

The effect of CBD ingestion on anxiety.

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ABSTRACT

Anxiety disorders are a prevalent mental health concern, for which current anxiolytic medications help to alleviate symptoms of, though often coincide with unwanted side effects. The present study investigated the relationship between cannabidiol (CBD) ingestion (in mL) and anxiety in longitudinal baseline conditions as well the effect in an experimental manipulation, measured using a mood scale and by heart rate. It was hypothesized that CBD ingestion would lead to a decrease in both self-reported and physiological anxiety. The results supported the hypotheses. These results are discussed in terms of the important implication that CBD does appear to have an anxiolytic effect, possibly without the harmful side effects seen in other interventions.

1. Introduction

Generalized social anxiety disorder (SAD) is a prevalent disorder with symptoms that make various aspects of day-to-day life very difficult for those who suffer the condition. Further, SAD seldom resolves itself without treatment, and yet, many people who undergo treatment suffer from subsequent side effects from their drug therapy (Bergamaschi et al., 2011). As such, alternative pharmacological interventions have recently been researched for the use in SAD treatment. One such alternative includes the use of cannabidiol (CBD), a cannabinoid, which is a constituent of the Cannabis plant that has been proven to have anxiolytic effects in both animals and human (Crippa et al., 2011).

Many studies that have researched the effects of CBD on anxiety have found that CBD causes a decrease in subjective

anxiety, but the findings regarding the effects on physiological anxiety have been varied (Bergamaschi et al., 2011; Crippa et al., 2011). An example of such an experiment was conducted by Bergamaschi et al (2011). This study researched the subjective and physiological effects of CBD on anxiety using a randomized between-subject, double blind design wherein half of participants ingested CBD, half of participants ingested a placebo and all participants performed an anxiety-inducing task, simulated public-speaking, and subsequent levels of anxiety were recorded using mood scales and various physiological measures (Bergamaschi et al., 2011). The researchers found that, on average, treatment with CBD prior to the speech task significantly reduced anxiety, while the placebo group displayed high levels of anxiety. This study measured anxiety with the Visual Analogue Mood Scale (VAMS)

and three physiological measures; skin conductance, arterial blood pressure, and heart rate.

The present study involved self-measured baseline measurements and a blind experimental study. During the baseline period, correlations were measured between CBD ingestion and self-reported anxiety, which was measured using the Tension item in the Profile of Mood States (POMS) scale, and CBD ingestion and physiological anxiety, measured using heart rate. The present experiment compared levels of physiological anxiety, measured using heart rate, using a blind procedure in which CBD was ingested when mixed with orange juice versus when orange juice was consumed on its own. Based on previous research demonstrating the anxiolytic effect of CBD, during the baseline methods, it was hypothesized that as CBD ingestion increased, both psychological and physiological anxiety would decrease. In the present experiment, it was expected that CBD ingestion would decrease heart rate.

2. Methods

2.1 Participants

The baseline methods and experiment used a single participant. This participant was a 24-year-old female psychology student from Camosun College with high levels of anxiety.

2.2 Materials and Apparatus

The materials used in this study consisted of 12.5mg/mL of CBD oil (Sun Irisa Cannabis, High Park Company Ltd, ON, Canada) and orange juice (Simply Orange, Minute Maid Canada Inc., Toronto, ON, Canada). Additionally, during the baseline methods, the Tension item is the POMS

scale was used to measure subjective levels of anxiety. Tension is calculated by summing the scores from 9 adjectives, each of which is awarded a score from 0 (“Not at all”) to 4 (“Extremely”), determined by how one subjectively feels at the time of the questionnaire (See Appendix A for copy of POMS scale, modified to include only items that contribute to Tension score. See Appendix B for scoring methods).

2.3 Procedure

The participant measured the amount of CBD ingested (in mL) over a two-week baseline period by recording in a diary the times and amount of CBD (in mL) ingested each day. During this baseline period, tension was recorded in a diary using the POMS Scale item 30 minutes before going to bed each night over the 2-week baseline period, regardless of whether or not CBD was ingested. During that same period, physiological anxiety was measured using the participant’s heart rate 45 minutes before going to bed each night, over the two-week baseline period, regardless of whether or not CBD was ingested.

During the experiment, the CBD ingestion was manipulated on experimental days by ingesting 0.75 mL (CBD 12.5mg/mL) of CBD oil mixed in one glass of orange juice. The control condition, used to compare, involved drinking one glass of orange juice without any CBD. In order to use a blind procedure for these manipulations, the participant’s roommate prepared the beverages in a separate room from the participant so that the participant was unaware of whether the juice contained the CBD oil during any given trial. The roommate recorded which method was used on which date, which was not analyzed until all of the data was collected. It was expected that the orange juice would mask any taste

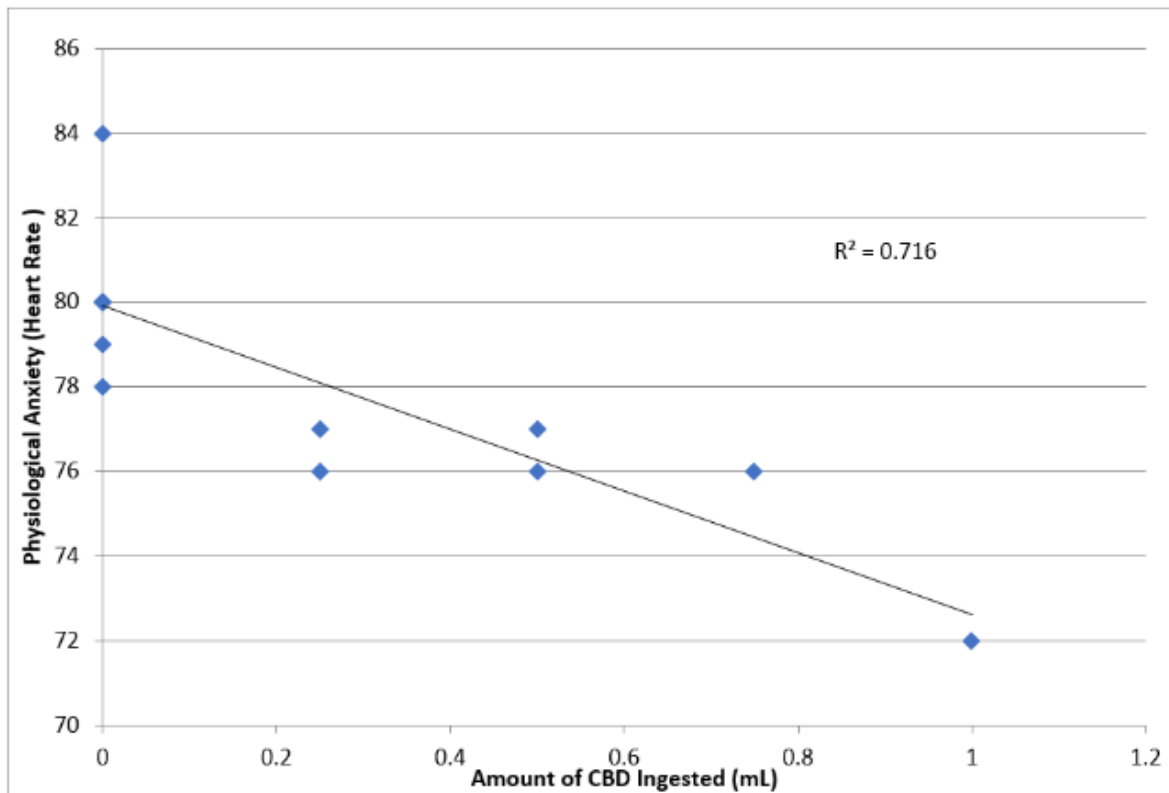


Figure 1. Correlation for physiological anxiety (measured by heart rate) and amount of CBD ingested (mL).

differences between conditions. The order of conditions was randomly assigned each day by the roommate by randomly picking a piece of paper from a pile of 12 pieces of paper. Prior to data collection, “CBD” was written on 6 pieces of paper and “orange juice” was written on 6 other pieces of paper to represent the two conditions of this study (“CBD” = Experimental condition, “orange juice” = Control condition) and to indicate which beverage the roommate was required to prepare on any given trial. Heart rate was quantitatively measured as number of heart beats per minute, and was measured once each day for 6 days per condition (12 days in total). For each day of the experiment, in both the Experimental and Control condition, the participant measured their

heart rate 60 minutes after drinking the orange juice.

3. Results

A strong, negative, linear relationship was found between the amount of CBD ingested and physiological anxiety, measured by heart rate, during the baseline measurements. The correlation for this relationship, $r = -0.85$, was statistically significant, $p = 0.00$, suggesting that these two variables are strongly related (see Figure 1 and Table 1).

A moderate, negative, linear relationship was found between the amount of CBD ingested and self-reported anxiety, measured using the POMS scale, during the baseline measurements. The correlation for

Table 1

Baseline correlation coefficient (r) values.

Hypothesis examined	<i>r</i>
Amount of CBD Ingested and Physiological Anxiety	-0.85
Amount of CBD Ingested and Self-Reported Anxiety	-0.68

this relationship, $r = -0.68$, was statistically significant, $p = 0.005$, suggesting that these two variables are modestly related (see Figure 2 and Table 1).

The level of significance set in this experiment was .05. The mean heart rate during the Experimental condition was 79.33 ($SD = 3.14$) and the mean heart rate during the Control condition was 86.67 ($SD = 2.42$) (see Table 2). These data were analyzed using a t-test and the results were

statistically significant, $t = 4.53$, $p = 0.001$, suggesting that CBD ingestion does reduce heart rate (see Figure 3), which is a frequently used physiological indicator of anxiety.

4. Discussion

The hypotheses under investigation in the current study, that as CBD ingestion increases, physiological anxiety would decrease and as CBD ingestion increases, self-reported anxiety would decrease, were supported by these findings.

The current results are consistent with many other studies that demonstrate the anxiolytic effect of CBD in both psychological and physiological measures (Bergamaschi et al., 2011; Crippa et al.,

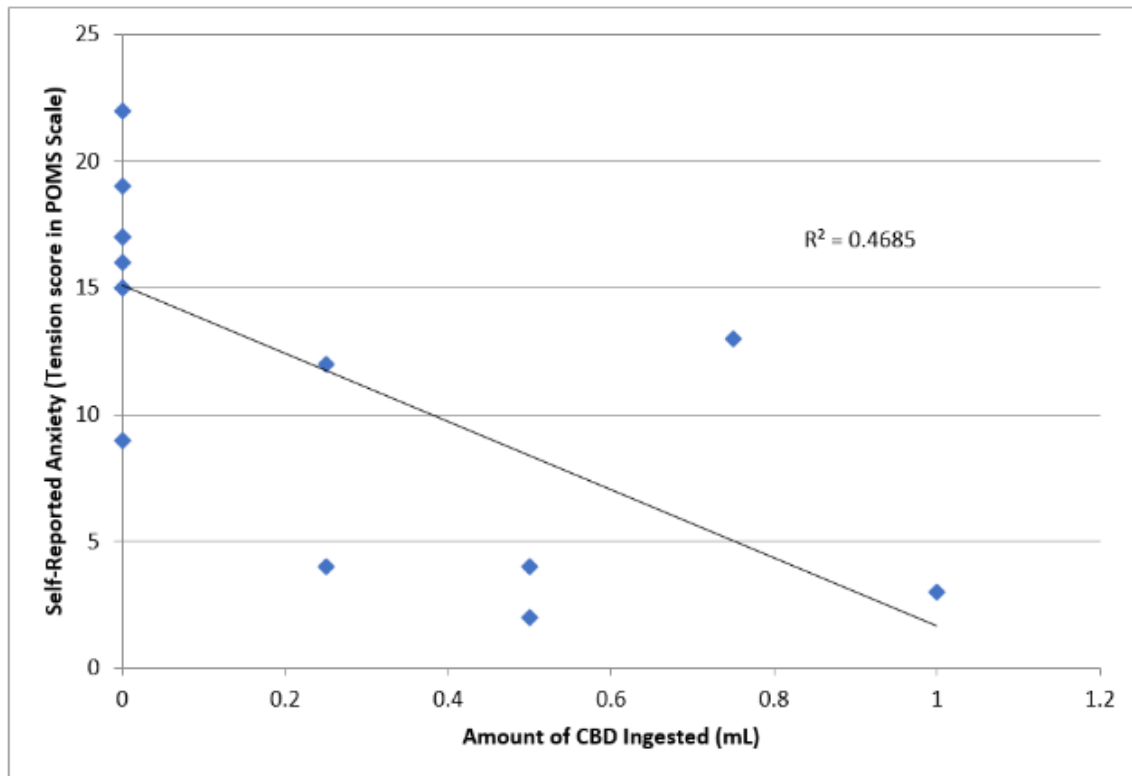


Figure 2. Correlation for self-reported anxiety (measured by Tension score in the POMS scale) and amount of CBD ingested (mL).

Table 2

Experiment descriptive statistics.

Condition name	Statistic	Value
CBD in Orange Juice	Mean	79.33333
	S.D.	3.141125
	N.	6
Just orange Juice	Mean	86.66667
	S.D.	2.42212
	N.	6

2011). Further, these results specifically demonstrate a statistically significant relationship between CBD ingestion and heart rate, which has been inconsistent in previous studies (Zuardi, Cosme, Graeff, & Guimaraes, 1993). However, limitations of this study include the number of participants used; future studies should attempt to replicate the finding that CBD ingestion causes a decreased heart rate using more participants in order to further validate this

finding. Finally, these findings are particularly important due to the effectiveness of the use of CBD as an anxiolytic intervention without the reported side-effects of other treatments (Bergamaschi et al., 2011).

References

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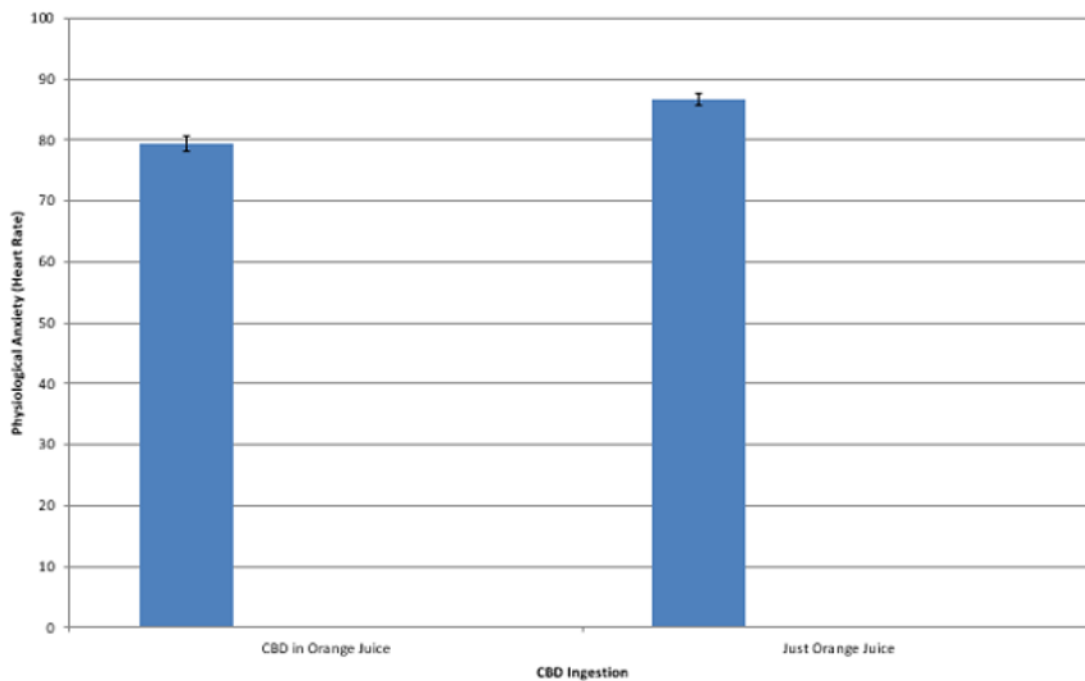


Figure 3. The mean heart rate in the CBD and orange juice conditions.

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Appendix A

Profile of Mood States

Subject's Initials _____

Birth date _____

Date _____

Subject Code No. _____

Directions: Describe HOW YOU FEEL RIGHT NOW by checking one space after each of the words listed below:

FEELING	Not at all	A little	Mod.	Quite a bit	Extremely
Tense	1	2	3	4	5
Shaky	1	2	3	4	5
On edge	1	2	3	4	5
Panicky	1	2	3	4	5
Relaxed	1	2	3	4	5
Uneasy	1	2	3	4	5
Restless	1	2	3	4	5
Nervous	1	2	3	4	5

Appendix B

How to score the POMS Scale

The Profile of Mood States (POMS) Scale is a standard validated psychological test formulated by McNair et al. (1971). The questionnaire contains 65 words/statements that describe feelings people have. The test requires you to indicate for each word or statement how you are currently feeling.

Each adjective in the POMS questionnaire is awarded the following score:

- 0 - Not at all
- 1 - A little
- 2 - Moderately
- 3 - Quite a Lot
- 4 - Extremely

except "Relaxed" and "Efficient" and they score the reverse:

- 4 - Not at all
- 3 - A little
- 2 - Moderately
- 1 - Quite a Lot
- 0 - Extremely

Total Mood Disturbance

A Total Mood Disturbance (TMD) can be calculated by adding the scores for Tension, Depression, Anger, Fatigue and Confusion and then subtracting the score for Vigour.

- $TMD = (Tension + Depression + Anger + Fatigue + Confusion) - Vigour$

Scores (scores in red are used in the shortened form as well – Shacham, 1983)

The total score for "Tension" is determined by adding the scores for:

Tense, Shaky, On Edge, Panicky, Relaxed, Uneasy, Restless, Nervous and Anxious