be brought on by old age, disease, and emotional problems. Since it is something we have never understood before and is very dissimilar from the two main causes of aging and medical therapy, the emotional component was thoroughly investigated.

We are only now starting to comprehend how important each function is to preserving health. Think about memory once more. All of these abilities generally diminish as people age. When in good condition, the decline comes gradually. The decline does, however, occasionally occur more quickly. For instance, the memory domain deteriorates more quickly than expected in persons with hypertension. Prior to diagnosing dementia, people may notice certain memory problems. It would be great to see more methods for employing cognitive function tests to accurately detect

psychological health illnesses earlier than we would otherwise. Cognitive tests are a potent medical tool with many uses when utilized properly.

Memory is affected by our emotions and mental health. To find out how psychiatric diseases affected short-term memory, the individuals were divided into two groups. The experiment will accept applications from thirty adults. Hospitals will have ten volunteers with psychiatric issues, while web searches will turn out 20 healthy individuals.

2. METHODS

2.1 Participants

The participants were 45 volunteers, 15 of whom had Mania (3 females, 12 males; $M_{age}=26.2$), 15 had depression (9 females, 6 males; $M_{age}=38.5$) and 15 were free of any mental illness (10 females, 5 males; The $M_{age}=33$). All participants had a junior high school education, were not color blind, and had normal vision. All the experimental patients were diagnosed with mental illness in Wenzhou Kangning Hospital, and some were receiving inpatient treatment. All participants are aware of the experiment and agree to participate in the experiment as volunteers. The hospital has approved the study.

2.2 Materials

2.2.1 Self-rating Depression Rate

Self-rating Depression Scale (SDS) is a method to test the degree of participants' mental situations. It is widely used in rough screening, emotional state assessment, investigation, and scientific research of outpatients, but cannot be used in diagnosis. SDS was used to test participants' current mental state. There are 20 questions in this rating scale, which list the problems that some people may have. Before the self-assessment, it is necessary to understand the filling method of the whole scale and the meaning of each question, and then make an independent self-assessment that is not affected by others. Read each item carefully and choose the answer that best fits your situation, based on how you feel in the last week or so. Participants were asked to slow down their thinking time, go with the flow and make judgments based on first impressions.

2.2.2 Experiment

The experiment was divided into two parts. I) The task includes 20 pictures of basic graphics, which are all from the graphics in Word (e.g., square, triangle, etc.). These shapes are filled with different colors (e.g., green, blue, etc.). ii) The task included a picture containing 48 icons, which came from free materials on the Internet. They were neatly arranged and presented in black and white. Both experiments were done using Psychopy, and all the stimuli were delivered to the participants via computers.

2.3 Procedure

All participants were asked to fill in informed consent before the experiment, and all experiments were completed by computer. We required the experimental environment to be quiet and free from other disturbances, and the participants in the patient group were in a relatively stable mood. In the first experiment, after reading the rules of the experiment, participants pressed Start. Random stimuli (base graphics) appeared in the center of the screen individually, switching to the next one after each stimulus appeared for one second, and stopping for 0.5 seconds between each stimulus. After all the stimuli were displayed, participants filled in as many patterns as possible in order of appearance until they could not recall them and recorded the maximum number they could remember. Figure 1 shows the content of the first experiment.



Fig. 1 Procedures of the first experiment in Psychopy

In the second experiment, when participants read the rules and pressed start, they had 10 seconds to remember all 48 stimuli given simultaneously. At the end of the 10 seconds, there was a gap of about three seconds for the participants to reconsolidate their memories. The screen then displayed the 48 stimuli as text, and participants were asked to choose whether the text corresponding to the 48 stimuli. If participants think they have seen the icon, they click right. If the participants didn't see it, they click left. Figure 2 shows the content of the second experiment.

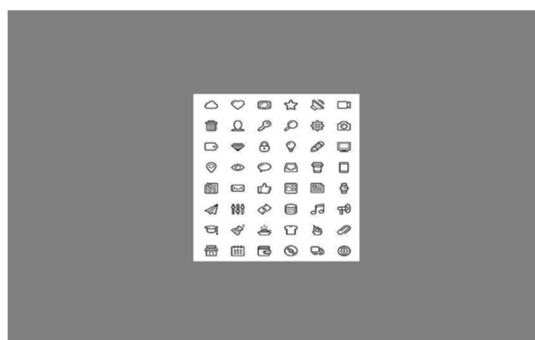


Fig. 2 Procedures of the second experiment in Psychopy

2.4 Data analysis

Experimental data as well as Psychopy comments about the number of participants and how well they remembered things were collected. The participants' short-term memory was judged by their mental health (hospital diagnosis) when they were in a state of depression or mania.

At the end of the experiment, the researchers stored data from all three groups, looked at details in Excel to see how many images they remembered from each group, and then determined whether mental states affected memory based on their psychological symptoms. Finally, these valid data are analyzed.

3. Results

3.1 Self-Rating Depression Scale

After deciding to participate in the experiment, participants were required to complete the SDS to determine their mental state at the time of the experiment. This scale contains 10 reverse-scoring questions. Forward scoring questions A, B, C, and D are counted as 1, 2, 3, and 4; Reverse scoring is the opposite. The score value is calculated by combining the scores of each of the 20 items. The rough score multiplied by 1.25 includes the standard score as a necessary component. The coefficient of severity is calculated by dividing the score by 80. The average score was 0.68 for the depression group, 0.71 for the mania group, and 0.41 for those without mental illness.

According to the official SDS score, people below 0.5 are not depressed; 0.5 to 0.59 were mild depression; 0.6 to 0.69 was moderate to severe. Anything above 0.7 is considered major depression.

According to the results of SDS, participants' mental health was accurately classified, and the results of subsequent experiments were prepared. Figure 3 illustrates this data.

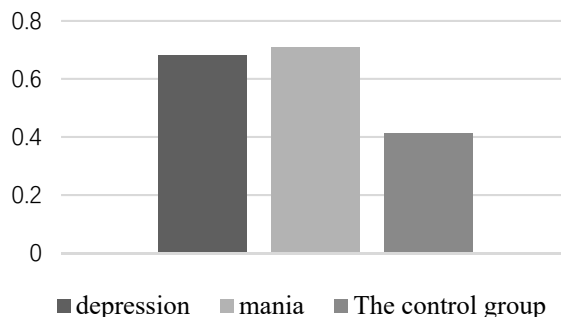


Fig. 3 The SDS results of participants in the experiment.

3.2 Experiment 1

The results of the first experiment were used for analysis. The average number of questions for the depression group was 14 (out of 20), the average for the mania group was 12, and the average for the control group was 16. The average accuracy rate was 54.3 percent for the depression group, 61.4 percent for the mania group, and 66.9 percent for the control group. The statistics showed that the control group's memory capacity was marginally better than that of the two experimental groups, but the difference was not statistically significant. These statistics are illustrated in Figure 4.

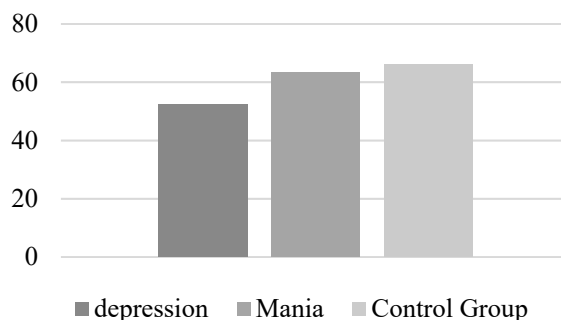


Fig. 4 The correct rate of three groups in experiment 1.

3.3 Experiment 2

A comparison of the results between the depressed patients, which is one of the experimental group, and the control group showed that depression affected the patients' memory. The average accuracy was 82 percent in the control group, and 73.8 percent in the experimental group. In terms of progress, participants in the control group were able to switch between words and images more quickly, required less memory time, and had faster reaction times when answering the questions. Figure 5 depicts these relationships.

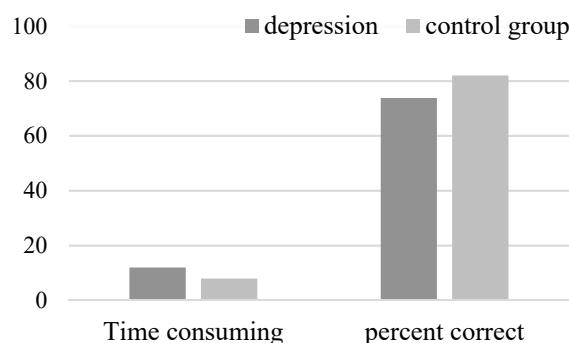


Fig. 5 Data analysis of depression experimental group and control group in Experiment 2

A comparison of patients with mania with a control group showed that mania affected their memory. In the experiment, two participants were impatient and complained verbally during the test, and they did not seriously participate in the process of answering the last few questions, so the experimental data of these two participants were not included. The average accuracy of the experimental group was 70.2%, lower than that of the depressed group and the control group. The time spent answering the questions was not much different from the control group. Figure 6 depicts these relationships.

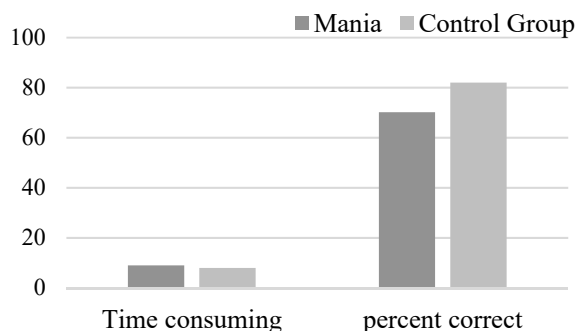


Fig. 6 Data analysis of Mania experimental group and control group in Experiment 2

4. Discussion

4.1 Overall findings

The study's ultimate finding is that short-term memory is affected by people's emotions. The first is the theoretical level of evidence. When their mood is unpredictable, people with depression, mania, and cognitive impairment, for instance, have very poor recollections. In the first trial, the subgroup with depression memorized the fewest items compared to the groups with mania and those without psychological disorders, suggesting that people who are depressed have a decreased capacity for short-term memory. Meanwhile, their subgroup suffering from mania also has a lower figure than just the subgroup cleans of mental illnesses. According to statistical data, persons with mental diseases typically display worse short-term memory behavior. In the second experiment, the group with mania, which targets a single diagnosis of mental diseases, takes more time to memorize the motifs and performs less accurately, as measured by the frequency of correct responses. This suggests that those who suffer from psychological disorders typically have short-term memories that last less time than those who do not. The conclusion is that mental illness has some effect on short-term memory.

4.2 Limitations

Considering the design and participant selection, this study has some limitations. First of all, patients in Wenzhou Kangning Hospital were selected as experimental subjects in this study. These patients received similar treatment and drug selection, so the results obtained in the experiment do not exclude the reasons for taking drugs. According to statistics, two patients in this experiment had taken Amitriptyline before. The drug reduces brain activity and can cause mental retardation when taken over time. Second, the total amount of sample data in the study is not large, so there is no way to be 100% sure that mental illness will lead to the decline of short-term memory. To this experiment, mania and depression are harmful to the short-term memory of patients. In addition, three of the subjects had undergone MECT, a form of physical therapy in which electrical stimulation is followed by induction of a seizure. This type of treatment was found to be very effective in treating the symptoms of schizophrenia a few years ago. MECT does not involve continuous medication and can control the symptoms of patients with schizophrenia in a very short time. Therefore, MECT can be used for the treatment of acute, severe, risky, and uncooperative patients. Retrograde amnesia, a condition where a person has very little memory of the years prior, or memory loss, can make it

difficult for some people to recall events that occurred before, during, or in the weeks or months before treatment, and may also make it difficult for them to recall events that occurred during treatment. During treatment, patients are also less able to respond and react slowly. After the completion of treatment, these memory issues often get better for the majority of people within a few months. In addition, the study did not take into account gender, age, duration, and severity of the disease, since memory is also linked to age.

5. Conclusion

In this study, two experiments are conducted respectively to find out the relationship between psychological diseases and the capacity and duration of short-term memory. The experiments involved forty-five participants, and the results show that, when participants have depression or mania, the duration tends to be shortened, and the capacity tends to be reduced. The results lead to the conclusion that both the capacity and duration of individuals' short-term memory would be negatively affected by the advent of psychological diseases. The reason may be that people with depression or mania tend to have very poor recollections, and they usually have memory loss and disorientation. This study can statistically help to prove the negative influence of psychological diseases on short-term memory.

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