How does Anxiety, Stress, Sleep Affect Memory?

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Introduction

Long-term memories are dependent on effective encoding, retrieval and working memory. ***Working memory (WM)*** is a small capacity for short-term storage and utilizing information for difficult tasks such as learning, comprehension, and reasoning (Baddeley, 1992). Working memory is a critical part of memory recall because it controls both the intentional encoding and retrieval of information. Working memory is also sensitive to changes in arousal and the daily hassles and fatigue that we encounter throughout the day.

In a prior experiment (Kaseya & Lawson, 2022a), we looked at the recall memory of 30 words and whether **stress**, **drug use**, and **sleep disturbances** affected their memory recall of those words. Fifty-four undergraduate students studied 30 words for 5 minutes, and after a 2-minute distractor task (i.e., basic math problems), recalled as many words as possible within 5 minutes. Handwritten surveys also measured stress levels, drug usage, and sleep disturbances. We hypothesized negative correlations between memory performance and stress, drug use, and sleep disturbances. Our results showed a positive correlation between sleep disturbances and memory recall. However, we did not find a correlation between drug usage, stress, and memory recall. A limitation was that each participant had different studying techniques.

In a second experiment (Kaseya & Lawson, 2022b), we dropped drug use and added **anxiety** to better understand memory recall. Forty-three college students participated in the online study. They studied 30 words for 3 minutes (the words were repeated twice). Afterward, a distractor task (basic math problems) was displayed on the screen for 2 minutes. Online surveys also measured stress levels, anxiety, and sleep disturbances. We hypothesized negative correlations between memory performance and stress, anxiety, and sleep disturbances. Our results indicated that participants with anxiety (negative) did have a higher chance of stress. Our hypotheses, however, were not supported in this study. Thus, our study did not link stress, anxiety, or sleep disturbances to memory performance.

The current study continued to examine factors associated with memory recall by including measures of stress, anxiety and sleep disturbances. We also collected EEG data during the study of words. Research by Paller and colleagues (e.g., ****) have shown that the late positive component of event-related potentials are sensitive to differences in items later recalled.

Hypotheses

- Stress will be positively associated with memory
- Anxiety, Sleep Disturbances & Impulsiveness will be negatively associated with memory
- EEG will differentiate the study of recalled word versus non-recalled words in the memory task

Method

Participants

College students (N = 19) enrolled at Eastern Kentucky University participated in the study. All participants gave informed consent and received course credit for their participation.

Materials

- Perceived Stress Scale Survey: A 10-item questionnaire was used from Cohen & Williamson (1988) to measure the participant's stress depending on their thoughts and feelings during the past month.
- State-Trait Inventory for Adults (Y-1): A 20-item questionnaire was used from Spielberg (1977) to measure the participant's anxiety by asking the participants about how they are feeling now.
- Pittsburgh Sleep Quality Index survey: A 20-item questionnaire was used from Watson et al. (1988) to measure the participant's anxiety by asking the participants about how they felt over the past week.
- Urgency-Premeditation-Perseverance-Sensation Seeking-Positive Urgency (UPPS-P): A 59-item questionnaire was used from Cyders et al. (2007) to measure the participant's factors that could lead to impulsive behaviors.
- Memory Task: A memory task based on Lawson et al. (2000) was used to measure the participant's recall memory. They were given 30 words and 3 minutes to study. Afterwards, they were given basic math problems to solve in 2 minutes. After the 2 minutes, participants were given 5 minutes to recall as many words as they can from the word list.

Procedure

After agreeing to participate, participants were asked to perform a memory task. With the memory task, they were asked to memorize a list of 30 words for 3 minutes. After 3 minutes, they worked on basic math problems for 2 minutes. Then they were given 5 minutes to recall as many words as possible in any order. Afterwards they were asked to fill out the three surveys on stress, anxiety, and sleep quality.

Memory Task

With the memory task, participants were given a list with 30 words and 3 minutes to study for memorization.

Ready	**Clear**	**Allow**	**Apple**	**Round**	**Pupil**
Adapt	**Pause**	**Offer**	**Light**	**Brick**	**Juice**
Fault	**Moral**	**Basis**	**Screw**	**Hotel**	**Paper**
Occur	**Lower**	**Labor**	**River**	**Cable**	**Party**
Dream	**Doubt**	**Habit**	**Table**	**Waste**	**Cloud**

Correlation Matrix

	Stress	Sleep Disturbances	Anxiety	UPPS-P	Recall
Sleep Disturbances	0.582				
Anxiety	**	0.			
UPPS_P	0.	0.	0.		
Recall	0.	0.	0.	0.*	
False Recall	0.	0.	0.	0.	0.999**

* p < .05
** p < .001

Discussion

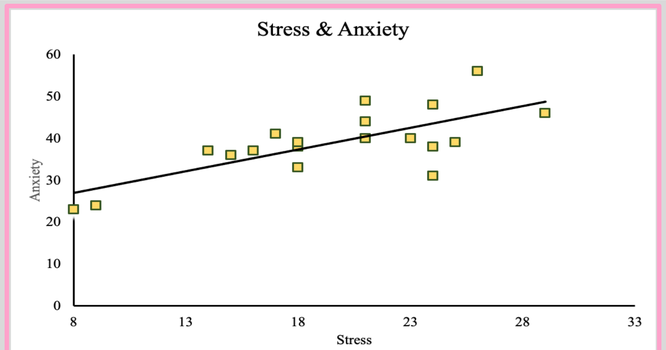
This study examined how stress, anxiety, and sleep disturbances affect memory recall. Results showed that participants with higher impulsiveness recalled less words. Participants with anxiety did have a levels of stress. Furthermore, participants who recalled more words from the task had less false recall.

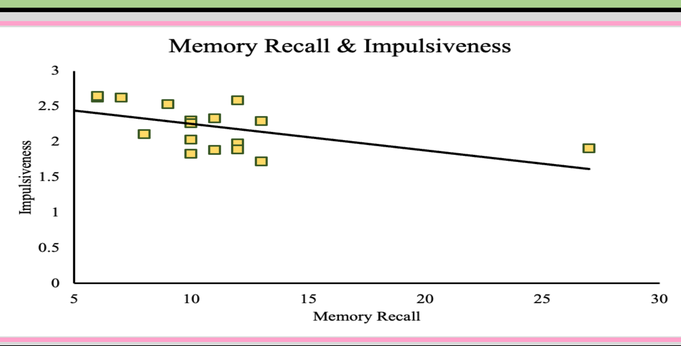
We are currently analyzing the ERP data, and thus do not yet have EEG results.

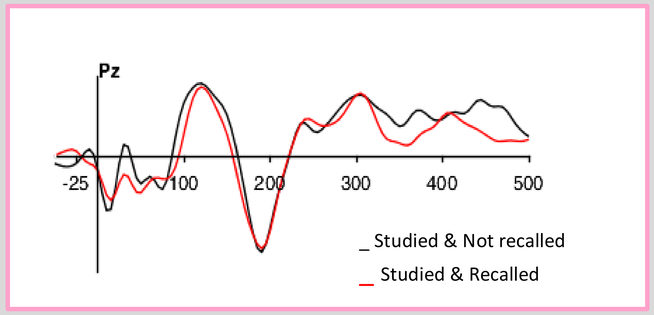
Given our lack of memory results for stress, anxiety and sleep disturbances, we conclude that these variables are not likely strong influences on the study and recall of words for college students.

Possible limitations are different studying techniques used and participants may have experienced fatigue. Also, we continue to collect data and expect to have 40 participants. Thus our current 19 participants make these results preliminary.

Results







References

Baddeley, A. (1992). Working memory. *Science*, *255*(5044), 556-559.
Borkowski, J. G., & Mann, T. (1968). Effects of anxiety and interference on short-term memory. *Journal of Experimental Psychology*, *78*(2, Pt.1), 352–354.
Buysse, D. J., Reynolds III, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Research*, *28*(2), 193– 213.
Cohen, S. and Williamson, G. Perceived Stress in a Probability Sample of the United States. Spacapan, S. and Oskamp, S. (Eds.) The Social Psychology of Health. Newbury Park, CA: Sage, 1988.
Cyders, M. A., Smith, G. T., Spillane, N. S., Fischer, S., Annus, A. M., & Peterson, C. (2007). Integration of impulsivity and positive mood to predict risky behavior: Development and validation of a measure of positive urgency. Psychological Assessment, 19(1), 107-118.
Lawson, A. L., Pratarelli, M. E., & Sprowls, D. A. (2000). Visual bimodal encoding and concreteness effects on free recall. *North American Journal of Psychology*, *2*(2), 219–232.
Spielberger, C. D. (1983). State-trait anxiety inventory for adults.

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