The Correlation Between Cannabidiol and Anxiety



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Submitted to the Psychology Department, Allegheny College
in partial fulfillment of the requirements for the degree of
BACHELOR OF PSYCHOLOGY
April 06, 2020

The Correlation Between Cannabidiol and Anxiety

A Senior Comprehensive Project
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April 06, 2020

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The Correlation Between Cannabidiol and Anxiety

Anxiety disorders are some of the most common psychological disorders affecting people in everyday life- such as canceling plans with friends or avoiding public places. According to the Anxiety and Depression Association of America (ADAA) it is the most common mental illness in the United States affecting 40 million people 18 years and older and only about 36.9% of those with an anxiety disorder receive treatment (Facts & Statistics. ADAA). There are different types of anxiety disorders such as generalized anxiety disorder (GAD), social anxiety disorder (SAD), panic disorder, and posttraumatic stress disorder (PTSD). GAD is characterized by an excessive worrying that is difficult to control (Carl, E., Witcraft, S. M., Kauffman, B. Y., Gillespie, E. M., Becker, E. S., Cuijpers, P., et al. 2020). SAD is a fear of negative feedback from others (Haller, Kadosh, Scerif, & Lau. 2015). Those with panic disorder tend to have unexplained cardiac symptoms (like an increase in heart rate), dizziness, and distress (Barlow, Gorman, Shear, & Woods. 2000). And those with PTSD often have flashbacks of the incident that had a traumatic effect on one's life (such as a sudden death in the family) (Post-Traumatic Stress Disorder, 2018). The present study will look at symptomatology of GAD and its relationship to use of cannabidiol (CBD) products.

Generalized Anxiety Disorder

Generalized Anxiety Disorder affects roughly 6.8 million people in America, (ADAA, n.d.) and only about 43.2% of those with GAD receive treatment. Which means, roughly 2.9 million Americans are experiencing these symptoms without the help of treatment. Those with GAD often have severe worry without any causation. Along with excessive worrying, those with GAD often have physical symptoms as well, such as trembling, twitching, muscle tension, headaches, irritability, sweating, hot flashes, and feeling lightheaded (Generalized Anxiety

Disorder, 2017). Individuals with GAD also tend to experience depression and have trouble concentrating. Current treatments for individuals with GAD include different medications and Cognitive Behavioral Therapy (CBT). Medications used could be an antidepressant such as Venlafaxine or an anti-anxiety such as benzodiazepines (Generalized Anxiety Disorder, 2017).

Cannabis and its history

Cannabis (marijuana) is a plant that has been used both in a medical sense and an industrial sense- such as hemp products (Shannon, Lewis, Lee, & Hughes, 2019). Cannabis consists of Tetrahydrocannabinol or THC and Cannabidiol, commonly known as CBD. Cannabis has been used throughout history in different cultures for different things. In ancient China cannabis was used to treat malaria, menstrual symptoms, gout, and constipation (Shannon et al., 2019). In Medieval times it was used for pain, epilepsy, nausea, and vomiting, while for Western medicine it has been used as a pain relief and for recreation (Shannon et al., 2019). Cannabis was used and prescribed in the U.S. up until the 1970's when it was made a Schedule 1 substance (Shannon et al., 2019). As of August 1, 2019, 12 states have legalized cannabis use for adults for recreational use and medical use, 21 states have medical cannabis legalized with no recreational use, 13 states have a CBD/low THC program, and four states have no form of legal cannabis (Hanson & Garcia, 2019).

Cannabidiol

Cannabidiol (CBD) is found in cannabis along with Tetrahydrocannabinol (THC). Unlike THC, CBD doesn't give you the sensation of being high. CBD can be made into and used as an oil, topical product, vaporizer, a sublingual spray (spraying under the tongue so that the substance is absorbed through the tissue), in capsules, and even in gummy form (Pahr, K. n.d.). The human body naturally has two cannabinoid receptors, CB1 and CB2 (Shannon & Opilia-

Lehman, 2016). CB1 receptors are found mainly in the brain, modulating neurotransmitter release which prevents excessive neuronal activity, reduces pain and inflammation (Shannon et al., 2016). CBD indirectly affects the CB1 receptors by stopping enzyme breakdown of anandamide (Shannon et al., 2016). CB2 receptors are found in the periphery in lymphoid tissue, but CBD has only a mild effect on CB2 receptors (Shannon et al., 2016). CBD lacks psychoactive effects, unlike THC, and studies have shown CBD possesses a wide range of therapeutic properties such as antipsychotic, analgesic (pain relief), neuroprotective (preservation of neural structure/function), anti-convulsant, antiemetic (helps with vomiting/nausea), anti-inflammatory, antioxidant, antiarthritic, and antineoplastic (acting to prevent/halt tumors) (Blessings, Steenkamp, Manzanares, & Marmar. 2015).

CBD in previous studies

In recent years, CBD has been studied as a possible treatment to manage anxiety disorders due to its anxiolytic effects (ability to reduce anxiety). CBD was first clinically used as a counter effect to THC, reducing anxiety brought along by THC (Blessings et al., 2015). A study by Bergamaschi et al., (2011) found that when patients with social anxiety disorder (SAD) were treated with CBD before performing a speech, their anxiety was significantly reduced as measured by the Visual Analogue Mood Scale (VAMS). Additionally, a case study done by Shannon and Opila-Lehman (2016) found CBD oil to be an effective substance for reducing anxiety and insomnia in a patient with PTSD.

Studies on anxiety have been going on for years to find new and effective ways of treating the disorder's symptoms. If CBD can be used as an alternative treatment for anxiety as opposed to medication, then it may help reduce other epidemics besides anxiety disorders- such as the opioid epidemic- in the sense that if a patient can manage their pain symptoms with CBD

instead of opioids then there will be no dependency with the patient and opioids. In other words, if fewer opioids are prescribed, then there should be a decrease in opioid addiction. CBD has been proven numerous times to be a positive potential treatment in managing anxiety symptoms. This correlational study will look at participants' personal CBD use and their self-reported anxiety using the State-Anxiety Inventory and Generalized Anxiety 7-Item Scale. I hypothesize that there will be a negative correlation between participants who use CBD and their State-Anxiety scores and GAD-7 scores.

Method

Design

This study is a correlational design. The study will consist of two anxiety questionnaires and a demographics form that includes questions on the participants' use of CBD.

Participants

The participants in this study consist of 27 Allegheny College students- 21 females and 6 males, age 18 years or older. The study will be available for participants to get a brief description of and sign up for using the online research scheduling app SONA. The description will include what the study is about and what the participants will be doing (Appendix A).

Materials

Anxiety Questionnaires

The state-trait-anxiety inventory (Julian 2011) will be given to participants to assess how the participant is feeling right then in the moment (state) (Appendix C). There will be 20 items on this state-trait-anxiety inventory and each will consist of 4 possible answers (1-4) with 1 being "not at all" and 4 being "very much so" in whether or not they describe the participant. Some items include "I feel calm" and "I am worried". Scores can range from 20-80 for the S-

Anxiety (Julian 2011). The S-Anxiety has a suggested cut off point of 39-40 and 54-55 for older adults (Julian 2011).

The generalized anxiety disorder 7-item scale (GAD-7) will be used to assess the participant's level of anxiety over the last two weeks (Spitzer, Kroenke, Williams, & Lowe, 2006). All questions on the GAD-7 start with "Over the last two weeks, how often have you been bothered by" and continue with a sub-question such as "feeling nervous, anxious or on edge?" (Appendix D). There are four answer options on the GAD-7: not at all sure, several days, over half the days, and nearly every day. The answers are associated with a number (0-3), with zero being "not at all sure" and three being "nearly every day". Scores are then added down each column and all four scores are added together for a total score. A max score of 20 and minimum score of 0 are possible. A score of 5 is the cut-off for mild anxiety, 10 is the cut off for moderate anxiety, and 15 is the cut off for severe anxiety (Spitzer et al., 2006).

CBD Questionnaire

As part of the demographic's questionnaire, participants will be asked about their use of CBD. Some of these questions include what type of CBD is being used (vaping, capsule, gummy, etc), how often, dosage amount, and why the participant is using CBD (Appendix E). For CBD use of how often using, how long using, and last time using CBD, the answers are quantified in order to analyze the results. Results for how often are quantified to 4 = daily use, 3 = weekly use, 2 = monthly and 1 = yearly use. For how long using CBD, it is quantified to 4 = years, 3 = months, 2 = weeks, and 1 = few days. Then for last time using CBD, it is quantified to 6 = yesterday, 5 = this week, 4 = last week, 3 = weeks ago, 2 = months ago, and 1 = years ago. These numbers will be added up for each participant to get the sum of the participants' CBD use with a max score of 14 and minimum score of 3.

Procedure

Once a participant arrives at the study site, a consent form will be given (Appendix B) describing the study. The participant will be told how long the study should take and the surveys they will be given. After the participant consents, they will be given a demographics form (Appendix E), the GAD-7 (Appendix D), and STAI (Appendix C), in that order. After the participant is finished they will place each questionnaire in the appropriately labeled folder. When the participants are finished they will be given a debriefing form (Appendix F) and they will receive one SONA credit.

Results

CBD user vs. non-user State-Anxiety Inventory scores

An independent t-test was performed to compare the State-Anxiety Inventory scores of the 8 CBD users (M = 43.4, SD = 8.3) with the State-Anxiety scores of the 18 non-users (M = 42.9 , SD = 14.4) (Figure 1). The result is *not* significant at $p < .05$, $t(24) = 0.08$, $p = .94$

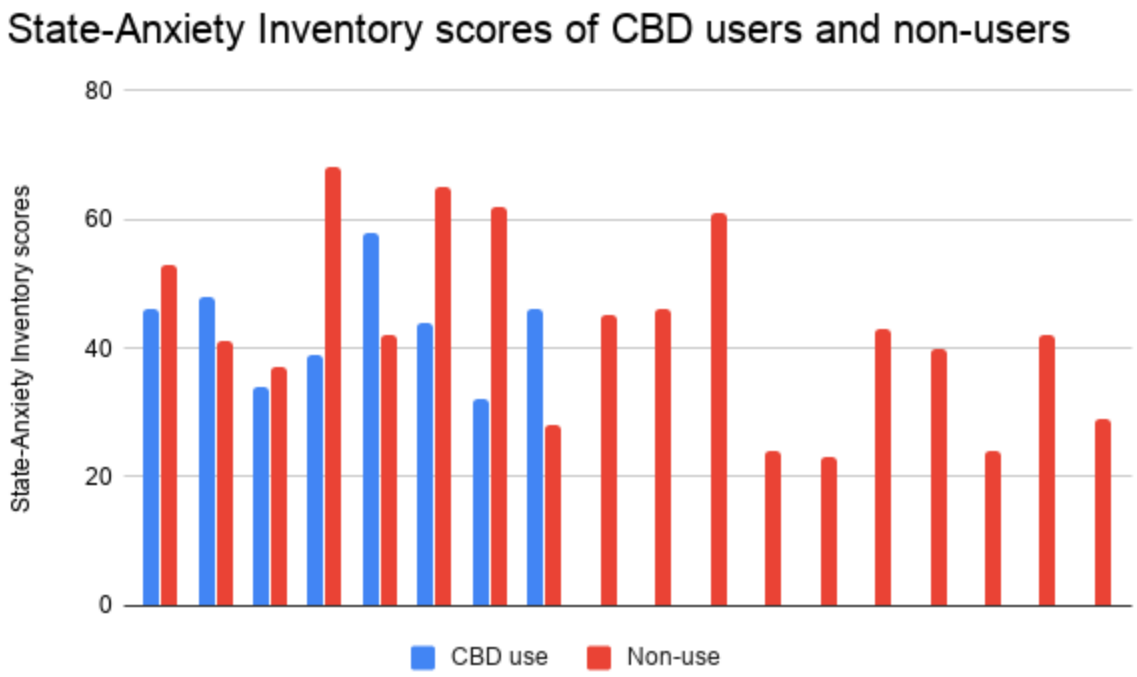


Figure 1. shows State-Anxiety Inventory scores of CBD users and non-users. For CBD users, the highest score is 58 and the lowest score is 32. For non-users, the highest score is 68 and the lowest score is 23.

State-Anxiety Inventory Scores vs. CBD users

Pearson's Correlation was used to look at CBD users' use and their State-Anxiety Inventory scores (Figure 2). CBD use was quantified by summarizing the participants' last time using CBD, how long they have been using CBD, and how often they use CBD. CBD use and State-Anxiety Inventory scores were found to not be significant at $p < .05$, $r(6) = .62$, $p = .101553$.

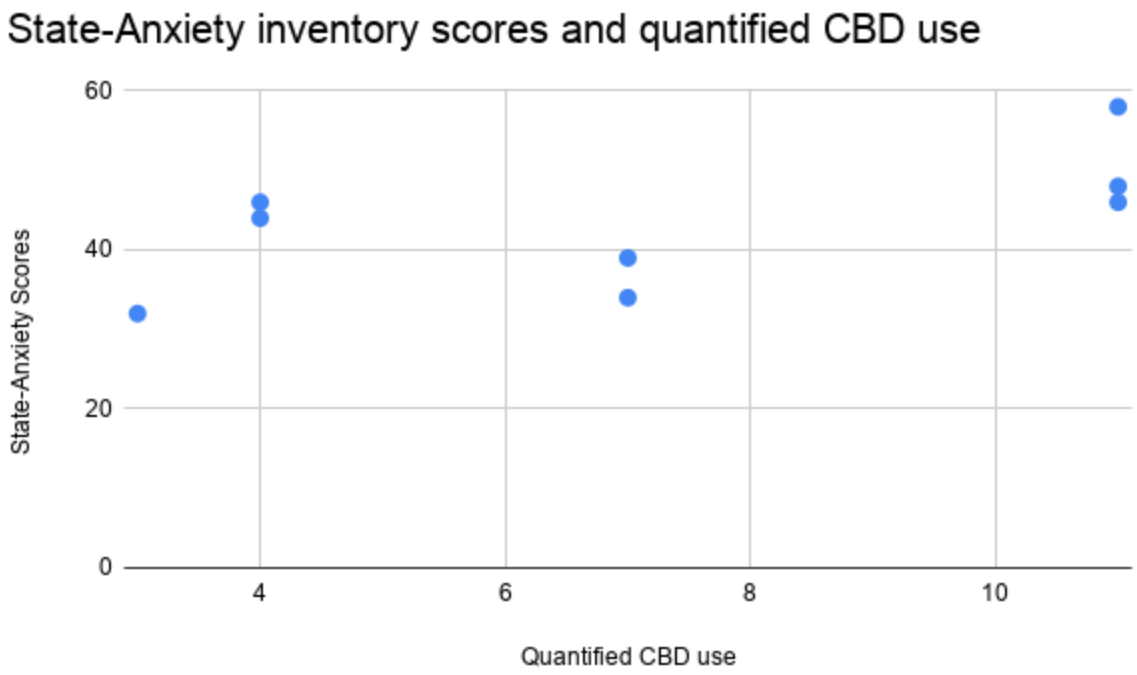


Figure 2. shows no correlation between State-Anxiety Inventory scores and the participants quantified CBD use. A higher number for quantified CBD use means more CBD use and a lower quantified number means less CBD use.

CBD user vs. non-user GAD-7 scores

To compare the GAD-7 scores of CBD users and non-users (Figure 3), a t-test was performed on the 8 CBD users (M = 8.5, SD = 3.6) and the 18 non-users (M = 7.4, SD = 5.9). The result is *not* significant at $p < .05$, $t(24) = 0.49$, $p = .63$

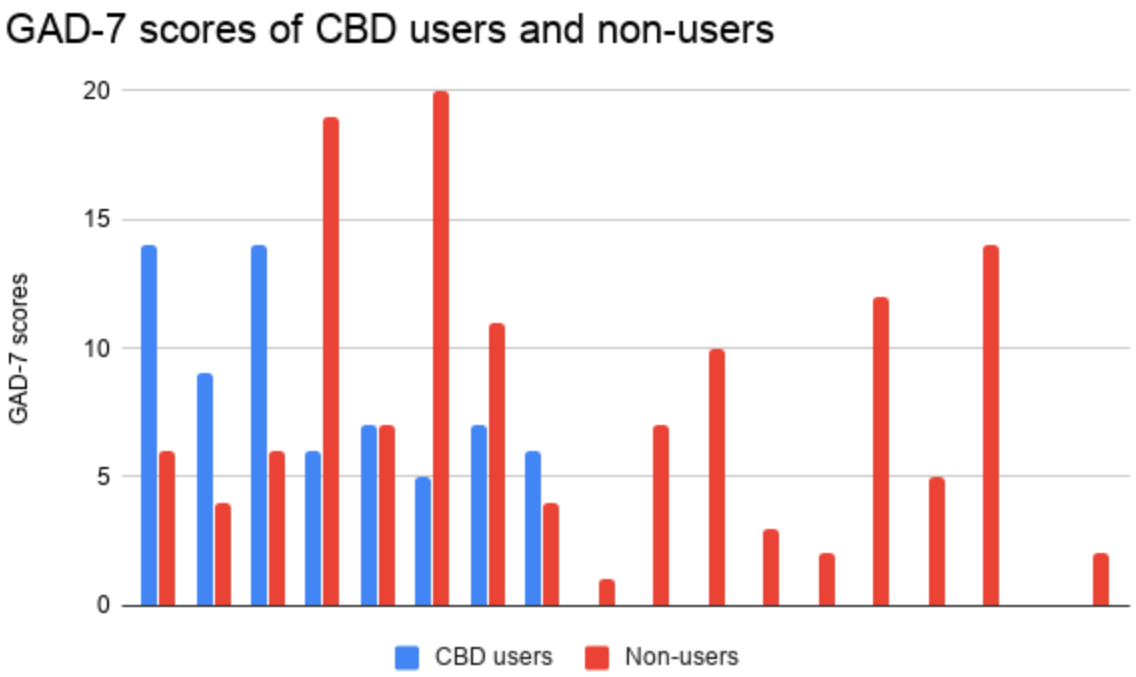


Figure 3. shows the GAD-7 scores of CBD users and non-users. For CBD users the highest score is 14 and the lowest score is 5. For non-users the highest score is 20 and the lowest score is 0.

GAD-7 scores vs. CBD users

Pearson's Correlation was used again to look at CBD users' use and their State-Anxiety Inventory scores (Figure 4). CBD use was again quantified by summarizing how often the participant uses CBD, how often they use, and the last time they used CBD. These scores were found to be significant at $p < .05$, $r(6) = .78$, $p = .021766$.

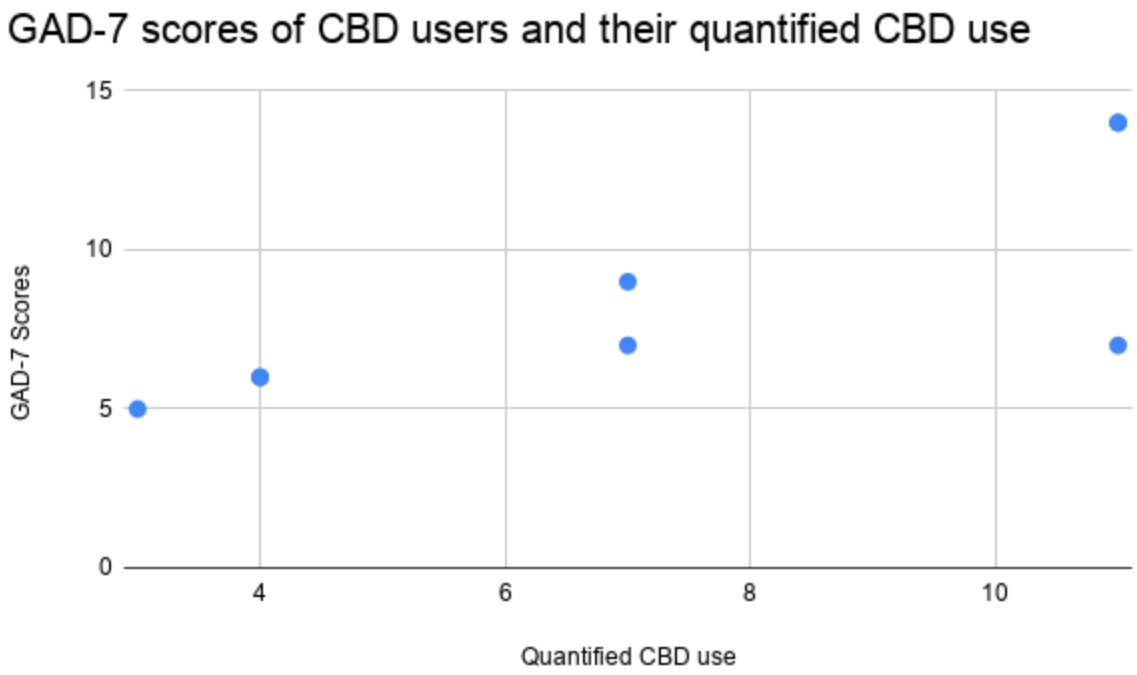


Figure 4. shows a positive correlation between GAD-7 scores and the participants quantified CBD use. A higher number for quantified CBD use means more CBD use and a lower quantified number means less CBD use.

Discussion

I hypothesized in the beginning that CBD use would be negatively correlated to the participants GAD-7 and State-Anxiety Inventory scores. The results of both Pearson Correlations show my hypothesis to be false. The correlation for quantified CBD use and State-Anxiety Inventory scores showed no correlation while quantified CBD use and GAD-7 scores showed a positive correlation. The no correlation between quantified CBD use and State-Anxiety Inventory scores may suggest that CBD has little to no effect on one's current (state) anxiety. While the positive correlation between quantified CBD use and GAD-7 scores may suggest that CBD use affects one's anxiety long-term. Further research on CBD and anxiety need to be explored.

CBD has been supported numerous times to be a positive potential treatment in managing anxiety symptoms but what do your brainwaves say? Are your brainwaves showing a decrease in anxiety activity as measured by electroencephalography (EEG)? Several studies have used EEG to measure anxiety by looking at electrical activity in the brain via brain waves which can be correlated with different functions. Frontal asymmetry of alpha power has been studied via EEG and has been shown to be correlated with one's emotional response (Smit, Posthuma, Boomsma, & Geus. 2007). Greater left hemispheric activity measured by EEG is associated with positive approach behavioral tendencies and greater right hemispheric activity measured by EEG has been associated with negative withdrawal related tendencies (Smit et al., 2007). A previous study done by Moscovitch et al., (2011) found that patients with social anxiety disorder (SAD) shifted from greater right (negative) to greater left (positive) resting frontal activity from pre-treatment of CBD to post-treatment of CBD with cognitive behavioral therapy. Another study found that participants treated with temazepam (sedative) for their anxiety had a decrease in anxiety and an increase in alpha power (Siciliani, Schiavon, & Tansella. 1975).

To further the research on CBD use and how it affects anxiety, using EEG, researchers could look at how CBD use correlates with anxiety levels and alpha power waves in the left and right frontal hemisphere of the brain. Measuring the participants anxiety level and alpha power waves in left and right frontal hemisphere before consumption of CBD and then again some time after CBD consumption could show a possible difference in alpha power waves if the CBD has a short term effect. The same could be done to look at a long term effect.

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Appendix A
Study Description on SONA

In this study participants will be asked to fill out two anxiety questionnaires and a demographics form that also includes questions about the participants CBD use. The State-Trait Anxiety Inventory (STAI) to look at how the participants anxiety level is right at that moment and the Generalized Anxiety Disorder 7-Item Scale (GAD-7) to see how the participant has been feeling over the last two weeks.

Appendix B
Research Participation Consent Form

Purpose of Research: The purpose of this study is to look at the correlation between CBD usage and one's self-reported feeling of anxiety.

Procedure: I understand that I will be asked to complete two anxiety questionnaires and a demographics questionnaire which will ask about my CBD use. I understand that these questionnaires should take no more than 20 minutes. I understand that when I am finished, I will place the questionnaires in a folder provided by the researcher.

Risks to the Individual: I understand that there will be no more than minimal risk.

Compensation: I understand that I will receive 1 SONA credit at the completion of this study.

Confidentiality: I understand that my name will never be associated with the data I provide and will be completely confidential. I understand that the researcher is interested in patterns in the data as a whole as opposed to individual scores. Any reports made based on the data will focus solely on these general patterns. Furthermore, I understand that all data will be stored under lock and key in the Psychology Department at Allegheny College. I understand that my consent form will be stored in a locked cabinet separately from my data. When the data I provide today are no longer needed, they will be destroyed.

Voluntary Nature of Participation: I understand that I do NOT have to participate in this study. Furthermore, upon beginning the study, I may choose to withdraw my participation at any time without penalty. I understand that I may skip any individual questions that I do not wish to answer, and I may choose not to participate in any part of the study without being questioned.

Contact Information: If I have any questions about this research project, I can contact Hannah Jimenez at jimenezh@allegheny.edu or the research advisor, Dr. Allison Connell Pensky at aconnell@allegheny.com. If I have questions or concerns about the treatment of research participants, I can contact Dr. Richard Bowden, Chair of the Allegheny Institutional Review Board (IRB) at rbowden@allegheny.edu

I understand that my signature below indicates that I am at least 18 years of age at the time of my participation in this study, and that I have received a copy of this informed consent form. I have carefully read and understood the information on this form and all of my questions thus far have been answered. I hereby agree to participate in the study.

Participant's Signature _____ date _____
Participant's Name (print) _____ date_____
Researcher's Signature (Hannah Jimenez) _____ date _____

Appendix C
State-Anxiety Inventory

ID #
DIRECTIONS: Please read each statement and answer on a scale of 1-4 on how you are feeling right now in this very moment. With 1 being "not at all" and 4 being "very much so".

	Not At All	**Somewhat**	**Moderately So**	**Very Much So**
1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense	1	2	3	4
4. I feel strained	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. I am presently worrying over possible misfortunes	1	2	3	4
8. I feel satisfied	1	2	3	4
9. I feel frightened	1	2	3	4
10. I feel comfortable	1	2	3	4
11. I feel self confident	1	2	3	4
12. I feel nervous	1	2	3	4
13. I am jittery	1	2	3	4
14. I feel indecisive	1	2	3	4
15. I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. I am worried	1	2	3	4
18. I feel confused	1	2	3	4
19. I feel steady	1	2	3	4

20. I feel pleasant	1	2	3	4

Source:
http://shodhganga.inflibnet.ac.in/bitstream/10603/40358/1/bibliography%20&%20appendices.pdf

Appendix D
Generalized Anxiety Disorder 7-Item Scale

Appendix E

Demographics Form

ID #: _____

Age: _____ Ethnicity:_____

Sex: F M Other/Choose not to respond

Year: First-year Second-year Third-year Fourth-year Other

1. **Have you used Cannabidiol (CBD) before? Y N**

If you answered yes to question 1 , then please answer questions 2 - 7. If you answered no, please skip to question 8.

2. **In what form have you used CBD? (Check all that apply)**

Vape Pen		**Flower**	
Candy/Edible		**Capsules**	
Oil		**Powder**	
Lotion		**Other**	

If other, please specify:_____

3. **When was the last time you used CBD?'**
   Yesterday This week Last week Weeks Ago Months Ago Years Ago

4. **When do you tend to use CBD? (Check all that apply)**

Before Exams		**Out with friends/family**	
In the Morning		**When anxious**	
Before Bed		**For pain**	
While Studying/doing homework		**Other**	

If other, please specify:_____

5. **How long have you been using CBD?**
   Weeks Months Years

6. **How often have you used/do you use CBD?**
   Only once Daily Weekly Monthly

7. **How much CBD have you used/do you use in a single dose?**
   < 25mg 25mg-50mg 50mg-100mg > 100mg I don't know

8. **Do you take any prescription medications for anxiety? Y N**
   If yes, how often? Daily Weekly Monthly Other:_____
   If yes, when did you last take it? _____

Appendix F
Research Participation Debriefing Form

Purpose of Research: The purpose of this study was to see if CBD has a correlation with one's self-reported anxiety. A previous study done by Nobuo Masataka on teenagers in Japan with social anxiety disorder found that the teenagers who took CBD daily for a month showed a decrease in anxiety using the Fear of Negative Evaluation Questionnaire and the Liebowitz Social Anxiety Scale (2019). The hypothesis for this study is that CBD will have a negative correlation with state anxiety.

> Masataka, N. (2019). Anxiolytic effects of repeated cannabidiol treatment in teenagers with social anxiety disorder. *Frontiers in Psychology*, 10, https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02466/full

Compensation: 1 SONA credit

Confidentiality: The data you provided for this research project will be confidential and your name will never be associated with your results. Furthermore, when your data is no longer needed, it will be shredded.

To Learn More: For further information about this topic, please consult the following sources:

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Contact Information: If you have any questions about this research project, please consult the information below:

Experimenter: Hannah Jimenez E-mail: jimenezh@allegheny.edu
Faculty Advisor: Dr. Allison Connell Pensky E-mail: aconnell@allegheny.com
IRB Committee Chair: Dr. Richard Bowden E-mail: rbowden@allegheny.edu
Counseling Center (Winslow Health Center, Schultz Hall, Suite 128) - (814) 332-4368

If you would like a copy of the results of this research study, please fill out and tear off the bottom portion of this debriefing statement and return it to the researcher.

I would like to receive a summary of the results of this study.

Yes O No O

If yes, what is your Box #? _____