

HOW NEGATIVE EMOTIONAL STATES AND IMPULSIVITY ARE ASSOCIATED  
WITH THE DUAL SUBSTANCE USE OF E-CIGARETTES AND CANNABIS

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A Thesis

Presented to

The Faculty of the Department of Psychology and Philosophy

Sam Houston State University

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In Partial Fulfillment

of the Requirements for the Degree of

Master of Arts

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by

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May, 2024

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This thesis follows the format and style of the Publication Manual of the American Psychological Association, 7<sup>th</sup> edition, except where superseded by the guidelines of The Graduate and Professional School at Sam Houston State University.

## **DEDICATION**

Dedicated to my family and my mentors. Thank you for your support and for always believing in me.

## ABSTRACT

Tayebi, Shayon, *How negative emotional states and impulsivity are associated with the dual substance use of e-cigarettes and cannabis*. Master of Arts (Psychology), May, 2024, Sam Houston State University, Huntsville, Texas.

E-cigarettes and cannabis are two of the most used substances among young adult Americans, and use is continuing to increase (Boakye et al., 2022; Clendennen et al., 2021). Moreover, dual use of these substances is common among college students (Buckner, Morris, et al., 2021). Research has found significant linkages between negative emotional states (depression, anxiety, and stress), impulsivity, and e-cigarette and cannabis use individually; however, only one previous study has examined the relationship between this dual substance use and negative emotional states. This research suggests that dual substance use is associated with increased mental health symptomology (Buckner, Morris, et al., 2021), but it does not elucidate directionality of this relationship. The aim of this study was to assess whether negative emotional states and impulsivity are associated with individual and dual substance use of e-cigarettes and cannabis. A secondary data analysis examined college students' (overall  $n = 585$ ) negative emotional states, impulsivity, e-cigarette use ( $n = 112$ ), cannabis use ( $n = 210$ ), and dual substance use ( $n = 82$ ). This study found higher anxiety and impulsivity scores significantly predicted higher cannabis use while higher stress scores significantly predicted lower cannabis use. Moreover, anxiety was found to significantly predict dual substance use, illustrating how anxiety plays a vital role in problematic cannabis use and high dual substance use. These findings suggest that anxiety treatments could lower dual substance use as a result. Thus, future research should examine how anxiety-targeted

cognitive behavioral therapy (CBT) impacts monthly cannabis use and dual substance use.

**KEY WORDS:** Dual substance use; Negative emotional states; Impulsivity; Cannabis; E-cigarettes

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## CHAPTER I

### Introduction

E-cigarettes are one of the most prevalent substances used among young adults today (Clendennen et al., 2021; Powers et al., 2021; Zvolensky et al., 2018). Specifically, 29% of college students presently use e-cigarettes (Clendennen et al., 2021; Schulenberg et al., 2020), and this number appears to be increasing (Bao et al., 2018; Buckner, Abarno, et al., 2021), with young adults ages 21-24 years old showing the greatest increase (Boakye et al., 2022). Young adult use of e-cigarettes is problematic for several reasons, including increased risk of using another substance (e.g., combustible cigarettes or cannabis) in addition to e-cigarettes (i.e., dual substance use; Haardorfer et al., 2016; Lanza et al., 2020; Meisel et al., 2015). One study found that e-cigarette users were more likely to become dual substance users in comparison to binge drinkers, combustible cigarette users, and cannabis users (Lanza et al., 2020). Although most dual-user studies examine two forms of cigarettes (e-cigarettes with combustible cigarettes) (Buckner, Abarno, et al., 2021; Marsden et al., 2019), research examining dual use of e-cigarettes and cannabis is especially important; specifically because combustible cigarette usage has drastically gone down in recent years (Marsden et al., 2019; Reboussin et al., 2021; Versella et al., 2019), with a 57% decrease in use from 1965 to 2014 (Jamal et al., 2015; Versella et al., 2019).

On the other hand, cannabis has become one of the most used substances for young adults, and its rate of use is continuing to grow (Buckner, Morris, et al., 2021; Clendennen et al., 2021; Frohe et al., 2018). For instance, recent research suggests that among college students, 26% have used cannabis in the last 30 days (Clendennen et al.,

2021; Schulenberg et al., 2020). Moreover, past-year cannabis use among young adults increased from 29% in 2011 to 43% in 2021 (National Institute on Drug Abuse [NIDA]; 2022). Dual use of e-cigarettes and cannabis is also common. In fact, over half of undergraduate students who use e-cigarettes noted cannabis use as well (Ashford et al., 2020; Buckner, Morris, et al., 2021; Evans-Polce et al., 2020). Furthermore, abuse of substances often begins around young adulthood (Lanza et al., 2020; Palmer et al., 2009). Indeed, recent research found that dual substance use of e-cigarette and cannabis was related to higher levels of negative emotional states than use of either e-cigarettes or cannabis individually (Buckner, Morris, et al., 2021). Thus, given the increasing usage of both e-cigarettes and cannabis and increased negative mental health effects from dual substance use, current research needs to explore how negative emotional states are associated with the dual substance use of e-cigarettes and cannabis.

Usage of e-cigarettes and cannabis can pose significant mental health and behavioral problems in individuals of all ages but especially in adolescents and young adults (Buckner, Morris, et al., 2021; Clendennen et al., 2021). Not only do e-cigarettes pose physical health effects such as increased risks of respiratory issues (Callahan-Lyon, 2014; Dinakar & O'Connor, 2016; Zvolensky et al., 2018), they also cause psychological harm as a young adult's brain develops, such as memory issues, cognitive dysfunction, and negative impacts on mood (Clendennen et al., 2021; Roditis et al., 2015). Cannabis use has also been linked to anxiety and depression (Center for Disease Control and Prevention [CDC]; 2021). The reverse associations have also been found that suggest that negative mood states can also lead to greater use of both e-cigarettes (Clendennen et al., 2023; Mantey et al., 2022) and cannabis (al'Absi & Allen, 2021; Kedzior & Laeber,

2014) individually. However, the reverse association of negative emotional states and dual substance use of e-cigarettes and cannabis has not yet been explored.

Additionally, impulsivity has been associated with both e-cigarettes and cannabis use individually; however, linkages between impulsivity and dual usage of these substances has not been reported (Ansell et al., 2015; Frohe et al., 2018; Grant et al., 2019; Lanza et al., 2020; Morean et al., 2017). The association of e-cigarette and cannabis usage with impulsivity may also be bidirectional, as use of these substances may lead to engagement in more risky behaviors (i.e., more impulsive behaviors; Frohe et al., 2018; Grant et al., 2019) at a time when young adults are often on their own for the first time. While current research has established the association between dual substance use and mental health symptomatology, clarifying the strength of the influence of mental health symptomatology on dual substance use will inform treatment of individuals with mental health symptomatology. Moreover, the prevalence of e-cigarette and cannabis use and their individual associations with mental health symptomatology and impulsivity make studying the associations between negative emotional states, impulsivity, and the dual use of cannabis and e-cigarettes particularly important.

### **Impulsivity and the Use of Substances**

Impulsivity has been explained as a person acting hastily, taking risks, or acting inappropriately without considering potential consequences for their actions (Frohe et al., 2018; Grant et al., 2019). Not only has it been shown to be associated with risky behaviors among young adults in college (Bidwell et al., 2013; Frohe et al., 2018), but past research has also found an association between impulsivity and use of e-cigarettes in young adults (Grant et al., 2019; Morean et al., 2017). For example, lack of premeditation

or planning usage in advance has been shown to be a predictor of e-cigarette use (Lanza et al., 2020). On the other hand, e-cigarette use has also been shown to be related to impulsivity (Grant et al., 2019). However, there has also been conflicting research findings when looking at trait impulsivity, as one previous study has indicated that there is no association between trait impulsivity and how much or how often individuals use e-cigarettes (Kale et al., 2020). Nevertheless, it is possible that impulsivity may be associated with increased risk of e-cigarette use.

Impulsivity has been linked to young adult cannabis use as well (Bidwell et al., 2013; Frohe et al., 2018; Morean et al., 2017), with one study finding that high impulsivity predicted higher cannabis use frequency (Rinehart & Spencer, 2021). Interestingly, the reverse association also appears to be evident, as Ansell and colleagues (2015) report that cannabis use was related to a rise in impulsivity within days of use. Thus, several recent studies demonstrate a potential bidirectional link between impulsivity and both e-cigarettes and cannabis individually (Ansell et al., 2015; Frohe et al., 2018; Grant et al., 2019; Lanza et al., 2020; Morean et al., 2017). However, there have been no studies to date that have examined if there is an association between impulsivity and the dual substance use of e-cigarettes and cannabis together. Given that past studies have found that dual substance use of e-cigarettes and cannabis are associated with exacerbated mental health symptoms (Buckner, Morris, et al., 2021), it is important to examine whether dual substance usage levels differ when including levels of impulsivity in the model as well.

## Negative Emotional States and Dual Use of Substances

Negative emotional states have also been shown to be associated with both e-cigarettes and cannabis individually (al'Abasi & Allen, 2021; Clendennen et al., 2023; Kedzior & Laeber, 2014; Mantey et al., 2022; Wilkinson et al., 2016). For instance, both depression and anxiety have been shown to predict increased use of e-cigarettes in young adults (Clendennen et al., 2023). Additionally, perceived stress has been shown to be associated with progressive use of e-cigarettes (Mantey et al., 2022). Moreover, e-cigarettes use was associated with increased depression symptomatology (Marsden et al., 2019). Furthermore, past research has highlighted how anxiety symptoms and disorders have predicted both cannabis use and cannabis use disorders (Kedzior & Laeber, 2014). Previous research has also found that higher stress predicts higher cannabis use frequency (al'Absi & Allen, 2021). Moreover, depression has shown a bidirectional relationship with cannabis use, with high depression predicting higher cannabis use and cannabis use predicting higher depression symptoms (Wilkinson et al., 2016). Thus, negative emotional states may serve as both predictors and outcomes of e-cigarette and cannabis use.

In terms of dual usage, several studies have examined the linkages between negative emotional states – such as depression, anxiety, and stress – to dual use of e-cigarettes with combustible cigarettes (Buckner, Abarno, et al., 2021; Marsden et al., 2019; Weinberger et al., 2020). For example, dual usage of e-cigarettes and combustible cigarettes has been associated with social anxiety (Buckner, Abarno, et al., 2021) and depression symptoms (Marsden et al., 2019). Moreover, veterans who experienced serious psychological distress (e.g., feelings of worthlessness and depression) were more

likely to report dual substance use of both e-cigarettes and combustible cigarettes (Weinberger et al., 2020). Thus, there may also be a bidirectional association between use of the dual substances of e-cigarettes and combustible cigarettes and negative emotional states.

To date, Buckner, Morris, and colleagues (2021) conducted the only study to our knowledge that has examined the association of the dual substance use of e-cigarettes and cannabis with anxiety and depression among college students. This study is important because not only does it examine the relationship between negative emotional states and dual substance use of e-cigarettes and cannabis, but it is also the first to examine the influence of cannabis use on e-cigarette use and vice versa (Buckner, Morris, et al., 2021). Buckner and colleagues (2021) found that in cannabis users, use of e-cigarettes was related to more prevalent use of cannabis and higher anxiety and depression. Moreover, among e-cigarette users, cannabis use was related to an increase in e-cigarette use and an increase in anxiety, but not an increase in depression. However, though this study used the Depression Anxiety Stress Scale-Short Form (DASS-21; Lovibond & Lovibond, 1995) in order to evaluate depression, anxiety, and stress in participants, scores from the stress subscale of the study were not reported. Nevertheless, this study indicates that dual substance use was associated with increased anxiety and depression. One other study has examined dual use of e-cigarettes and cannabis; however, they focused on linkages between usage and stress and did not assess anxiety and depression. In this study, Clendennen and colleagues (2021) collected qualitative data where college students indicated they increased their e-cigarette use when stressed and increased cannabis use when they had less responsibilities. While these two studies do address the

dual substance use of e-cigarette and cannabis, neither look at the relationship between these substances and stress, anxiety, and depression.

However, no study has specifically addressed if negative emotional states are associated with the dual substance use of e-cigarettes and cannabis. Additionally, to our knowledge, no studies have examined the relationship between impulsivity and dual substance use of e-cigarettes and cannabis. Since dual substance use of e-cigarettes and cannabis have been shown to be related to exacerbations in mental health symptoms (Buckner, Morris, et al., 2021), it is important to examine whether dual substance use responds differently from single substance use. Thus, further exploration is necessary to understand the extent to which negative emotional states and impulsivity could predict dual substance use.

### **The Current Study**

The current study was designed to assess whether individuals who have higher negative emotional states (depression, anxiety, and stress) and levels of impulsivity have higher individual usage of e-cigarettes and cannabis, as well as dual usage of these two substances. It was hypothesized that higher scores on depression, anxiety, stress, and impulsivity would be associated with higher individual use of e-cigarettes (hypothesis 1) and cannabis (hypothesis 2) among those who endorsed individual use. Also, among those who endorsed dual substance use of e-cigarettes and cannabis, it was hypothesized that higher scores of depression, anxiety, stress, and impulsivity would be related to higher levels of dual substance use (hypothesis 3). It was also hypothesized that each of the predictors of interest in this study (depression, anxiety, stress, and impulsivity) would be statistically significant predictors in multiple regression models predicting e-cigarette



use (hypothesis 4), cannabis use (hypothesis 5), and dual usage (hypothesis 6). Finally, it was hypothesized that the predictors of interest would account for more variance (i.e., have a higher  $R^2$ ) in dual usage than they did in the individual use models (hypothesis 7).

The results of the current study will provide more knowledge about the association between negative emotional states and impulsivity with the individual and dual substance use of e-cigarettes and cannabis. These results may aid the treatment of those with substance use disorders by influencing clinicians' focus on treating the elevated significant predictors with psychotherapy or psychopharmacology and could contribute to developing treatment programs and strategies for individuals who are dual users and struggle with mental health symptomology.

## CHAPTER II

### Method

#### Participants

The current study involves a secondary analysis of data that were collected as a part of the larger Collaborative Data Collection Project on College Student Health Behaviors. College students from multiple universities ( $n = 585$ ) were recruited to answer self-report questionnaires regarding demographics, depression, anxiety, stress, impulsivity, cannabis use, and e-cigarette use. Those who indicated use of cannabis *and* e-cigarettes were included in a dual substance use composite variable as well. Of the 585 participants total, 210 reported cannabis use (35.9% of the sample), 112 indicated e-cigarette use (19.1%), and 82 endorsed dual usage (14.0%). Moreover, of the 112 participants that reported e-cigarette use, over 73% also endorsed cannabis use. Of note, only data from these participants are included in the current study (e.g., data from participants who did not endorse e-cigarette and/or cannabis usage were not included in the analyses). Participants were required to be between the ages of 18 and 24 years old, enrolled in 6 or more credit hours in their current semester, and provide informed consent in order to be included in the study. Data were collected between February and May of 2022.

#### Procedures

Participants were recruited via the SONA system or the Psychology Research Participation (PeRP) system at multiple universities in the United States of America. After receiving informed consent, the surveys were conducted online through Qualtrics and were projected to last around an hour and a half. Participants earned 1.5 research

participant credits at the conclusion of the survey. Results from the survey were entered into SPSS and given ID numbers to deidentify participants.

## **Measures**

In addition to questions about basic demographics, four measures were used to assess negative emotional states (depression, anxiety, and stress), impulsivity, e-cigarette use, and cannabis use in consenting young adults.

### ***Negative Emotional States***

The Depression Anxiety Stress Scale-Short Form (DASS-21; Lovibond & Lovibond, 1995) is a 21-item scale that was used to assess past-week levels of negative emotional states in young adults. Items were split into three different subscales, including *depression* (e.g., “I couldn’t seem to experience any positive feeling at all”), *anxiety* (e.g., “I felt I was close to panic”), and *stress* (e.g., “I found it hard to wind down”). The 21 items were each rated on a 4-point Likert scale that ranged from 0 (Did not apply to me at all) to 3 (Applied to me very much, or most of the time). Overall internal consistency was shown to be excellent with a past sample of young adults at  $\alpha=.96$ . Each individual subscale also indicated good internal consistency with the Cronbach’s alpha for the anxiety subscale at .87 (95% CI: .86-.89), the depression subscale at .92 (95% CI: .91-.93), and the stress subscale at .89 (95% CI: .88-.90) (Thiyagarajan et al., 2022). Overall internal consistency in the current study was shown to also be excellent at  $\alpha=.95$ . The internal consistency of the depression subscale was also shown to be excellent at  $\alpha=.92$ , while anxiety ( $\alpha=.85$ ) and stress ( $\alpha=.86$ ) showed good internal consistency. Concurrent validity has also been shown between each subscale and corresponding measures such as the Beck Anxiety Inventory (BAI; Beck & Steer, 1990), the Beck Depression Inventory

(BDI; Beck et al., 1979), and the State-Trait Anxiety Inventory (STAI-T; Antony et al., 1998; Spielberger, 1983) in previous research. The total scores for each individual subscale (depression, anxiety, and stress) multiplied by two were used in the analyses.

### ***Impulsivity***

Impulsivity levels in young adults was examined by using the Barratt Impulsiveness Scale (Version 11; BIS-11; Patton et al., 1995). The BIS-11 (Patton et al., 1995) is a 30-item scale that asks participants to rate the frequency the statements provided describe them (e.g., “I say things without thinking.”). The items were each rated on a 4-point Likert scale that ranged from 1 (Rarely/Never) to 4 (Almost Always). The scale has shown good internal consistency using a sample of college students with a Cronbach’s Alpha of .82 (Patton et al., 1995). The measure in the current study showed acceptable internal consistency at  $\alpha=.71$ . The sum of the scores from all 30 items was used in the analyses.

### ***Cigarette and E-Cigarette Use***

The Cigarette and E-Cigarette Use Questionnaire (Hinds et al., 2016) is a 37-item self-report used to assess the use of both combustible cigarettes and e-cigarettes in the past 30 days. There are several types of questions including yes/no questions and frequency of use during the past 30 days (“On how many of the past 30 days have you used such as product?”). Yes or no questions were scored 1 for yes and 2 for no and frequency of use was scored by adding together the number of days of use in the past 30 days for each of the four e-cigarette types including e-cigarettes, vape pens, JUULs, and e-hookahs. In the current study, we only included data from the four questions pertaining to the usage of the different types of e-cigarettes (e.g., e-cigarettes, vape pens, JUULs,

and e-hookahs). The dependent variable characterizing e-cigarette usage was a continuous variable that was measured by adding the frequency of use in the last 30 days for each of the four types of e-cigarettes together to create an overall composite score. Missing data was replaced by 0 for participants who answered at least one of the four e-cigarette use questions in order to obtain a proper composite score. While questions about combustible cigarettes use were presented, this study was specifically focused on e-cigarette use, so those data were not used in analyses. Additionally, no Cronbach's alpha is available for this scale as it was recently adapted from cognitive interview questions developed by Hinds and colleagues (2016) and has not been published in any research studies yet. We did not calculate the alpha for the scale in the current study because the four questions were about usage only of four different types of e-cigarettes.

### *Cannabis Use*

Frequency of cannabis use in the past 6 months and cannabis use disorder was measured using The Cannabis Use Disorder Identification Test (CUDIT; Adamson & Sellman, 2003). The 11-item scale begins by asking participants if they have used cannabis in the last 6 months (Adamson & Sellman, 2003). If participants answer yes, they were then presented with 10 items asking about problematic cannabis use (e.g., "How often during the past 6 months did you have a feeling of guilt or remorse after using cannabis?"). The first eight items were rated on a 5-point Likert scale ranging from 0 ("Never" or "1 to 2" hours) to 4 ("daily or almost daily" or "10 or more"). The last two items were rated on a 2-point Likert scale ranging from 0 (No) to 4 (Yes). The total score was calculated and served as a continuous dependent variable. The scale has shown

acceptable internal consistency in past studies with a Cronbach's Alpha of .72 (Annaheim et al., 2008) and in the current study with a Cronbach's Alpha of .76.

### ***Dual Use***

The dual use dependent variable was determined by creating a composite variable from e-cigarette use and cannabis use. Both the total score of the frequency of past 30-day e-cigarette use and the total score of problematic cannabis use variables were standardized and summed for each participant in order to get a new composite variable for dual substance use. Participants were only eligible for a composite variable if they endorsed both e-cigarette use in the past 30 days and cannabis use in the past 6 months. Those who did not use either substance or who used only one were marked as a missing value in the dual substance use analyses.

## CHAPTER III

### Results

#### Preliminary Analysis

Multiple bivariate correlations along with two sets of three multiple regression analyses were conducted to assess the research questions presented. Thus, prior to running the analyses, the core regression assumptions of additivity and linearity, homoscedasticity, independence, and normality were examined using investigative analytic strategies, such as evaluating histograms, boxplots, and scatterplots as well as additional diagnostic tests within SPSS Version 27, such as the Shapiro-Wilk test and Levene's test.

In order to examine the association between negative emotional states and impulsivity with the individual and dual substance use of e-cigarettes and cannabis, correlations between all variables were examined using SPSS Version 27. Additionally, two sets of three multiple regression models were conducted, also using SPSS Version 27. For each multiple regression model, all three negative emotional states (anxiety, depression, and stress) and impulsivity were entered as the independent (or predictor) variables. In the first multiple regression model, the dependent (or outcome) variable was e-cigarette use; in the second regression model, the dependent variable was cannabis use alone; and in the third regression model, dual substance use was the dependent variable. This was done to compare the models of the use of the two substances individually to the dual substance use model. In the first set of three regression models, all participants who endorsed usage were included in the models (so the *ns* varied across models: 112 in the e-cigarette model, 210 in the cannabis model, and 82 in the dual usage model). In the

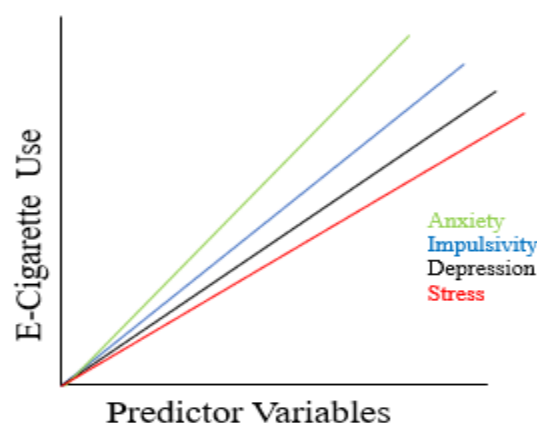
second set of three multiple regression models run, only data from the 82 dual users were included in the analyses to allow for a comparison of  $R^2$  values across the three models (e-cigarette, cannabis, and dual usage).

### Hypothesized Results

The predictor variables of negative emotional states (depression, anxiety, and stress) and impulsivity and their relationships with e-cigarette use, cannabis use, and with the dual substance use of e-cigarettes and cannabis were evaluated through correlations (H1-H3) and then through multiple regression analyses (H4-H7). As shown in Figure 1, Figure 2, and Figure 3, we hypothesized that levels of depression, anxiety, stress, and impulsivity would be positively associated with e-cigarette use, cannabis use, and dual usage. Moreover, we hypothesized that the predictors in the dual usage multiple regression model would account for more variance than in the e-cigarette use or cannabis use models.

### Figure 1

*Proposed Results: H1*

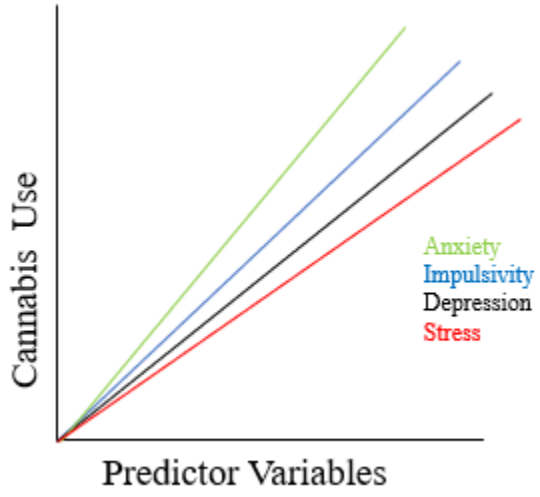


*Note.* Figure is for visual purposes only. The figure is not predicting which variable will have the biggest predictive value in comparison to others.



**Figure 2**

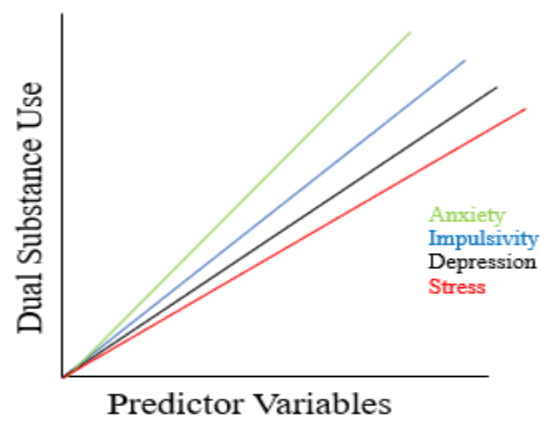
*Proposed Results: H2*



*Note.* Figure is for visual purposes only. The figure is not predicting which variable will have the biggest predictive value in comparison to others.

**Figure 3**

*Proposed Results: H3*



*Note.* Figure is for visual purposes only. The figure is not predicting which variable will have the biggest predictive value in comparison to others.

## Descriptive Data

Descriptive data for each individual variable and correlations between predictor and outcome variables are provided in Tables 1 and Table 2.

**Table 1**

*Descriptive Statistics*

Measures/Variables	<i>N</i>	Min	Max	<i>M</i>	<i>SD</i>
Cannabis Use Disorder Identification Test (CUDIT)	210	0.00	21.00	3.16	4.50
E-Cigarette Use	112	1	116	18.49	22.28
Dual Substance Use of E-Cigarettes and Cannabis	82	-1.49	7.45	0.37	1.62
Depression	585	0.00	42	11.15	10.38
Anxiety	585	0.00	42	10.26	9.14
Stress	585	0.00	42	13.83	9.30
Barratt Impulsiveness Scale (BIS-11)	585	30	114	67.69	8.38

*Note.* E-cigarette Use variable is derived from the Cigarette and E-Cigarette Use Questionnaire; Depression, Anxiety, and Stress are subscales derived from the Depression Anxiety Stress Scale-21 (DASS-21)

**Table 2***Correlation Matrix*

Variable	D	A	S	I
1. E-Cig	.279**	.265**	.286**	.204*
2. CUDIT	.170*	.294**	.133	.217**
3. Dual Use	.448**	.492**	.414**	.317**

*Note.* E-cigarette monthly use from the Cigarette and E-Cigarette Use Questionnaire (E-Cig); Cannabis Use Disorder Identification Test (CUDIT); Composite variable of the dual substance use of e-cigarettes and cannabis (Dual Use); Depression subscale from the Depression Anxiety Stress Scale-21 (D); Anxiety subscale from the Depression Anxiety Stress Scale-21 (A); Stress subscale from the Depression Anxiety Stress Scale-21 (S); Barratt Impulsiveness Scale BIS-11 (I)

\*\*  $p < .001$  (2-tailed); \*  $p < .05$  (2-tailed)

**Hypothesis 1**

Bivariate correlations were run to evaluate how negative emotional states and impulsivity were associated with how many days out of a month participants used e-cigarettes. As shown in Table 2, results of a Pearson correlation established that there was a statistically significant correlation between e-cigarette use and depression scores ( $r = .279, p = .003, n = 112$ ), anxiety scores ( $r = .265, p = .005, n = 112$ ), stress scores ( $r = .286, p = .002, n = 112$ ), and impulsivity scores ( $r = .204, p = .031, n = 112$ ). Thus, participants' negative emotional states and impulsivity scores were shown to be significantly positively correlated with e-cigarette use, fully supporting hypothesis 1.

**Hypothesis 2**

As illustrated in Table 2, results of a Pearson correlation indicated that there was a statistically significant correlation between cannabis use and depression scores ( $r = .170, p = .014, n = 210$ ), anxiety scores ( $r = .294, p < .001, n = 210$ ), and impulsivity scores ( $r$

= .217,  $p = .002$ ,  $n = 210$ ). Contrary to the hypothesis, no significant association was found between stress scores and cannabis use ( $r = .133$ ,  $p = .055$ ,  $n = 210$ ). Thus, as predicted, there were statistically significant associations between participants' cannabis use and depression symptoms scores, impulsivity scores, and anxiety scores. However, contrary to what was expected, there was not a significant linear association between participants' stress scores and cannabis use. In turn, the majority of hypothesis 2 is supported by the bivariate correlation results.

### **Hypothesis 3**

As conveyed in Table 2, results of Pearson correlations indicated that there were statistically significant correlations between the dual substance use of e-cigarettes and cannabis with depression ( $r = .448$ ,  $p < .001$ ,  $n = 82$ ), anxiety scores ( $r = .492$ ,  $p < .001$ ,  $n = 82$ ), stress scores ( $r = .414$ ,  $p < .001$ ,  $n = 82$ ), and impulsivity scores ( $r = .317$ ,  $p = .004$ ,  $n = 82$ ). In accordance with hypothesis 3, negative emotional states and impulsivity were shown to be significantly related to the dual substance use of e-cigarettes and cannabis.

### **Hypothesis 4**

The overall model predicting e-cigarette use was significant and showed a weak effect size [ $F(4, 107) = 2.81$ ,  $p = .029$ ,  $R^2 = .095$ ]. However, depression ( $B = .122$ ,  $\beta = .136$ ,  $p = .412$ ), anxiety ( $B = .032$ ,  $\beta = .039$ ,  $p = .820$ ), stress ( $B = .091$ ,  $\beta = .099$ ,  $p = .622$ ), and impulsivity ( $B = .08$ ,  $\beta = .09$ ,  $p = .391$ ) did not significantly predict e-cigarette use. Thus, contrary to hypothesis 4, higher negative emotional states and impulsivity scores did not significantly predict higher e-cigarette use.

### **Hypothesis 5**

The overall model predicting cannabis use was significant and showed a moderate effect size [ $F(4, 205) = 7.59, p < .001, R^2 = .129$ ]. Specifically, anxiety ( $B = .406, \beta = .45, p < .001$ ) and impulsivity ( $B = .143, \beta = .161, p = .037$ ) significantly predicted cannabis use, such that higher anxiety and impulsivity scores related to higher cannabis scores. Contrary to our hypothesis, stress ( $B = -.291, \beta = -.318, p = .009$ ) significantly predicted cannabis use, such that lower stress scores related to higher cannabis scores. In addition, depression ( $B = .022, \beta = .02, p = .824$ ) did not significantly predict cannabis use. Thus, hypothesis 5 is partially supported.

### **Hypothesis 6**

The overall model predicting dual substance use of e-cigarettes and cannabis was significant and showed a strong effect size [ $F(4, 77) = 6.88, p < .001, R^2 = .263$ ]. Specifically, anxiety ( $B = .545, \beta = .438, p = .036$ ) significantly predicted cannabis use, such that higher anxiety scores related to higher dual substance use. However, depression ( $B = .272, \beta = .20, p = .288$ ), stress ( $B = -.272, \beta = -.191, p = .389$ ), and impulsivity ( $B = .162, \beta = .117, p = .313$ ) did not significantly predict dual substance use. In turn, hypothesis 6 was only partially supported.

### **Hypothesis 7**

The results indicated that the predictor variables (depression, anxiety, stress, and impulsivity) accounted for more variance in predicting dual substance use of e-cigarette and cannabis ( $R^2 = .263$ ) than individual use of e-cigarettes ( $R^2 = .095$ ) or cannabis ( $R^2 = .129$ ). Additionally,  $R^2$  values were evaluated using only the 82 participants who were dual users in order to provide a more accurate comparison of the variance accounted for

in each model. Again, the results indicated that the predictor variables accounted for more variance in predicting dual substance use of e-cigarettes and cannabis [ $F(4, 77) = 6.88, p < .001, R^2 = .263$ ] than individual use of e-cigarettes [ $F(4, 77) = 2.517, p = .048, R^2 = .116$ ] or cannabis [ $F(4, 77) = 4.194, p = .004, R^2 = .179$ ]. Thus, hypothesis 7 was supported.

### ***Post-Hoc Test***

In order to further explore these data, several post-hoc analyses were conducted. Specifically, we explored if negative emotional states and levels of impulsivity differed between participants who endorsed usage of e-cigarettes in the last 30 days and those that did not, and between participants who endorsed usage of cannabis in the last six months and those that did not. Thus, independent sample *t*-tests were conducted.

In analyses to explore group differences between e-cigarette users and non-users, there were significant differences in depression scores between those who have ( $M = 13.61, SD = 11.49$ ) and those who have not ( $M = 10.27, SD = 10.22$ ) used e-cigarettes in the past 30 days,  $t(285) = 2.60, p = .01$ , Cohen's  $d = .31$ . The average depression score was 3.34 units higher in those who used e-cigarettes in the past month compared to those who reported not using e-cigarettes. The results indicated there were also significant differences in anxiety scores between e-cigarette users ( $M = 13.07, SD = 10.92$ ) and non-users ( $M = 8.55, SD = 8.03$ ),  $t(239.134) = 3.94, p < .001$ , Cohen's  $d = .48$ , such that e-cigarette users had anxiety scores 4.52 units higher than their non-using peers. In terms of levels of stress and impulsivity, we also observed significant differences between those who endorsed usage of e-cigarettes compared to those who did not. In stress scores, there was a significant difference between e-cigarette users ( $M = 16.11, SD = 9.97$ ) and non-

users ( $M = 13.79$ ,  $SD = 9.09$ ),  $t(284) = 2.05$ ,  $p = .041$ , Cohen's  $d = .24$ , such that e-cigarette users had stress scores 2.31 units higher than their non-using peers. For impulsivity levels, e-cigarette users ( $M = 69.15$ ,  $SD = 8.99$ ) had significantly higher scores than non-users ( $M = 66.54$ ,  $SD = 7.80$ ),  $t(284) = 2.632$ ,  $p = .009$ , Cohen's  $d = .31$ , such that e-cigarette users had impulsivity scores 2.61 units higher than their non-using peers.

In terms of group differences between cannabis users and non-users, there was a significant difference in depression scores between those who have ( $M = 12.57$ ,  $SD = 11.04$ ) and those who have not ( $M = 10.35$ ,  $SD = 9.92$ ) used cannabis in the past six months,  $t(398.08) = 2.43$ ,  $p = .016$ , Cohen's  $d = .22$ . The average depression score was 2.22 units higher in those who used cannabis compared to those who reported not using cannabis. The results indicated there were also significant differences in anxiety scores in those who have ( $M = 11.33$ ,  $SD = 9.81$ ) and those who have not ( $M = 9.65$ ,  $SD = 8.70$ ) used cannabis in the past six months,  $t(584) = 2.13$ ,  $p = .033$ , Cohen's  $d = .18$ , such that cannabis users reported anxiety scores 1.68 units higher than their non-using peers. In terms of stress scores, there were also significant group differences between those who have ( $M = 15.12$ ,  $SD = 9.88$ ) and those who have not ( $M = 13.11$ ,  $SD = 8.89$ ) used cannabis in the past six months,  $t(583) = 2.52$ ,  $p = .012$ , Cohen's  $d = .22$ . The average stress score in cannabis users was 2.01 units higher than in non-users. Finally, there was also a significant difference in impulsivity scores between those who have ( $M = 68.91$ ,  $SD = 9.17$ ) and those who have not ( $M = 67.00$ ,  $SD = 7.84$ ) used cannabis in the past six months,  $t(382.18) = 2.55$ ,  $p = .011$ , Cohen's  $d = .23$ , such that the average impulsivity score was 1.91 units higher in those who used cannabis compared to those who did not.

## CHAPTER IV

### Discussion

The purpose of the current study was to evaluate if negative emotional states and impulsivity were related to the dual substance use of e-cigarettes and cannabis among young adults. Moreover, negative emotional states and impulsivity's association with the individual use of each substance was also evaluated. Based on past research, it was hypothesized that negative emotional states and impulsivity would not only be correlated with e-cigarette use, cannabis use, and dual substance use, but also would predict individual e-cigarette and cannabis use, as well as dual substance use in multiple regression models. In total, these hypotheses were partially supported.

In this study, it was found that negative emotional states and impulsivity were all significantly correlated with e-cigarettes, supporting the hypothesis. In an exploratory post-hoc analysis, we also found that depression, anxiety, stress, and impulsivity levels were significantly different between those who endorsed e-cigarette use in the last month and those who did not, with those who endorsed e-cigarette usage having higher scores on average. Of note, negative emotional states and impulsivity did not significantly predict e-cigarette use in the multiple regression analysis, which was not expected. This result is also contrary to past findings, where depression, anxiety, and impulsivity were found to predict e-cigarette use in longitudinal studies (Bandiera et al., 2017; Clendennen et al., 2023; Mittal et al., 2022). The current study's results may differ from past findings on negative emotional states' significant prediction of e-cigarette use due to the current study's smaller sample size in the e-cigarette regression model ( $n = 112$ ), as previous research has had sample sizes as large as 4,293 participants (Bandiera et al., 2017;



Clendennen et al., 2023). Moreover, past studies also examined their linkages through a longitudinal study, making directionality (e.g., through cross-lagged path models or advanced statistical modeling) available to evaluate. Thus, since larger sample sizes typically represent populations better and longitudinal studies help establish directionality in results over time (Andrade, 2020; Caruana et al., 2015), it is possible that these differences are responsible for the unexpected results. Furthermore, Mittal et al. (2022) found that specific impulsivity characteristics, such as sensation seeking, predicted higher e-cigarette use in young adults. In turn, because the current study examined impulsivity as a whole rather than examining the traits that make up impulsivity, regression results potentially differed from past research.

Depression, anxiety, and impulsivity were significantly correlated with cannabis use, but there was not a significant association between stress and cannabis use. Additionally, higher anxiety and impulsivity scores were shown to significantly predict problematic cannabis use in a multiple regression analysis. These results are in line with past research stating anxiety and impulsivity predict cannabis use (Kedzior & Laeber, 2014; Rinehart & Spencer, 2021). Moreover, an exploratory post-hoc analysis found that depression, anxiety, stress, and impulsivity levels were significantly different in those who endorsed cannabis use and those who did not, with those who endorsed cannabis use in the last six months as having higher scores on average. This further emphasizes the linkages between negative emotional states and impulsivity and cannabis use and highlights mental health-related and impulsivity-related differences between cannabis users and non-users. However, because directionality could not be assessed in this study, future research is needed.

Unexpectedly, lower stress scores were shown to predict higher cannabis use in the multiple regression analysis, which is contrary to past longitudinal studies that assessed directionality and found that higher stress predicted higher cannabis use (al'Absi & Allen, 2021; Myers et al., 2014). This discrepancy may be explained by a suppression effect in the multiple regression analysis, as stress was highly significantly correlated with anxiety ( $r = .761, p < .001, n = 585$ ), depression ( $r = .756, p < .001, n = 585$ ), and to a lesser extent impulsivity ( $r = .389, p < .001, n = 585$ ). Thus, because the other variables were highly related and shared common traits with stress, it is possible that their influence changed stress' predictive relationship with cannabis use due to a suppression effect. Moreover, while this finding was in contrast to our hypothesis, past research indicating that young adults increased their cannabis use when they had less responsibilities (Clendennen et al., 2021) may explain why less stress predicted higher cannabis use in our study.

Additionally, depression was not found to be a significant predictor of cannabis use, contrary to findings of past longitudinal studies, where bidirectionality could be assessed (Wilkinson et al., 2016). Thus, the cross-sectional nature of the current study may explain the results and their discrepancies from past research. Furthermore, depression levels between those who endorsed cannabis use and those who did not endorse use were significantly different, with those who endorsed use having higher depression scores on average. Given that depression scores were significantly correlated with cannabis use, the significant difference in depression scores between cannabis users and non-users, but the fact that depression did not emerge as a significant predictor of higher cannabis use in multiple regression analyses, it is possible that a positive

relationship is present between the two variables but that higher depression scores may not have a strong predictive influence on cannabis use when included in a model that also included anxiety, stress, and impulsivity as predictors.

In terms of dual substance use, negative emotional states and impulsivity were found to be significantly correlated with the dual substance use of e-cigarettes and cannabis. However, only anxiety significantly predicted dual substance use in the multiple regression analysis. Additionally, predictors of substance use (depression, anxiety, stress, and impulsivity) explained a larger portion of variance in predicting dual substance use in comparison to models that examined individual use of e-cigarettes and cannabis. To our knowledge, this is the only study that has examined all three subscales of negative emotional states on the DASS-21 (Lovibond & Lovibond, 1995) and impulsivity and if they predict dual substance use. Only Buckner, Morris, et al. (2021) has examined the relationship between negative emotional states and dual substance use, similarly finding that anxiety had a significant relationship with dual substance use. Thus, these results provide not only a baseline for future research, but also important information for clinicians.

### **Limitations**

This study had several limitations. First, this study's data were cross-sectional. Thus, because the data were only collected at one time and were not collected at several different time periods in a longitudinal study, cross-lagged analyses could not be conducted, and directionality could not be evaluated. Instead, the influence of negative emotional states and impulsivity on e-cigarette and cannabis use were evaluated. Another limitation was that each multiple regression analysis had a different sample size based on

the number of students that endorsed usage of e-cigarettes, cannabis, and both substances. We ran the regression models twice, once with the full number of participants who endorsed each substance (i.e., each model had a different  $n$ ) and then again including only the dual users in each model to be able to more accurately compare the difference in  $R^2$  values between the three models (e-cigarette use, cannabis use, and dual usage, all with the same four predictor variables: depression, anxiety, stress, and impulsivity).

### **Implications, Conclusions, and Future Directions**

With the consistency of these results with past findings, these results provide future clinicians with areas to target in therapy with clients who endorse anxiety symptoms, impulsive behaviors, and problematic cannabis use. In turn, working to lower anxiety levels and impulsive behaviors using cognitive behavioral therapy (CBT) could also lower cannabis use. Although past research has suggested that clinicians should focus on both anxiety and substance use disorders during treatment at the same time for better anxiety disorder outcomes (Brady et al., 2013), based on the finding from the current study, a clinician could target anxiety symptoms using CBT and potentially not only lessen anxiety symptoms, but also comorbid problematic dual substance use of e-cigarettes and cannabis, making therapy more efficient.

Overall, this study suggests that anxiety plays a crucial role in both cannabis use individually and the dual substance use of e-cigarettes and cannabis in young adults. Thus, because of the ever-increasing usage of both e-cigarettes and cannabis, these results provide valuable information on how negative emotional states and impulsivity influence dual substance use differently than they influence single use.

Future research should seek to expand on this study by examining anxiety-targeted CBT interventions and how high subsequent cannabis and e-cigarette use is potentially impacted. Doing so will help provide practicing clinicians with more data supporting or clarifying the predictive relationship between high anxiety and high dual substance use of e-cigarettes and cannabis. Additionally, because this was the first study to examine impulsivity and the dual substance use of e-cigarettes and cannabis, future research should seek to either replicate this study's findings or look at more specific impulsivity traits and how they may predict dual substance use. Lastly, future research could examine how negative emotional states and impulsivity relate to oral nicotine pouch use and potential dual substance use of oral nicotine pouches and e-cigarettes or oral nicotine pouches and cannabis. With the rise of oral nicotine pouches in the United States among young adults and past research showing a relationship between e-cigarette use and oral nicotine use (Patel et al., 2023), new research is needed to evaluate this substance's interaction with mental health symptomology.

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## APPENDIX A

**Table 1A**

*Depression Anxiety Stress Scale (DASS-21)*

The rating scale is represented by the following:	
1	Did not apply to me at all
2	Applied to me to some degree, or some of the time
3	Applied to me to a considerable degree or a good part of time
4	Applied to me very much or most of the time
Over the past week...	
1 (s)	I found it hard to wind down
2 (a)	I was aware of dryness of my mouth
3 (d)	I couldn't seem to experience any positive feeling at all
4 (a)	I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in absence of physical exertion)
5 (d)	I found it difficult to work up the initiative to do things
6 (s)	I tended to over-react to situations
7 (a)	I experienced trembling (e.g., in the hands)
8 (s)	I felt that I was using a lot of nervous energy
9 (a)	I was worried about situations in which I might panic and make a fool of myself
10 (d)	I felt that I had nothing to look forward to
11 (s)	I found myself getting agitated
12 (s)	I found it difficult to relax

The rating scale is represented by the following:

- 1 Did not apply to me at all
- 2 Applied to me to some degree, or some of the time
- 3 Applied to me to a considerable degree or a good part of time
- 4 Applied to me very much or most of the time

Over the past week...

13 (d)	I felt down-hearted and blue
14 (s)	I was intolerant of anything that kept me from getting on with what I was doing
15 (a)	I felt I was close to panic
16 (d)	I was unable to become enthusiastic about anything
17 (d)	I felt I wasn't worth much as a person
18 (s)	I felt that I was rather touchy
19 (a)	I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat)
20 (a)	I felt scared without any good reason
21 (d)	I felt that life was meaningless
<i>Note.</i> (d) represents the depression subscale, (a) represents the anxiety subscale, and (s) represents the stress subscale.	



**Table 2A***Barratt Impulsiveness Scale (BIS-11)*

<p>Directions: People differ in the ways they act and think in different situations. This is a test to measure some of the ways in which you act and think. Read each statement carefully and select the appropriate option for each statement. Answer quickly and honestly.</p> <p>1) Rarely/Never 2) Occasionally 3) Often 4) Almost Always</p>	
1	I plan tasks carefully.
2	I do things without thinking.
3	I make-up my mind quickly.
4	I am happy-go-lucky.
5	I don't "pay attention."
6	I have "racing thoughts."
7	I plan trips well ahead of time.
8	I am self-controlled.
9	I concentrate easily.
10	I save regularly.
11	I "squirm" at plays or lectures.
12	I am a careful thinker.
13	I plan for job security
14	I say things without thinking.
15	I like to think about complex problems.
16	I change jobs.

<p>Directions: People differ in the ways they act and think in different situations. This is a test to measure some of the ways in which you act and think. Read each statement carefully and select the appropriate option for each statement. Answer quickly and honestly.</p> <p>1) Rarely/Never  2) Occasionally  3) Often  4) Almost Always</p>	
17	I act "on impulse."
18	I get easily bored when solving thought problems.
19	I act on the spur of the moment.
20	I am a steady thinker.
21	I change residences.
22	I buy things on impulse.
23	I can only think about one thing at a time.
24	I change hobbies.
25	I spend or charge more than I earn.
26	I often have extraneous thoughts when thinking.
27	I am more interested in the present than the future.
28	I am restless at the theater or lectures.
29	I like puzzles.
30	I am future oriented.

**Table 3A***Cannabis Use Disorder Identification Test (CUDIT)*

Have you used any cannabis over the past six months?				
1) Yes		2) No		
1. Directions: Please indicate the response that is most correct for you in relation to your cannabis over the past six months. How often do you use cannabis?				
1) Never	2) Monthly or less	3) 2-4 times a month	4) 2-3 times a week	5) 4 or more times a week
2. Directions: Please indicate the response that is most correct for you in relation to your cannabis over the past six months. How many hours were you “stoned” on a typical day when you had been using cannabis?				
1) 1 or 2	2) 3 or 4	3) 5 or 6	4) 7 to 9	5) 10 or more
3. How often were you “stoned” for 6 or more hours?				
1) Never	2) Less than monthly	3) monthly	4) Weekly	5) Daily or almost daily
4. How often during the past 6 months did you find that you were not able to stop using cannabis once you had started?				
1) Never	2) Less than monthly	3) Monthly	4) Weekly	5) Daily or almost daily
5. How often during the past 6 months did you fail to do what was normally expected from you because of using cannabis?				
1) Never	2) Less than monthly	3) monthly	4) Weekly	5) Daily or almost daily
6. How often during the past 6 months did you need to use cannabis in the morning to get yourself going after a heavy session?				
1) Never	2) Less than monthly	3) monthly	4) Weekly	5) Daily or almost daily
7. How often during the past 6 months did you have a feeling of guilt or remorse after using cannabis?				
1) Never	2) Less than monthly	3) monthly	4) Weekly	5) Daily or

				almost daily
8. How often in the past 6 months have you had a problem with your memory or concentration after using cannabis?				
1) Never	2) Less than monthly	3) monthly	4) Weekly	5) Daily or almost daily
9. Have you or someone else been injured as a result of your use of cannabis over the past 6 months?				
1) No		2) Yes		
10. Has a relative, friend, or doctor or other health worker been concerned about your use of cannabis or suggested you cut down over the past 6 months?				
1) No		2) Yes		

**APPENDIX B***Cigarette and E-Cigarette Use Questionnaire*

1. In your lifetime, have you smoked a cigarette, cigar, or cigarillo (even just a few puffs)?
  - Yes (1)
  - No (2)

*Display This Question:*

*If In your lifetime, have you smoked a cigarette, cigar, or cigarillo (even just a few puffs)? = Yes*

2. How old were you the first time you used a tobacco product, even one or two puffs?
  - Under 10 years old (1) ... 30 years old (22)

*Display This Question:*

*If In your lifetime, have you smoked a cigarette, cigar, or cigarillo (even just a few puffs)? = Yes*

3. In the past 30 days, how often did you use a cigarette, cigar, or cigarillo?
  - Every day (1)
  - Some days (2)
  - Not at all (3)

*Display This Question:*

*If In your lifetime, have you smoked a cigarette, cigar, or cigarillo (even just a few puffs)? = Yes*

4. In the past 30 days, how much did you smoke?
  - Less than half a pack per day (1)
  - Half to a pack per day (2)
  - One to two packs per day (3)
  - Two packs per day (4)
  - More than two packs per day (5)

- I didn't smoke in the past 30 days (6)
5. Have you ever used an Electronic Nicotine Delivery System (ENDS) product, (i.e., e-cigarettes, vape pen, or e-hookah) as intended (i.e., with nicotine cartridges and/or e-liquid/e-juice), even one or two puffs?
- Yes (1)
  - No (2)

*Display This Question:*

*If Have you ever used an Electronic Nicotine Delivery System (ENDS) product, (i.e., e-cigarettes, va... = Yes*

6. How old were you the first time you used an ENDS product, (i.e., e-cigarette, vape pen, pod device, or e-hookah), as intended (i.e., with nicotine cartridges and/or e-liquid/e-juice) even one or two puffs?
- Under 10 years old (1) ... 30 years old (22)

*Display This Question:*

*If Have you ever used an Electronic Nicotine Delivery System (ENDS) product, (i.e., e-cigarettes, va... = Yes*

7. During the past 30 days, have you used any ENDS product (i.e., an e-cigarette, vape pen, pod device, e-hookah), even one or two puffs, as intended (i.e., with nicotine cartridges and/or e-liquid/e-juice)?
- Yes (1)
  - No (2)
8. The following questions ask about your use of four different types of ENDS products (disposable e-cigarettes, vape pens, JUUL/PHIX pod devices, and Mods/Advanced Personal Vaporizers). When reporting your use of ENDS products, please be sure that any use you report corresponds to the specific device you use(d). During the past 30 days, have you used a **disposable e-cigarette or**

**an e-cigarette with a disposable nicotine cartridge?** (These devices DO NOT require the addition of e-liquid or e-juice) E-cigarettes of this type are pictured below.

- Yes (1)
- No (2)

*Display This Question:*

*If The following questions ask about your use of four different types of ENDS products (disposable e... = Yes*

9. On how many of the last 30 days have you used such a product?

- 1 (32) ... 30 (67)

*Display This Question:*

*If The following questions ask about your use of four different types of ENDS products (disposable e... = Yes*

10. On those (#) days, how many disposable e-cigarettes or disposable nicotine cartridges did you usually use per day?

- Fewer than 1 per day (1)
- 1 per day (2)
- More than 1 (3)

*Display This Question:*

*If During the past 30 days, have you used any ENDS product (i.e., an e-cigarette, vape pen, pod devi... = Yes*

11. During the past 30 days, have you used a vape pen, hookah pen, or EGO (Has a battery and a tank. Has refillable tank for e-liquids) as intended (i.e., with nicotine e-liquid/e-juice)? Devices of this type are pictured below.

- Yes (1)
- No (2)

*Display This Question:*

*If During the past 30 days, have you used a vape pen, hookah pen, or EGO (Has a battery and a tank.... = Yes*

12. On how many of the past 30 days have you used such a product?

- 1 (31) ... 30 (66)

*Display This Question:*

*If During the past 30 days, have you used any ENDS product (i.e., an e-cigarette, vape pen, pod devi... = Yes*

13. During the past 30 days, have you used a JUUL/PHIX e-cigarette (Has pods that insert into device) as intended (i.e., with nicotine e-liquid/e-juice)? A device of this type is pictured below.

- Yes (1)
- No (2)

*Display This Question:*

*If During the past 30 days, have you used a JUUL/PHIX e-cigarette (Has pods that insert into device)... = Yes*

14. On how many of the past 30 days have you used such a product?

- 1 (31) ... 30 (66)

*Display This Question:*

*If During the past 30 days, have you used any ENDS product (i.e., an e-cigarette, vape pen, pod devi... = Yes*

15. During the past 30 days, have you used a Mod or Advanced Personal Vaporizer as intended (i.e., with nicotine e-liquid/e-juice)? A device of this type is pictured below.

- Yes (1)
- No (2)

*Display This Question:*

*If During the past 30 days, have you used a Mod or Advanced Personal Vaporizer as intended (i.e., wi... = Yes*



16. On how many of the past 30 days have you used such a product?

- 1 (31) ... 30 (66)

*Display This Question:*

*If Have you ever used an Electronic Nicotine Delivery System (ENDS) product, (i.e., e-cigarettes, va... = Yes*

17. Have you ever tried to quit or stop using an ENDS product (for example, e-cigarette, vape pen, JUUL, or e-hookah)?

- Yes (2)
- No (3)

*Display This Question:*

*If Have you ever tried to quit or stop using an ENDS product (for example, e-cigarette, vape pen, JU... = Yes*

- Which of the following services/resources did you use to help you stop vaping?

(Select all that apply)

- A texting program for vaping cessation (for example, This is Quitting/Ditching JUUL) (1)
- A vaping cessation app (for example, quitSTART). Which one? (2)
- Nicotine replacement products (for example, patch, gum, lozenge) (3)
- A telephone quit line or helpline (4)
- One-on-one counseling (5)
- Group support (6)
- Help or support from friends or family (7)
- Replacing vaping with another activity, like exercise (8)
- Medications like Zyban/Wellbutrin/Bupropion or Chantix/Varenicline (9)
- Internet or web-based program (for example, smokefree.gov) (10)
- Books, pamphlets, videos, or other materials (11)

- Acupuncture (12)
- Quitting "cold turkey" (13)
- Willpower (14)
- Hypnosis (15)
- Other (16)

*Display This Question:*

*If Have you ever tried to quit or stop using an ENDS product (for example, e-cigarette, vape pen, JU...  
= Yes*

How helpful do you think each of the following strategies was (or would be if you never tried it) to quit vaping?

	1 - Not at all Helpful (1)	2 - A Little Helpful (2)	3 - Somewha t Helpful (3)	4 - Helpful (4)	5 - Very Helpful (5)
18. A texting program for vaping cessation (for example, This is Quitting/Ditch JUUL) (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19. A vaping cessation app (for example, quitSTART). (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. Nicotine replacement products (for example, patch, gum, lozenge) (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21. A telephone quit line or helpline (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22. One-on-one counseling (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23. Group support (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24. Help or support from friends or family (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25. Replacing vaping with another activity, like exercise (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26. Medications like Zyban/Wellbutrin/Bupropion or Chantix/Varenicline (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27. Internet or web-based program (for example, smokefree.gov) (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28. Books, pamphlets, videos, or other materials (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29. Acupuncture (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30. Quitting "cold turkey" (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- |                    |                       |                       |                       |                       |                       |
|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 31. Willpower (14) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 32. Hypnosis (15)  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 33. Other: (16)    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

*Display This Question:*

*If During the past 30 days, have you used any ENDS product (i.e., an e-cigarette, vape pen, pod devi...  
= Yes*

34. Are you seriously thinking about quitting the use of e-cigarettes?

- Yes, within the next 30 days (1)
- Yes, within the next 6 months (2)
- Yes, in more than 6 months (3)
- I am not thinking about quitting the use e-cigarettes (4)

*Display This Question:*

*If During the past 30 days, have you used any ENDS product (i.e., an e-cigarette, vape pen, pod devi...  
= Yes*

*And In your lifetime, have you smoked a cigarette, cigar, or cigarillo (even just a few puffs)? = Yes*

35. During the past 30 days, did you use any ENDS products (for example, e-cigarettes, vape pens, or e-hookah) to try and quit cigarette smoking?

- Yes (1)
- No (2)

*Display This Question:*

*If During the past 30 days, have you used any ENDS product (i.e., an e-cigarette, vape pen, pod devi...  
= Yes*

*And In your lifetime, have you smoked a cigarette, cigar, or cigarillo (even just a few puffs)? = Yes*

36. Have you ever successfully quit smoking cigarettes by using any ENDS product (i.e. e-cigarette, vape pen, or e-hookah)?

- Yes (1)

- No (2)

## APPENDIX C



**Institutional Review Board**  
**3556 Caroline Street, Room C110**  
**St. Louis, MO 63104**  
**TEL: 314 977 7744**  
**FAX: 314 977 7730**  
**www.slu.edu**

**NOTICE OF INSTITUTIONAL REVIEW BOARD APPROVAL**

**Date:** July 25, 2022  
**To:** Weinstock, Jeremiah, Psychology  
 Gfeller, Jeffrey, Psychology  
**From:** Ferguson, William, Chairperson, SLUCare/SSM Faculty, Minimal Risk #2  
**Protocol Number:** 30467  
**Protocol Title:** Collaborative Data Collection Project on College Student Health Behaviors

**Sponsor Protocol Version Number and Version Date : Not Applicable**

The above-listed protocol was reviewed and approved by the Saint Louis University Institutional Review Board.  
 Assurance No: FWA00005304

Below are specifics of approval:

**Form Type:** CONTINUING REVIEW  
**Level of Review:** EXPEDITED #7  
**Form Approval Date:** July 21, 2022  
**Protocol Expiry Date:** August 03, 2023  
**HIPAA Compliance:** Not Applicable  
**Waiver of Consent:** Waiver of Written Consent

The Saint Louis University Institutional Review Board complies with the regulations outlined in 45 CFR 46, 45 CFR 164, 21 CFR 50 and 21 CFR 56 and has determined the specific components above to be in compliance with these regulations, as applicable.

**Approved Study Documents Include:** Ginley, M- CITI.pdf, Moore, K - CITI .pdf, Irons, J - CITI.pdf, Stanley, T - CITI.pdf, Young, C - CITI.pdf, Ryan, P - CITI.pdf, Bibliography.docx; Approved\_Importance of Research Message.pdf, Approved\_Study Description on SONA.pdf, Approved\_Debriefing Scripts.pdf, Approved\_Ineligible Debriefing Script.pdf, Approved\_Instructional Manipulation Checks.pdf, Approved\_AJUDIT .pdf, Approved\_Brief Young Adult Alcohol Consequences Questionnaire (BYAACQ).pdf, Approved\_Drinker Type Identity.pdf, Approved\_Drinking Identity Measure .pdf, Approved\_Drinking Multiple Choice Questionnaire.pdf, Approved\_Drinking Physical Activity Motives (DPAM).pdf, Approved\_Guilt About Drinking Scale.pdf, Approved\_Physical Activity as a Hangover Cure .pdf, Approved\_Protective Behavioral Strategies Scale .pdf, Approved\_Family History of Addiction.pdf, Approved\_Cannabis Use Disorders Identification Test (CUDIT).pdf, Approved\_Problem Gambling



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Severity Index (PGSI).pdf, Approved\_South Oaks Gambling Screen (SOGS) - Behavioral Items.pdf, Approved\_PROMIS E-Cigarette.pdf, Approved\_IPAQ-SF.pdf, Approved\_PROMIS - Sleep Disturbance Inventory.pdf, Approved\_PROMIS - Sleep Related Impairment.pdf, Approved\_Sleep Condition Indicator (SCI).pdf, Approved\_SF-12v2.pdf, Approved\_Anticipated Stigma Scale.pdf, Approved\_Barrett Impulsivity Scale (BIS 11).pdf, Approved\_Depression Anxiety Stress Scales-21 (DASS-21).pdf, Approved\_Difficulties in Emotion regulation scale-18.pdf, Approved\_Eating Pathology Symptoms Inventory (EPSI).pdf, Approved\_Maslach Burnout Inventory - Student Survey (MBI-SS).pdf, Approved\_Addiction Severity Index (ASI).pdf, Approved\_Brief Sensation Seeking-4 (BSS-4).pdf, Approved\_Test of Self-Conscious Affect-3 (TOSCA-3).pdf, SHSU-SLU IAA\_fully executed.pdf, JMU-SLU IAA\_fully executed.pdf, RU-SLU IAA\_fully executed.pdf, TC-SLU IAA\_fully executed.pdf, UofA-SLU IAA\_fully executed.pdf, Approval Letter - Ginley Exempt Review 8-29-19.pdf, Agro CITI certificate.pdf, Neighbors, C. - CITI.pdf, Leasure, J.L. - CITI.pdf, Cunningham-Erdogdu, P. - CITI.pdf, Angosta, J. - CITI.pdf, Najjar, L. - CITI.pdf, Approved\_COVID Specific Questions.pdf, Approved\_Fear of COVID 19.pdf, Submission for ABCT 54th Annual Convention.pdf, Meinerding, Poe, & Weinstock (2020) - CEBRACS CFA Poster.docx, Approved\_Fear of Illness and Virus Evaluation Questionnaire.pdf, Approved\_Demographics - Revised -09-22-20.pdf, Thomas, L - CITI -01-29-19.pdf, DeLucia, A - CITI.pdf, Questionnaire Battery - Core, Battery A, & Battery B.docx, SLU.Revised.UH rely on SLU SITE-264 part exec - KH-1-signed.pdf, Approved\_AEAS.pdf, Approved\_NewGeneralSelfEfficacy Scale.pdf, Approved\_Pontes\_Internet Gaming Disorder Scale.pdf, Approved\_NewE-Cigarette & Vaping Measures.pdf, Approved\_BDEFS-Short Form.pdf, Mitchell et al (2021).pdf, Borato, L (2021) CITI.pdf, Paul, M (2021) CITI.pdf, Vargas, I (2021) CITI.pdf, Approved\_Demographics - Revised -01-12-22.pdf, Approved\_Substance Co-Use with Alcohol.pdf, Approved\_Marijuana & Morality Cannabis Use Norms Rating Form.pdf, Approved\_Marijuana & Morality Injunctive Norms.pdf, Other Institutions' IRB Contact Information for IAA.docx, Taylor, D - CITI.pdf, Henderson, C - CITI.pdf, Christensen, M - CITI.pdf, White, E - CITI.pdf, Najarian, C - CITI.pdf, Pingeon, C - CITI.pdf, Wint, A - CITI.pdf, Holt, L - CITI.2.pdf, Henslee, A - CITI (2).pdf, Miller, S - CITI.pdf, Approved\_Recruitment State for Research Participation - Revised.pdf

## VITA

### EDUCATION

- Sam Houston State University** **Expected May 2024**  
 Master of Arts in Clinical Psychology  
 Overall GPA: 4.0  
 Thesis: *How negative emotional states and impulsivity are associated with the dual substance use of e-cigarettes and cannabis.*  
 Thesis Chair: Hillary Langley, Ph.D.  
 Committee Members: Craig Henderson, Ph.D., Chelsea Ratcliff, Ph.D.
- Louisiana State University** **May 2021**  
 Bachelor of Science in Psychology  
*summa cum laude*  
 Overall GPA: 4.13  
 Major: Psychology (GPA 4.18)

### AWARDS/HONORS

- Society for Personality Assessment Student Travel Scholarship**  
 Spring 2023
- Graduate School Scholarship**  
 Spring 2023 Summer 2022  
 Fall 2022
- SHSU College of Humanities & Social Sciences Graduate Student Scholarship**  
 Spring 2024, Fall 2023  
 Summer 2022, Spring 2022
- LSU Medalist**  
 Spring 2021
- LSU *Summa Cum Laude***  
 Spring 2021
- LSU Discover Travel Stipend**  
 Fall 2020
- President's Honor Roll, Louisiana State University**  
 Spring 2020, Fall 2019



Spring 2018

**Tiger Excellence Scholarship**

Fall 2017-Spring 2021

**CLINICAL EXPERIENCE**

**Applied Psychological Services**

**June 2023-Present**

*Position:* Contractor

*Supervisor:* Dr. Dan Fox

*Responsibilities:*

- Conducted clinical interviews for those seeking Social Security assistance.
- Wrote clinical interview and mental status exam reports for clients with a myriad of mental health and functional concerns.

**SHSU Counseling Center**

**January 2023-Present**

*Position:* Practicum Student

*Supervisor:* Dr. Diane Stoebner-May, Noah

Throne M.A., & Dr. Shelley A. Riggs

*Responsibilities:*

- Conducted therapy sessions with college-age students.
- Wrote intakes, progress notes, treatment plans, and termination reports.

**OCD Comorbidities,**

**SHSU September 2022-Present**

*Position:* Research Assistant

*Supervisor:* Dr. Tiffany Russell

*Responsibilities:*

- Wrote literature review on tics and stereotyped movement as a differential diagnosis for OCD for book chapter.

**Project T.R.E.A.D.,**

**SHSU June 2021-December 2022**

*Position:* Research

Assistant *Supervisor:* Dr.

Craig Henderson

*Responsibilities:*

- Conducted orientation sessions with new participants
- Set up communication lines with participants through Qualtrics
- Coded into Excel

**Effects of Race-Related Stress and the Racial/Ethnic Identity on the Health Behaviors of Black College Students, SHSU**

**June 2020-Present**

*Position:* Research Assistant *Supervisor:*

Dr. Craig Henderson *Responsibilities:*

- Located measures for the study
- Developed surveys in Qualtrics
- Coded into SPSS

**Responses to COVID-19,**

**SHSU June 2020-Present**

*Position:* Research Assistant

*Supervisor:* Dr. Craig Henderson

*Responsibilities:*

- Developed surveys and coded them in Qualtrics
- Found measures for the study
- Researched articles on COVID-19 psychological responses

**Anxiety and Addictive Behaviors Clinic, LSU**

**August 2019-May 2021**

*Position:* Research Assistant

*Supervisor:* Dr. Julia Buckner

*Responsibilities:*

- Collected data for a study examining brief mindfulness training among individuals with clinically elevated social anxiety
- Created anxiety responses in participants
- Coordinated with other research assistants to help recruit students for participation in studies more efficiently
- Researched mental health services available in order to provide information for graduate students
- Developed surveys in Qualtrics for studies on college substance use and Cannabidiol Effect Expectancies
- Coded participant answers into categories for a study on Cannabidiol Effect Expectancies
- Developed a conference proposal
- Created a poster of study
- Presented study at a conference
- Created PowerPoint presentation of study

**Critical Mentoring,  
SHSU**

**June 2019-August 2019**

*Position:* Research Assistant

*Supervisor:* Dr. Lydia Fox

*Responsibilities:*

- Created literature review about college mentoring for at-risk students
- Developed a conference proposal
- Worked with diverse students
- Published research in journal

**PUBLICATIONS**

Rodriguez, R., **Tayebi, S.**, Tayebi, K., Fox, L. (in press). Mentoring Latinx students in higher education: A culturally responsive approach. *The Chronicle of Mentoring & Coaching*

Wang, X., Xie, Y., **Tayebi, S.**, & Henderson, S. (2023). Informational and racial injustice during COVID-19: Challenges and hope in participatory health risk communication. Manuscript in revision.

Russell, T. D., Johnson, T., Callahan, A., Benemann, H., McCartin, H., Concannon, A., **Tayebi, S.** & Cash, D. (In press, 2023). OCD Comorbidities. In C. Lack (Ed.), *Obsessive- Compulsive Disorder: Etiology, Phenomenology, and Treatment* (2<sup>nd</sup> ed.). Fareham, UK; Onus Books.

Phillips, J., **Tayebi, S.**, Henderson, C., & Banks, C. (2022). The moderating role of anti- Black racial identity and coping on the association between perceived racism and health behaviors. *Texas Psychologist*, 81(2), 30-33.

Tayebi, K., Strauss, B., Fox, L., & **Tayebi, S.** (2019). Critical mentoring: Empowering students to evaluate the system. *The Chronicle of Mentoring & Coaching*, 2(1), 112-117.

**PRESENTATIONS**

**Tayebi, S.**, & Henderson, C. (2024, March). The Relationship Between Negative Emotional States and Impulsivity Using the DASS-21 and BIS-11 [Poster to be presented]. Society for Personality Assessment Convention, San Diego, CA.

- Rodriguez, R., Tayebi, S., Tayebi, K., Fox, L. (2023, October). Mentoring Latinx students in higher education: A culturally responsive approach [Paper presentation]. University of New Mexico Mentoring Conference, Albuquerque, NM.
- Tayebi, S.**, Russell, T., & Cash, D. (2023, April). *The Relationship between Pathological Personality Characteristics and Alcohol Use Disorder Using the PID-5-BF and SMAST* [Poster presentation]. Society for Personality Assessment Convention, Austin, TX. <https://www.personality.org/2023-spa-convention>
- Tayebi, K., Fox, Lydia, & **Tayebi, S.** (2022, September). *Critical mentoring: Empowering students through Equitable Practices* [Paper presentation]. Diversity Education, Engagement, Development Support Certificate Program (DEEDS), Huntsville, TX.
- Phillips, J., Dotson, A., **Tayebi, S.**, & Henderson, C. (2021, November). *The relationship between childhood racial discrimination, psychological distress and health behaviors among black undergraduate students* [Poster presentation]. The annual conference for the International Society for Traumatic Stress Studies, <https://istss.org/am21/home.aspx>
- Tayebi, S.**, Lewis, E. M., Heimberg, R. G., & Buckner, J. D. (2020, November). *The impact of mindfulness training on post-event processing among individuals with clinically elevated social anxiety* [Poster presentation]. LSU Discover Day, Baton Rouge, LA.
- Tayebi, S.**, Lewis, E. M., Heimberg, R. G., & Buckner, J. D. (2020, November). *The impact of mindfulness training on post-event processing among individuals with clinically elevated social anxiety* [Poster presentation]. Association for Behavioral and Cognitive Therapies, Philadelphia, PA.
- Tayebi, K., Strauss, B., Fox, L., & **Tayebi, S.** (2019, October). *Critical mentoring: Empowering students to evaluate the system* [Paper presentation]. University of New Mexico Mentoring Conference, Albuquerque, NM.

### **PROFESSIONAL EXPERIENCE**

**Sam Houston State University**  
Department of Psychology

**January 2023-Present**

*Position:* Graduate  
Teaching Assistant  
*Supervisor:* Dr. Jeff  
Anastasi *Responsibilities:*

- Assisted in Research Methods Class
- Graded papers
- Assisted in running the lab

**Sam Houston State University** **August 2021-Present**

Department of Psychology

*Position:* Graduate

Teaching Assistant

*Supervisor:* Dr. Tiffany

Russell *Responsibilities:*

- Assisted in Abnormal Psychology Classes
- Graded tests and discussion board posts
- Conferenced with students with questions and for test preparation

**Sam Houston State University** **August 2021-December 2022**

Department of Psychology

*Position:* Graduate Teaching

Assistant *Supervisor:* Dr.

Hillary Langley

*Responsibilities:*

- Assisted in Developmental Psychology Classes
- Graded tests, discussion board posts, and essays
- Conferenced with students with questions regarding grades and future research opportunities
- Provided a lecture

**Sam Houston State University** **June 2019-July 2019**

Department of Athletics

*Position:* Intern

*Supervisor:* Chris Thompson

*Responsibilities:*

- Helped with compliance preparation for the NCAA audit
- Attended mental health seminars regarding the university's responsibilities towards athletes' mental health
- Met with NCAA faculty representative regarding the faculty's role in ensuring athletes' success

**VOLUNTEER WORK**

**Greater Baton Rouge Food Bank**

**February 2020-March 2020**



**Theta Xi Fraternity, Louisiana State University**  
August 2017-May 2021