



Effects of Positive and Negative Emotions on Working Memory Renewal

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Abstract. Emotion plays an important role in perception, attention, memory and decision-making. Working memory is a limited capacity memory system that temporarily processes and stores information. It builds a platform for information exchange between perception, memory and human cognitive behavior. The relationship between emotion and working memory, especially the influence of emotion on working memory, has always been worth studying. The purpose of this paper is to investigate the influence of positive and negative emotions on students' working memory. An experiment was conducted in August 2021 in which thirty high school students aged sixteen to nineteen with a normal IQ in Qingdao, Shandong Province were randomly selected. According to the findings, both negative and positive emotions may have an impact on a high school student's working memory.

Keywords: positive emotion · negative emotion · working memory

1 Background Introduction

In 2012, the Ministry of education clearly pointed out in the guidelines for mental health education in primary and secondary schools that the specific objectives of mental health education are to enable students to learn how to study and live, correctly understand themselves, improve their abilities of self-education and self-help, strengthen their ability to regulate emotions, accept setbacks and adapt to the environment, and cultivate their sound personality and good personality; For students with psychological distress or psychological problems, scientific and effective psychological guidance should be provided, and necessary crisis intervention should be given in time to promote the healthy development of their psychology [1]. In September 2016, the Ministry of Education held the research results conference of “Chinese students’ development core literacy” at Beijing Normal University. At the meeting, the general framework and the basic connotation of Chinese students’ development core literacy were announced. The purpose of core literacy is to cultivate “people with all-round development”, including “independent development”, “social participation” and “cultural foundation” [2]. Among them, independent development specifically refers to the two core qualities of learning to learn and living a healthy life. These reflect the importance our country attaches to students’ learning ability and emotional control ability.

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Emotion is a complex psychophysiological phenomenon. It is an attitude experience generated by whether people meet their own wishes or needs for objective things or situations (to the outside world or self stimulation). It is a psychological and physiological state generated by the comprehensive reaction of people's multiple feelings, thoughts and behaviors [3]. Working memory is a memory system with limited capacity for temporary processing and storage of information [4]. In daily life, almost all cognitive activities, such as speech understanding, decision-making, learning and thinking, need the help of working memory. Therefore, working memory plays an important role in the process of cognitive activities. Some researchers even describe working memory as the cognitive center of human beings. It is the short-term and special focus of essential component information and the bridge between short-term memory and long-term memory [5]. Working memory can enable people, particularly students, to make an impression on new things and learn new things in a short period of time. People often use this type of memory during their everyday lives, while studying or at work. These days, many people memorize words through working memory or memorize information they need for their jobs. Working memory has become an indispensable part of people's life. It affects people's life. In daily life, some people hope they can remember as much information as possible in a short time, or in work and study, they hope they can quickly mobilize the information in their brain and remember something. But people often can't do it. They usually can't remember or remember something quickly [6]. These characteristics are closely related to individual emotions. Emotions affect our lives all the time and control our views and attitudes towards things. The level and fluctuation of emotions affect our current state and our ability to receive information. This study aims to investigate the relationship between emotional state and working memory by conducting an experiment.

2 Literature Review

Before this study, there were some related studies, such as the effect of emotion regulation on working memory [7]. Subjects were divided into four groups: neutral control group, cognitive reappraisal, expression inhibition and simple viewing. Using the method of laboratory research, the experimenter evaluated the subjects' cognitive reappraisal and expression inhibition to judge the effect of emotion regulation on working memory. First, subjects were asked to watch emotional pictures, such as surgery, animal fighting, household goods and geometry. Each picture is presented for 8 s, and there are eight pictures in total. After each group of subjects watched, they were asked to score their current emotional state using the 7-point scoring method. The seven emotions are pleasure, disgust, satisfaction, fear, anger, surprise and sadness. Then, the accuracy of memory is tested by using the experimental method of 2-back. The results show that emotion regulation can effectively reduce negative emotional experience, and negative emotion can reduce the performance of working memory. The second experiment is the experimental study on the memory span of 11–18-year-old children by presenting numbers [8]. The experiment uses the memory span method to test the memory span of 11–18-year-old children by presenting numbers. A visual stimulus is a way of presenting numbers. The results showed that the development of digital memory was very rapid at the age of 14–16. It was thought that 11–18 years old was the transition period from children to adults, and

the psychological quality of the subjects had great changes. The peak can be reached at the age of 16. And the difference of number memory span between men and women is not very obvious. The third experiment is the experimental study on the influence of emotional state on College Students' short-term memory capacity [9]. The subjects' respiratory and skin electrophysiological indexes under different emotional states are collected by using psychophysiological bar tester. And show the subjects videos that can reflect different emotions. When the subjects had emotions, the subjects began to present cards to the subjects. Each card was presented for one second. Five seconds after the card was presented, the subjects were asked to write all the contents on the card by dictation. The results showed that the subjects' upper respiratory depth was the highest under happy mood; Fear was the second highest; The lower and upper respiratory depth of central emotion is the lowest. And the short-term memory capacity of numbers is higher than that of letters. The short-term memory capacity of college students with phobic emotion is significantly lower than that of college students with happy emotion and neutral emotion. The fourth experiment is "investigation and Research on emotional state and sleep quality of adults in Xi'an" [10]. There are many research methods used in this experiment. POMS (mood scale for young and middle-aged people) shows that young people respond more to emotional events than middle-aged people, and middle-aged men are calmer than young people. Positive emotions can make people feel comfortable, always energetic and affect memory. Negative emotions can make people mentally disordered. In addition, PSQI shows that poor sleep quality can also make people feel tired and lack energy, which affects their mood, mental state and work efficiency. In the fifth experiment, there are two studies: the level of positive and negative emotions and arousal [11]. This experiment adopts the mixed factor design, and the subjects are also divided into three groups by using the inter group design. The results showed that positive emotion and negative emotion had no significant effect on memory. What matters is the level of arousal in the mood. The results of cognitive reappraisal group were the highest in both positive and negative high arousal mood. The results of the group with low arousal were lower than those of the group with high arousal. The sixth experiment looked at the effect of negative emotions on working memory, and the effect of exercise on working memory [12]. The experiment involved a mix of six exercise subjects and 15 sedentary subjects. The results showed that negative emotions impair working memory, and the participants' reaction time was shorter, that is, they responded faster, but their accuracy rate also decreased. The accuracy of spatial working memory was lower than that of verbal working memory. Those who were sedentary took longer to react than those who were active.

3 Experimental Study

3.1 Question Raising

Through the above review of previous studies, we can see that in the field of Academic Emotion and working memory, scholars have carried out a large number of in-depth studies and achieved very rich results. Reviewing researchers' research on academic emotion over the past ten years, a systematic and comprehensive theoretical framework based on pekrun's clearly defined definition and a mature and widely used evaluation

tool have been formed, and a series of influencing factors and related factors have been discussed.

Due to its specific learning situation and development characteristics, existing studies have carried out subjects from young students to graduate students. However, most of the studies as influencing factors take college students as subjects. Similarly, the research on the development of central executive function of working memory will involve different age groups, but in the research on its influencing factors, it is less targeted at middle school students. This study is mainly aimed at high school students, which still needs to further enrich the type and scope of research objects.

On the basis of previous studies, this study takes high school students as the research object to investigate the impact of different types of emotions on working memory tasks, and to explore the impact of high school students' academic emotions on the central executive function of working memory.

3.2 Research Hypothesis

High school students with different types of emotions have significant differences in the central executive renewal function of working memory.

3.3 Experimental Method

Based on the above experiments, this paper mainly studies the effects of positive and negative emotions on senior high school students' working memory from the perspective of senior high school students. Thirty high school students aged 16–19 with normal IQ in Qingdao, Shandong Province were randomly selected for the experiment, with 15 men and 15 women. Using the experimental method of inter group design, it was divided into three groups, five men and five women in each group, a total of ten people. There is a control group and two experimental groups in this experiment. Group A is the control group of this experiment, and group B and C are the experimental groups. This experiment adopts the experimental method of n-back. Before the formal experiment, show group a positive and optimistic pictures, such as amusement park, smiling face, rainbow and so on; Show group B pictures of negative fear, such as faces, dark pictures, lonely people, etc.; Show group C ordinary pictures, such as the most common furniture or daily necessities in life. Each picture was shown to the subjects for five seconds, with eight pictures in each group. After the presentation, the subjects were asked to rate their psychological state. From 1 to 10, 1 represents extreme negativity and 10 represents extreme happiness. To determine that the subjects in group A have positive emotions, the subjects in group B have negative emotions, and the subjects in group C perform normally. Then, using the n-back experimental method, the experimenters showed the letter cards to the subjects in each group. After reading a picture, the subjects were asked whether the letters on the picture were consistent with those in the previous picture. Subjects who responded more than five seconds were regarded as "forgetting". After testing everyone, add the individual accuracy of each group and divide it by the number of people to get the average accuracy of the three groups. After the experiment, tell the participants the purpose and significance of the experiment.

4 Analysis

The results showed that the correct rate of group A was 81%; The correct rate of group B who watched negative pictures before the formal experiment was 63.5%; The correct rate of group C was 72%. The accuracy of subjects with negative emotions was lower than that of subjects with normal emotions and lower than that of subjects with positive emotions. The experimental results show that positive emotion can promote the renewal of working memory of senior high school students, while negative emotion is not conducive to the renewal of working memory. Because the accuracy of subjects with positive and negative emotions is different from that of the control group, the regulation of emotion can affect the renewal of working memory of senior high school students.

5 Conclusion

Having a positive emotional state helps to enhance working memory, whereas a negative emotional state causes working memory to fall below normal levels. Nonetheless, it should be stated here that in this experiment, the sample size was limited to 30 high school students between the ages of 16 and 19, in Qingdao. As such, the findings that were obtained in this experiment may not be applicable to others in this age group or other parts of the country. In spite of this, the results of the experiment can support the previous conjecture to some extent, and the results of this experiment are consistent with what was mentioned in the literature review. The results of this experiment can be further improved by increasing the sample size in the future, which will result in more convincing conclusions.

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