Research plan:

Past literature on the effects of cannabinoids clearly demonstrates robust acute and long-term impacts on cognition, especially verbal learning and memory deficits. It is also recognized that men and women may experience cannabinoid effects differently, even though the biological sex differences in cannabinoid-induced verbal learning and memory deficits are not well-categorized.

The cannabinoid being analyzed is delta-9-tetrahydrocannabinol (THC), the principal psychoactive constituent of cannabis, which is typically used in a man-made controlled version called dronabinol. Past literature has shown that THC produces verbal learning deficits acutely similar to herbal cannabis and can be used to model the acute psychoactive effects of cannabis use. The cognitive test used in this experiment was the Rey's Auditory Verbal Learning Task (RAVLT). The participants were read a list of fifteen words (List A) learned in early childhood that hold no extreme emotional significance (i.g. "love" or "hate"). The participants then had to recall as many of the fifteen words as they could. This was done over five trials. Then the participants had to complete one trial of a distractor list of fifteen different words (List B). Right after the List B trial, the participants were required to recall the words from List A. After 20 minutes of completing a distractor task, the participants were again required to recall as many words from List A as possible. The participants in this study took the RAVLT with either dronabinol or placebo. Nothing else was manipulated.

Past literature on both RAVLT and the effects cannabinoids have on verbal learning and memory have shown that women generally do better overall than men while taking the RAVLT, regardless of the presence of cannabinoids. Using the information provided by journal articles (see bibliography) and mentors, the student hypothesized that THC (dronabinol) will acutely induce verbal learning deficits measured using the RAVLT scores compared to placebo scores and this deficit will be influenced by the biological sex of the participants.

The data being analyzed in this project will be collected from a double-blind, randomized, placebo-controlled human laboratory study in healthy individuals conducted by mentors Dr. Mohini Ranganathan and Dr. Patrick Skosnik. The study was conducted over the course of two test days separated by at least three days. The participants were only included if they had a history of cannabis exposure. Cognitive assessments primarily included the electrophysical (EEG) version of the RAVLT. The data provided only gave the subject identification number, drug condition, and biological sex for demographics in order to ensure the subjects' privacy was protected.

The independent variables being analyzed are the biological sex of the participants and the drug condition. The biological sex of the participants will be either male or female, while the drug condition will be either 10 mg of dronabinol or placebo.

First, the data will be separated by gender to better analyze any differences that may have been influenced by gender. Then, the data in each gender group will be split into dronabinol or placebo groups. In each group, the mean, standard deviation, and standard error will be calculated and graphed for each RAVLT trial. Then the data will be put through several different analysis methods in order to determine the relationships between the effects of biological sex and drug condition on RAVLT performance. Finally, t-test analyses will be conducted in order to

determine whether the relationships between drug condition, biological sex, and verbal learning deficits are significant or not.

The implications of this project are that once this analysis is completed, it will be contributed to the steadily growing amount of research done on how cannabinoids affect verbal learning and memory in relation to biological sex. This information will be useful to both clinicians and the general public since it will add to the amount of literature on the cognitive effects of cannabis and THC.

Bibliography:

Imperatori, Claudio, et al. “Open AccessArticle Increased Resting State Triple Network Functional Connectivity in Undergraduate Problematic Cannabis Users: A Preliminary EEG Coherence Study.” Brain Sciences, vol. 10, no. 11, 2020, p. 834., https://doi.org/10.3390/brainsci10110834.

Jacobus, Joanna, and Susan F Tapert. “Effects of cannabis on the adolescent brain.” Current pharmaceutical design vol. 20,13 (2014): 2186-93. doi:10.2174/13816128113199990426

Nia, Anahita Bassir et al. “Cannabis Use: Neurobiological, Behavioral, and Sex/Gender Considerations.” Current behavioral neuroscience reports vol. 5,4 (2018): 271-280.

Schoeler, Tabea, and Sagnik Bhattacharyya. “The effect of cannabis use on memory function: an update.” Substance abuse and rehabilitation vol. 4 11-27. 23 Jan. 2013, doi:10.2147/SAR.S25869

Skosnik, Patrick D, et al. “The Effect of Chronic Cannabinoids on Broadband EEG Neural Oscillations in Humans.” Neuropsychopharmacology, vol. 37, no. 10, 2012, pp. 2184–2193., https://doi.org/10.1038/npp.2012.65.

Smith, Janette L et al. “Verbal Learning and Memory in Cannabis and Alcohol Users: An Event-Related Potential Investigation.” Frontiers in psychology vol. 8 2129. 8 Dec. 2017, doi:10.3389/fpsyg.2017.02129

Solowij, Nadia, and Nicole Pesa. "Cognitive abnormalities and cannabis use." Brazilian