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Influence Of Emotions On Working Memory Capacity Among Young Adults

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ABSTRACT

Perception, attention, memory, and decision-making are significantly influenced by emotion. Working memory is a memory system with a restricted capacity that temporarily processes and stores information. It establishes a foundation for the exchange of information between human cognitive behavior, memory, and perception. The relationship between emotion and working memory, particularly the impact of sentiment on working memory, has always been a subject of interest. The objective of this study is to examine the impact of positive and negative emotions on the working memory of students. The effects of emotion on working memory performance in human individuals represent that emotion could impair performance in the low-capacity group and could increase it in the high-capacity group. Another purpose of the proposed research is to investigate[1] the influence of emotions to working memory capacity determining the level of WMC among young adults (18-25) the objective is to identify the pre and post influence of emotions on WMC and to compare the influence of positive and negative emotions with respect to high and low capacity of WMC among undergraduate university students. The young adults of age (18-25) years was taken from University of Agriculture. Research was experimental based where 180 young adults was divided into groups according to high and low levels of WMC in respondents to administer pre and post-test influence of emotions on WMC. The Digit Span Memory Test, Positive and Negative Affect Schedule (PANAS) and Pictures of emotions was used to induce emotions. Data was analyzed through standardized scoring system and the help of statistical standards.

Key words: *Working Memory Capacity, Emotion, Cognitive control and Memory.*

INTRODUCTION

Working memory capacity (WMC), a generic processing ability, has an attention regulation-specific component. Working memory is used to process information that is relevant to the target and reduce distractions, as well as the propensity for competitive responses. The executive control, alerting, and orientation functions of the attention network fall under the umbrella of attention control, which is particularly related to working memory capacity. While the orienting function actively participates in information selection and filtering, the executive control function is responsible for oversight and conflict resolution. The management of awareness and arousal in the brain is the responsibility of the alerting function. Attention

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control, which consists of the executive control and orientation functions, assesses the information and responds in a way that prefers the task-relevant information when task-relevant and task-irrelevant information are in conflict with one another (Mackle et al., 2013).

To accomplish a certain goal-oriented behavior, knowledge that has already been learned is briefly integrated with freshly obtained information. Because working memory demands sustained focus and attention—essential for learning, problem solving, reasoning, and other vital abilities needed for successful everyday living—higher executive functioning and working memory scores have been associated with a lower likelihood of suicidal conduct. A meta-analysis of studies that examined the impact of PTSD on older people's working memory found that older persons with PTSD consistently performed worse on tests in all areas tested when compared to older adults without PTSD (Zelazny et al., 2019).

Although working memory has always been affected by emotion, this topic has received more attention in recent years due to its clinical significance and implications on higher-order cognitive processes, which include emotion influence. Research has used a wide range of emotional inputs, such as facial, visual, and auditory emotions. Positive or negative stimuli, such joyful faces, nostalgic memories, or menacing pictures, can be included in this category. Happy recollections and smiling faces are examples of pleasant stimuli. Studies look at working memory and the impact of emotional information using functional magnetic resonance imaging (fMRI) and a meta-analysis of behavioral tests. Even while accuracy on working memory tests seems to be similar for both neutral and emotional content, the results demonstrated that processing of emotion information has an impact on working memory processing above and beyond processing of neutral information (Schweizer et al., 2019).

More cognitive resources are needed when emotional stimuli are present during working memory performance, due to the higher processing demand for emotional stimuli relative to neutral stimuli that happens (in non-clinical persons). Working memory capacity may become overloaded when emotional stimuli are added to a task, which may make it challenging for people to finish goal-directed tasks. The fact that working memory task performance is known to be severely degraded in specific clinical populations, such as those with Major Depressive Disorder (MDD) or PTSD, makes this particularly worrying. Internal or external triggers can cause intrusive thoughts in people with PTSD, which can reduce working memory efficiency by taking the focus away from daily duties. Compared to those with a similar trauma history who had never met the criteria for a PTSD diagnosis, those who had suffered a traumatic incident (such as a car accident or sexual assault) and were currently suffering from post-traumatic stress disorder (PTSD) remembered fewer words. This was contrasted with the word recall percentage of neutrally-contented sentences. These findings suggest that working memory is used less by PTSD patients when there is emotional content (Figueira et al., 2017).

Emotional content can both improve and decrease working memory efficiency. Working memory depends on executive control, which manages the attentional processes needed to perform goal-directed actions. offered a dual-competition model of executive control in which the degree to which an emotional stimulus aids or hinders the target in reaching the objective depends on how important the emotional stimulus is to the target. Strong emotional input may hamper information processing, whereas less powerful negative stimuli have been found to enhance it. It was demonstrated that participants would report the color of a dot rather than the emotional content of images with varied degrees of arousal. In an attention test using IAPS images, the results showed that low arousal producing negative stimuli enhanced performance whereas high arousal producing negative distracter stimuli decreased performance. Negativity bias was seen in working memory tests with emotive words, as more negative words were remembered. Emotional signals may enhance working memory processing if emotionally charged, attention-grabbing content provides additional context (Mammarella et al., 2013; (Philip et al., 2016).

Human memory is selective, therefore it's crucial to pick which knowledge to save or recover. Emotions can have a substantial impact on how working memory is processed. People usually recall emotionally charged events over neutral ones, and there is strong evidence to support the notion that emotion enhances working memory. Emotions have a unique role in how the mind works when recalling knowledge since they may be tested in a lab setting for memory improvement. various study materials and test styles (Boga et al., 2021).

It is generally believed that negative emotions involve a more methodical processing style. A decrease in WM recall variability suggests that a negative emotional state may have an effect that manifests as higher WM recall accuracy. The newest evidence, however, suggests that cognitive WM representations are resistant to emotional influences. Emotion is a complex psycho physiological process. The degree to which people are able to satiate their own needs or requirements for objective things or circumstances (for stimulation of the self or the outside world) determines how successfully that attitude experience occurs. It is a psychological and physical condition resulting from a person's vast range of feelings, thoughts, and deeds (Xie et al., 2022).

Objectives

- To determine the level of Working Memory Capacity (WMC) among young adults (18-25) years
- To identify the pre and post-influence of emotions on the working memory of respondents
- To compare the influence of emotions with respect to high and low a capacity of working memory in respondents

MATERIAL AND METHODS

The aim of this study is to investigate the influence of emotions (positive and negative) on Working Memory Capacity (WMC) among young adults. The primary goal is to see weather positive or negative emotions have significant or non-significant effect on WMC. Another purpose was to investigate the low-level and high-level of WMC influenced extent by emotional stimuli i.e. pictures in young adults. The suggested study was experimental in nature with 180 participants divided into 3 groups. First group was tested with positive emotions to check influence, second group were of negative emotions and third was neutral emotions or called control group. A sampling strategy was used to determine the sample size. The experiment was carried out at University of Agriculture Faisalabad, with 180 respondents aged 18 to 25 (30 males and 30 females) in each group. A non-random sampling approach was used to establish the sample size for the proposed study, which was experimental in nature and had a sample size of 180 respondents. Participants were both male and female with ages ranging from (18 to 25 years) young adults. Participants were collected through poster displays and research desks. Initially, each of the participants was asked for their consent to participate in the research. The demographic data was taken from the participants to maintain the record.

To achieve the goal of the proposed study, demographic data was taken from respondents initially. Positive and Negative Affect Schedule (PANAS) was used to access the existing emotional state of the respondents that was from last 2 weeks. Digit Span Test (Forward and Backward) that is used to access cognitive ability was used to access Working Memory Capacity (WMC) among young adults. The Nencki Affective Picture System (NAPS) standardized, wide-range, high-quality, realistic picture database, Pictures of emotions (positive, negative, neutral) were used as emotional stimuli to induce emotions particularly in respondents for post assessment.

In this study, the proportion of different data categories was generated to present data in a comparable manner. By dividing the mean difference by the total standard deviation for both categories, the t-test was able to ascertain whether there was a true difference between the means of the two groups. It can be completed on your own with a computation or by applying data analysis methods. For a set of randomized samples with variability that was roughly regularly distributed, the two-tailed test looked at the distributional differences between the individuals. People were often evaluated both in their pre- and post-treatment states. The Paired T-test was a statistical method wherein two values are subtracted from each other depending on their differences. The paired t-test calculation's difference, represented by the letter d. The sum of the squares of n times the sum of the differences squared minutes the sum of the squared variation is the definition of the paired t-test formula. It is the sum of the differences in each pair. the p-value that represents the real number of coefficient of determination degrees of freedom. The p-value is always greater than 0.05 when the t-test is applied; if it is less than 0.05, the results are significant; if it is greater than 0.05, the findings are not significant.

Result and Discussion

A focus of this section is to provide analysis of the data for the research difficulties at hand.

Table 1: Pre/post-assessment correlation between effects of positive emotions on WMC.

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre-assessment and Post-assessment	60	.899	.000

Table 2: Pre/post-assessment differences between effects of positive emotions on WMC.

Paired Samples Test

Pair 1	Paired Differences					t	Df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pre-assessment post-assessment	1.51667	2.63928	.34073	-2.19847	-.83487	-4.451	59	.000

Table 3: Mean differences between pre/post difference effects of positive emotions on WMC.

Paired Samples Statistics

Pair 1	Mean	N	Std. Deviation	Std. Error Mean
Pre-assessment	18.9167	60	6.02056	.77725
Post-assessment	20.4333	60	5.31186	.68576

Of the 60 young adults form 180 respondents were induced in the analysis of positive emotions (stimuli pictures) influence on WMC. In order to identify the difference in pre scoring, when no emotions were induced and the respondents were in normal circumstances and post scoring, after emotional induction pair T-test is applied on both variables (Table 4.2,4.3 and Figure 4.2) shows the pre and post test scoring. Table 4.4 shows the mean difference between pre and post test score which is 18.9167 for pre assessment and 20.4333 for post assessment.

Table 4 : Pre/post-assessment correlation between effects of neutral emotions on WMC

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre-assessment & post-assessment	60	.305	.018

Table 5: Mean differences between pre/post difference effects of neutral emotions on WMC.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-assessment	19.0333	60	5.29140	.68312
	Post-assessment	17.2667	60	5.22013	.67392

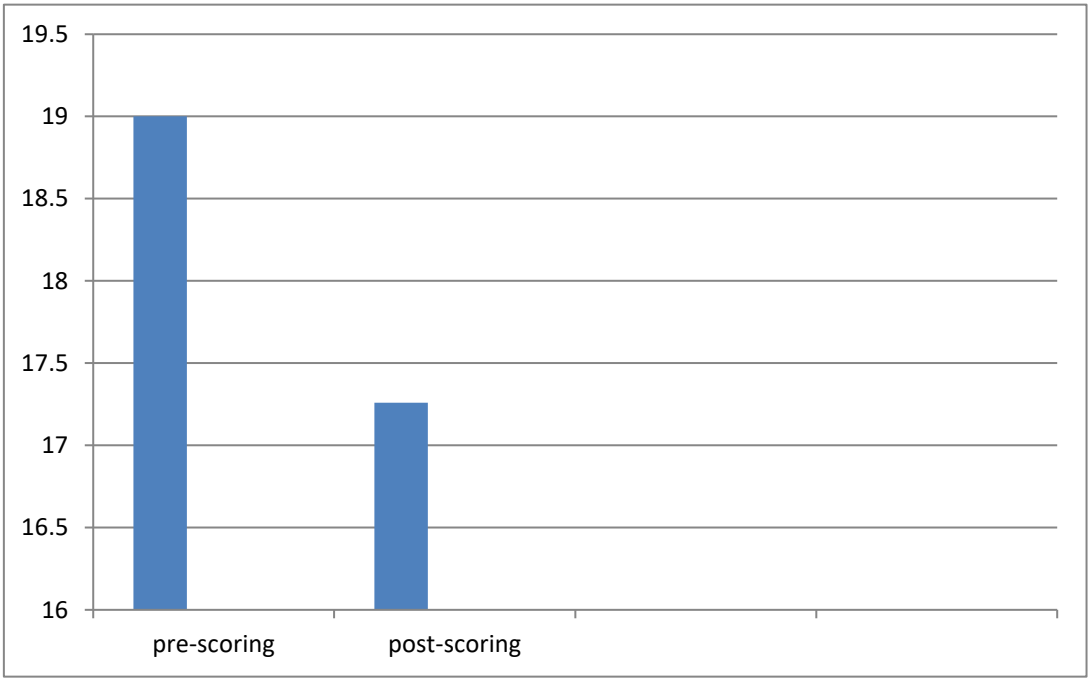

Figure 1.1: shows the pre/post scoring mean differences among neutral emotions effect on WMC.

Discussion

The present study aimed to explore the emotion regulation to impact on WMC of negative and POSITIVE possible cognitive costs depleting or enhancing working memory capacity. Firstly we examined how positive emotions influence on WMC for this,of the 60 young adults form 180 respondents were induced in the analysis of positive emotions (stimuli pictures) influence

on WMC. In order to identify the difference in pre scoring, when no emotions were induced and the respondents were in normal circumstances and post scoring, after emotional induction pair T-test is applied on both variables the mean difference between pre and post test score which is 18.9167 for pre assessment and 20.4333 for post assessment. Of the 60 young adults form 180 respondents were induced in the analysis of negative emotions (stimuli pictures) influence on WMC. In order to identify the difference in pre scoring, when no emotions were induced and the respondents were in normal circumstances and post scoring, after emotional induction pair T-test is applied on both variables the mean difference between pre and post test score which is 19.1667 for pre assessment and 16.6000 for post assessment.

There is some proof that WMC might be affected by states of happiness. So, it's possible that the people in this experiment were in a more emotional or charged mood state when they did the emotional (rather than neutral) OSPAN, and this mood state made it harder for them to focus on the task at hand. There needs to be more research into this idea because a mood measure wasn't used in this study. Some of the most well-known studies that looked into how emotional knowledge affected working memory in the past found that it had almost no effect on n-back tasks, reverse span tasks, and alphabetical span tasks. Other research, though, has shown that emotional material either hurts or helps WMC (Lindström & Bohlin, 2011). Also, Schweizer and his colleagues used span tasks to find out how much WMC neutral words had when they were in emotional or neutral contexts. They found that words in emotional contexts had both higher and lower WMC compared to words in neutral contexts (Schweizer & Dalgleish, 2011, 2016; Schweizer et al., 2017). Other studies have also found that certain groups of people have trouble using their WMC in stressful situations (Hubbard et al., 2016; Shi et al., 2014; Shi & Liu, 2016). As a result, study on how emotional moods and emotional stimuli affect WMC is mixed. There is evidence of no effect, emotional enhancement, and emotional impairment of WMC. In this study, the idea that emotional content affects WMC was tried again. The main goal of our well-powered study was to find out how emotional content affected WMC using methods, hypotheses, and data analysis plans that had already been recorded. A lot of psychologists have used the OSPAN task to test working memory because it is a true and reliable test of working memory. That's why we used it to test WMC. Other span tasks, like the alphabet span or reading span, have similar levels of reliability. The OSPAN, on the other hand, doesn't need emotional knowledge as a parallel mental activity. The second goal of this study was to look at how negative affect and ER affect cognitive abilities, specifically how well people do on the dual N-back test. A previous study (Bauer et al., 2015) found that making someone feel bad can hurt their success on working memory tasks. A lot of study has looked at antecedent (CR) and response focused strategies (ES) to see when ER strategies are used during the process of making people feel something. But this study had a mindful attention condition where people were asked to use techniques related to mindfulness. This was done to build on earlier research and look into other ER strategies. Based on previous research, this study thought that people who were given CR and MA would do better than people who were given ES or the control group. It was also thought that the people in the CR group would respond faster than the people in the MA, ES, and CTR groups. Previous research has shown that intrusive thoughts drain people's mental resources and make them focus on their ideas instead of the task at hand. This effect has been linked to stress and trouble sleeping.

Of the 60 young adults form 180 respondents were induced in the analysis of neutral emotions (stimuli pictures) influence on WMC. In order to identify the difference in pre scoring, when no emotions were induced and the respondents were in normal circumstances and post scoring, after emotional induction pair T-test is applied on both variables the mean difference between pre and post test score which is 19.0333 for pre assessment and 17.2667 for post assessment.

Of the 180 respondents, the frequencies has been calculated and produced a mean comparison indicates that female had high WMC score than male, so according to these results. It is concluded that the given prediction was accurate the mean differences among respondents. Male have 18.92 while female have 19.15 that is greater than 18.92 shows that female have more WMC as compare to male.

Conclusions

It was found that the WMC was lower for neutral and negative feelings compared to positive emotions shown in pictures. 180 college students between the ages of 18 and 25 took part in an experiment. WMC was checked with the Digit Span Test (forward and backward). In the meantime, the PANAS test was used to figure out how the interviewees were feeling emotionally so that the tests could be useful. The two tests were both valid and valid. They didn't cost much and were safe to use. The pictures used to make people feel different emotions came from the NAPS (LOBI) Laboratory of Brain Imaging and were found online at the Nencki institute in Poland. The results show that emotional pictures made it harder to do digit span tasks that required working memory. This could be because emotionally charged stimuli use up a lot of processing power. Researchers have also found that differences between people in their WMC for positive pictures can predict a number of outcomes linked to emotions. In the future, it might be interesting to see if differences between people's scores on the Digit Span Test (forward and backward) and the PANAS scale for pre-emotional state testing have effects on emotion-related results that go beyond the effects of positive WMC.

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