Knowledge and use of cannabis edibles in a college sample

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Knowledge and Use of Cannabis Edibles in a College Sample

by

Stacey Farmer

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Abstract

Cannabis use is a prevalent behavior among college students; however, less is known about edible cannabis use in this population. Available research indicates that college students are indeed using cannabis edibles, even in states where cannabis is not legalized for recreational use. The present study sought to assess the prevalence and knowledge of cannabis use in a college population and to assess the utility of a brief presentation on participant's knowledge and scores on an adopted measure of health literacy to assess the ability to read a manufactured cannabis edible label. Hypotheses predicted greater health literacy in experimental condition compared to the control condition, cannabis knowledge will be greater on posttest measures compared to pretest measures, pretest and posttest measures of current knowledge of edibles will be different for participants who have used versus have not used cannabis edibles prior, and prior use of cannabis in any form and prior edible cannabis use will predict greater health literacy. No difference was found in cannabis literacy between an experimental and control condition or on pre and post measures. Results did show significant differences in the scores of pre/post scores on subjective knowledge of edibles, differences on the pretest and posttest measures on current knowledge of edibles for those who have used versus have not used cannabis edibles prior, and prior cannabis use in any form and numeracy predicted higher levels of cannabis literacy. With an increasing number of states legalizing cannabis for medicinal and recreational purposes and with documented increases in edible use in college studies, understanding prevalence and knowledge in the population as well as the dissemination of harm reduction information is imperative.

Keywords: cannabis; edibles; health literacy; harm reduction
CHAPTER I
INTRODUCTION

Cannabis, colloquially called marijuana, is the most frequently used psychoactive drug worldwide. Currently, in the United States, it is estimated that 123.9 million people aged 12 or older have tried cannabis at least once, and 27.7 million reported past-month use (SAMHSA, 2019). Recreational cannabis use is legal for adults in 11 U.S. states and Washington DC; an additional 33 states have fully legalized medical cannabis programs (National Conference of State Legislatures, NCSL, 2019). Alternative methods for consuming cannabis (e.g., vaping and edibles) have become increasingly popular in the wake of U.S. cannabis legalization (Reuteman, 2010; Gourdet et al., 2017; Borodovsky et al., 2016). In particular, edible use has gained traction in states that have legalized cannabis use in some form (Bestrashniy & Winters, 2015; Borodovsky et al., 2016). Typical items consumed include baked goods, such as brownies or cookies, candies such as lollipops, hard candies, gummies, or chocolate bars.

Edible Use in the United States

Approximately 25% of cannabis users have consumed cannabis in an edible form (Schauer et al., 2020). Furthermore, in 2014, among 12th graders who used cannabis in the past year, the percentage that reported consuming edibles was 40% in medical marijuana states and 26% in non-medical marijuana states (SAMHSA, 2019). It is estimated that between 16 and 26 percent of medicinal cannabis patients consume edible products (Grella et al., 2014), which is unsurprising, given that smoked cannabis is often contraindicated for therapeutic applications (Huestis, 2007). The purchase of edible cannabis in legalized markets makes up a large percent of cannabis sales. For example, in 2014, in Colorado, 4.8 million cannabis edibles were sold,
which was approximately 40% of the state's cannabis sales (Brohl et al., 2015). As more states continue to legalize cannabis, the demand for cannabis edibles is likely to rise.

States that manufacture and sell cannabis edibles have mandates that guide the packaging of manufactured edibles (Baca, 2015). However, studies have shown that edible products are often inaccurately labeled and deliver variable doses of tetrahydrocannabinol (THC; Vandrey et al., 2015; MacCoun & Mello, 2015). While these mandates can help guide edibles users to use the products more efficiently, more research and dissemination of information is crucial.

Routes of Administration

Understanding the route of administration of varying forms of cannabis is critical for both current and potential users due to differing effects, including latency of onset and duration. For example, when inhaled, the primary intoxicating molecule in cannabis, Δ⁹-THC, is absorbed through the lungs and reaches the brain quickly. Absorption of THC in the stomach or mucous membranes of the mouth is a slower process than in the lungs. Ingested cannabis enters the stomach where the blood absorbs it and carries it to the rest of the body. Peak effects of ingested cannabis tend to occur one to two hours post-ingestion compared to five to ten minutes for smoking (Huestis, 2007). Differences in bioavailability and rate of absorption in the stomach contribute to highly variable psychoactive effects of ingested cannabis (Favrat et al., 2005). Moreover, dosing accuracy can be difficult to control with edible cannabis, due to limited ability to titrate and inaccurate labeling of cannabinoid concentrations, even among commercially available products (Vandrey et al., 2015).

Finally, the delay in the onset of effects of edibles can lead to users ingesting more to achieve a desired subjective experience. Further, potential users may not be aware that edible cannabis doses do not correlate to smoked cannabis doses in a one to one fashion. Given these
factors, negative cannabis edible experiences are common. While subjective experiences of smoked cannabis have been well documented, the subjective experience of edibles has received less attention. Case reports have documented the adverse effects of cannabis edibles. However, there have been fewer studies looking at both the full range of experiences of cannabis edible users. One study (Farmer et al., 2019) examined correlates of uncomfortable use in a sample of individuals with previous edible experiences. The study found that a majority, approximately 62%, stated that they would monitor the dose much more closely to avoid uncomfortable experiences associated with edible cannabis use. However, this study only looked at individuals who had prior experience with edibles it did not include individuals with no prior edible use.

Knowledge of Edibles

As alternative methods to cannabis consumption are becoming more popular (Borodovsky et al. 2016), the importance of availability and dissemination of factual information regarding the differences in consumption methods is crucial, however, is currently a limited area of knowledge in the scientific literature (Meacham et al., 2018). While more research is needed on cannabis edibles, studies have investigated the availability of information on cannabis on the Internet. One study analyzed twitter conversations and found that among a randomized sample of tweets containing cannabis-related keywords, approximately 10 percent mentioned blunts, marijuana edibles, or paraphernalia (Cavazos-Rehg et al., 2014). Further, a study looking at marijuana-related posts on Instagram found that novel forms of consumption of edibles were endorsed (i.e., edibles) and that cannabis products were explicitly marketed on the social media platform (Cavazos-Rehg et al., 2016.) Another study analyzed posts on a popular Internet website, Reddit, and found that posts about different forms of cannabis were common and increasing. Specifically, over six years, there was increased online discussion of alternative
cannabis forms such as dabbing, butane hash oil, and edible use (Meacham et al., 2018). A study looking at cannabis edibles as a specific search term on YouTube found 51 videos that had over 9 million views. An exploration of the content of videos revealed that more than half had an informative purpose, with most of the information related to the making of edibles. Other content topics included entertainment, product reviews/promotions, news stories, and documentaries. In this study, videos on how to make edibles had the greatest number of views (Krauss et al., 2017).

As the studies discussed above indicate, information about cannabis edibles is widely available on the Internet, and many individuals are interacting with the material. Research also indicates that the information is presented in several forms across the Internet (i.e., tweets, discussion boards, and videos) with varying degrees of information. Currently, there is a lack of validated content material that aims to increase knowledge of cannabis edibles for both current and potential edible users.

**Labeling of Manufactured Edibles**

One research team conducted focus groups in the states of Colorado and Washington to collect information on consumer's use and understanding of edible cannabis labels on products sold for recreational use. Findings from the study suggest that improvements are needed in the labeling of edibles to prevent unintentional ingestion among adult nonusers and to help ensure proper dosing and safe consumption among adult users. Specifically, focus group participants noted that the labels contained too much information, there was no clear indication that the product contained THC and that the information on how to consume the product was not clear (Kosa et al., 2017). This study provided practical guidance on labeling of manufactured cannabis products to help ensure safe consumption among both current and potential users; however, not all edible users are consuming purchased edibles, providing further support for knowledge on
cannabis edibles to be available and accessible to all potential users of ingested cannabis.

While manufactured edibles are not currently available for sale in New York State, that does not preclude individuals from accessing them either through home-baked goods or manufactured products from legal markets. For instance, Vidourek and colleagues (2018) found that over 25% of the students who completed their survey in Ohio, a state where recreational cannabis use is not currently legalized, had used edible cannabis in their lifetime, with 15.5% using in the last year, and 5.8% using in the previous month. With the increase of availability of cannabis in various forms, such as edibles, the rates of edible use in college students have the potential to rise. Furthermore, studies indicate that adolescents in states with access to legalized medical marijuana are more likely to perceive marijuana as less harmful (Keyes et al., 2016). With the increase in availability, college students may lack the information or have difficulty paying attention to guidelines of safe edibles use due to deficits in current cannabis knowledge.

**Health Literacy**

Health literacy is defined as the "ability to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (US DHHS, 2000). It is estimated that in the United States, 90 million people have low general literacy and nearly 36% of adults have low health literacy (Kutner et al., 2006). Health literacy also includes the ability and motivation of an individual to use such information and services in ways that enhance one's health. In the healthcare field, it is vital that patients can understand and use information in a meaningful way to make decisions about their well-being. Research has shown that individuals with limited health literacy have less knowledge about health issues, worse health status, and higher health care costs than individuals with adequate health literacy skills (Ryan, 2008). Research has indicated that education level, reading level, and other demographic variables alone
do not predict a patient's health literacy (Wallace et al., 2006; Sheridan et al., 2004). The lack of predictive power of education level, reading level, and other demographic variables to assess an individual's ability to obtain, process, and understand necessary health information were key factors that led to the creation of health literacy measures.

**Measuring Health Literacy**

Several instruments have been created to assess health literacy in adults. The Test of Functional Health Literacy in Adults (TOFHLA; Parker et al., 2005), the shortened form, Test of Functional Health Literacy in Adults (S-TOFHLA; Baker et al., 1999), Rapid Estimate of Adult Literacy in Medicine (REALM; Davis et al., 1991), and the Newest Vital Sign (NVS; Weiss et al., 2005) are assessments that have received considerable research. The Newest Vital Sign was developed to screen for limited literacy quickly and accurately in healthcare settings. The NVS assessment consists of a nutritional label and is followed by six questions that assess both the patient's reading and numeracy skills. Developers of the measure assert that the use of a nutrition label placed importance on both reading and math skills that are important for patients to be able to effectively navigate today's health care system (Weiss et al., 2005).

The NVS assessment is administered by presenting a nutrition label to the patient and asking patients to answer the following questions: (1) "If you eat the entire container, how many calories will you eat?" (2) "If you are allowed to eat 60 grams of carbohydrates as a snack, how much ice cream could you have?" (3) "Your doctor advises you to reduce the amount of saturated fat in your diet. You usually have 42 grams of saturated fat each day, which includes one serving of ice cream. If you stop eating ice cream, how many grams of saturated fat, would you be consuming each day?" (4) "If you usually eat 2,500 calories in a day, what percentage of your daily value of calories will you be eating if you eat one serving?" After the patient answers
the four questions, the following statement is presented, "Pretend that you are allergic to the following substances: penicillin, peanuts, latex gloves, and bee stings" and the following questions are asked (5) "Is it safe for you to eat this ice cream? "(6) "Why Not?" (Only asked if the patient responds "no" to question (5). Scores on the measure can vary from 0 to 6, scores of 0–1 indicate limited literacy skills; scores of 2–3 indicate the possibility of limited literacy, and scores between 4–6 indicate adequate literacy skills. Research by the authors of the NVS reported adequate internal consistency (Cronbach α = 0.76). Additionally, research conducted at a large college university found no difference in average NVS score across group paper and pencil, group online, or individual administration (Mackert et al., 2017).

**Health literacy Applied to Cannabis Use**

The extent to which consumers can interpret manufactured cannabis labels is under investigation. Research in the fields of nutrition and tobacco labeling consistently demonstrates that consumers struggle to understand and apply the information. There are also substantial disparities in how consumers understand and use health information. For example, one study found that consumers with lower education, income, and literacy skills were less likely to use the nutrient amounts displayed on product labels to make food purchasing decisions. (Cowburn & Stockley, 2005).

There is currently limited literature on how potential consumers understand and interact with manufactured edible cannabis labels (Orenstein and Glantz, 2018). One issue raised in previous research is that individuals may be unfamiliar with terminology for cannabis products (e.g., "THC," "CBD") and therefore they may be less confident about the meaning of associated numbers (i.e., dosing instructions; McKiernan & Fleming, 2017; Spackman et al., 2017). A recent study that assessed Canadian youth’s ability to read different types of manufactured
cannabis edible labels found that individuals had a difficult time reading labels with quantitative numbers (Leos-Toro et al., 2020).

**Edible Use in Infrequent Cannabis Users**

Research on smoked cannabis has been conducted on a range of user types (i.e., no prior use to daily heavy use; Newmeyer et al., 2017a; Niedbala et al., 2001; Wachtel et al., 2002), however less research has been conducted with individuals with no prior cannabis edible use. It is critical to understand the patterns of cannabis edibles use in a range of users. Results from one study found that over two years, edible consumption increased among non-daily marijuana users but not daily users during the same period. This finding is significant as it indicates that individuals with varying degrees of past use of cannabis are indeed using cannabis edibles (MacCoun & Mello, 2015). Further, a recent study (Schlienz et al., 2020) evaluated subjective effects, cognitive, and psychomotor performance during an administration of cannabis edibles. This study is one of the few that has looked explicitly at cannabis edible use in a sample of individuals who used infrequently.

**Cannabis Use Among College Students**

Epidemiological studies have found that the rate of cannabis use is nearly the same for college students and their non-college peers at approximately 43% (Miech et al., 2017). Research trends indicate that cannabis use among college students is increasing in the United States (Johnston et al., 2016), with approximately a 7% increase over five-years. Daily or near-daily use of cannabis has also increased in recent years for college students, rising from 3.5% in 2007 to 5.9% in 2014, the highest level of daily use measured in the last 34 years. Also, since the early 2000's the amount of 19 to 22-year-olds indicating regular use of cannabis as "dangerous" has declined from 58% in 2003 to 33% in 2018 (SAMHSA, 2019). Furthermore, states that enacted
recreational cannabis legislation from 2012 to 2017, had greater increases in cannabis use by college students (Bae & Kerr, 2019). As mentioned prior, edible cannabis use has increased, and it can be hypothesized that edible use in college students also has the potential to rise. Studies have found several reasons for increased interest in edibles for teens and adults, including the ability to conceal cannabis use, longer-lasting highs, and subjective anxiety-relieving effects. (Giombi et al., 2018; Friese et al., 2017).

**Primary Aims**

Two studies were conducted to assess the utility of a brief online informational video on cannabis and an individual's knowledge of cannabis edibles. The first study included a control and experimental condition. The second study was a larger sample of individuals who watched the experimental video only. The first study aimed to evaluate cannabis literacy using an adopted health literacy measure in a college sample. The second study has several aims; 1. Assess subjective and objective knowledge of safe edible use, the participant's perceived importance of learning about the substance, and intention to use the information in the future using a novel approach. 2. Assess differences in knowledge for individuals with prior edible use compared to individuals with no prior edible use 3. Evaluate the feasibility of a brief interventional approach to increase cannabis knowledge in both current and non-cannabis users. 4. Assess the prevalence of edible use in a college sample. Hypotheses for each study are listed below.

**Study 1:**

**H1:** Individuals receiving a cannabis literacy intervention will have greater cannabis literacy compared to those who receive a control condition.

**Study 2:**
**H1:** There will be differences on the pretest and posttest measures on current knowledge of edibles for those who have used versus have not used cannabis edibles prior.

**H2:** Individuals' knowledge on posttest measures will be higher than pretest measures of cannabis knowledge.

**H3:** Prior use of cannabis in any form and prior edible cannabis use will predict greater health literacy
CHAPTER II

METHOD

Participants

The sample for this study was recruited from the University at Albany's undergraduate psychology subject pool who received course credit for completing the study. Participants were excluded if they were under the age of 18 or not proficient in English. Participants with varying (zero to daily) use of cannabis were recruited for the study to obtain information on current use patterns of cannabis edibles in a college population.

Procedure

Following institutional review board approval, data were collected through a secure online platform. Participants accessed the survey through the psychology subject pool and were directed to the secure webpage (www.qualtrics.com) where they read the informed consent and the inclusion criteria, which described the voluntary nature of participation, the anonymity of the data, the right to withdrawal from the study at any time, and the potential benefits and minimal risk associated with completing the study. Participants indicated their consent by choosing "yes I consent" or "no, I do not consent." Following online consent, participants were directed to an online survey that consisted of several parts. The first part of the survey included questionnaires regarding demographics, participants' history of smoked and ingested (edible) cannabis use, current knowledge of cannabis edibles, and craving. Next, participants watched a brief experimental or control presentation. The experimental presentation provided them with knowledge on safe edible use, including dosing, time to psychoactive effects, the difference between smoked and ingested cannabis, and reasons why this knowledge is essential. The control presentation provided general information on cannabis, including the history of the substance in
the U.S., history of legislation/current legalization status, and medicinal uses of cannabis. All participants were then presented with a picture of a manufactured cannabis edible label, similar in appearance to labels found in states where recreational cannabis is legal. Participants answered several questions regarding packaging, dosing, and labeling. Finally, participants completed post-study questionnaires, including changes in knowledge and attitude towards edibles from baseline, intent to use knowledge, confidence in their ability to use the knowledge presented, craving, and an open-ended question to provide feedback on the survey.

**Stimuli**

**Experimental Presentation:** The experimental stimuli consisted of a short informational video that provided participants with knowledge on safe edible use, including dosing, time to psychoactive effects, and differences between smoked and ingested cannabis.

**Control Presentation:** The control stimuli consisted of a short video that provided participants with information on the history of cannabis in the United States.

**Manufactured Edible Label:** An edible cannabis label similar in appearance and content to manufactured cannabis edibles was presented to participants. The Newest Vital Sign (NVS; Weiss et al., 2005) health literacy assessment was adopted to evaluate the ability to read and analyze the edible label accurately.

**Measures**

**Demographics:** Standard demographics for all participants were collected, including age, year in college, GPA, sex/gender, race/ethnicity, and state of residency.

**Cannabis use:** Participants were asked to answer ("yes" or "no") if they had ever used cannabis in any form. If they answered "no," the remaining questions about cannabis use were not administered.
**Smoked cannabis use:** Responses to the following questions assessed the frequency of cannabis use (only presented to participants who endorsed using cannabis in their lifetime): 1. When did you last smoke cannabis? 2. How many days in the past week did you smoke cannabis (0-7)? 3. On average, how many days in a month do you smoke cannabis (0-31)? 4. How old were you when you first smoked cannabis? 5. How many grams of cannabis do you use (inhale) during a typical session? Participants were also asked to estimate lifetime uses of smoked cannabis. Answer choices ranged from "1-5 times in life" to "more than 10,000 lifetime uses."

**Edible cannabis use:** Participants answered ("yes" or "no") if they had ever consumed cannabis edibles in their lifetime. If participants answered "no," they were redirected to the next set of questions. If they endorsed "yes," participants answered additional questions, including 1. How many times have you used edibles in your lifetime? 2. What purposes did you use edibles for (recreational, medicinal, or both?), 3. If endorsed medicinal use, participants were asked to indicate for what conditions.

**Uncomfortable edible experience:** Participants were asked to indicate "yes" or "no" if they had an uncomfortable experience with cannabis edibles in the past.

**Alcohol Use:** Participants answered the following questions 1. Have you used alcohol in the last year ("yes" or "no")? 2. Approximately how many days do you usually consume alcohol in one week (0-7)? 3. Approximately how many standard alcoholic drinks do you usually consume in one week?

**Knowledge of edibles:** Subjective knowledge was assessed by asking participants to 1. Rate their current knowledge of edibles: 0 ("I have no knowledge of cannabis edibles") 1 ("I have limited knowledge of cannabis edibles") 2 ("I have some knowledge of cannabis edibles") 3 ("I have considerable knowledge of cannabis edibles") and 4 ("I am extremely knowledgeable
about cannabis edibles)  2. Do you believe that cannabis in any form (smoked or ingested) is bad for you (yes; no; maybe; I am not sure)? and 3. Do you think that cannabis edibles are dangerous (definitely yes; probably yes; might or might not; probably not; definitely not)? Participants also rated how important they believed it was to understand or have knowledge about a substance before consuming or experimenting with it using a visual analog scale from 0 (not important at all) to 100 (extremely important). Participants also answered factually based questions about cannabis edibles. These questions included: 1. Does smoked and ingested cannabis reach the brain in the same way? 2. Which form of cannabis do you think takes longer for the user to feel the effects (the "high") from the drug? 3. Does CBD make people feel high?

**Craving:** A single-item visual analog rating scale ("How much are you craving cannabis in ANY form right now") was used to assess craving on a 0 (not at all) to 100 (extremely) scale.

**Numeracy:** Participants answered five math questions to assess basic calculation abilities. An overall score was created by totaling the number correct.

**Post Intervention Measures**

**Health Literacy Questions:** Participants were asked the following questions after viewing a manufactured cannabis edible label. 1. What is the suggested single serve dose of the edible in grams? 2. How many total servings are in this cannabis product? 3. Hypothetically speaking, if you were to consume (which is NOT advised) the entire contents of this edible, how many milligrams of THC would you have consumed? 4. How many milligrams of THC is contained in each serving? 5. After ingesting a dose of this cannabis edible, after how many minutes would you expect to feel an effect (a "high")? 6. What psychoactive ingredient(s) are in this cannabis edible?
**Safety Label:** After the cannabis label was not visible to participants any longer, participants were asked to indicate if they noticed a warning label on the product, ("yes" or "no.") If participants endorsed "yes," they were asked to describe the appearance and message of the warning label.

**Knowledge of edibles:** Subjective knowledge was re-assessed by asking participants to rate their current knowledge of edibles RIGHT NOW and to answer the following questions: 1. Do you believe that cannabis is any form (smoked or ingested) is bad for you? 2. Do you think that cannabis edibles are dangerous? Participants also rated how important they believed it was to understand or have knowledge about a substance before consuming or experimenting with it on a visual analog scale from 0 (not important at all) to 100 (extremely important). The factually based questions described above were re-assessed after the intervention.

**Craving:** Craving was re-assed with a single-item visual analog rating scale ranging from 0 (not at all) to 100 (extremely).

**Change in knowledge:** At the end of the survey, participants were asked to rate 1. How informative did you find the information from the presentation? 2. How much did your knowledge change after viewing the presentation? 3. How would you rate your intention to use the information from the presentation?

**Analytic Plan**

All data were analyzed using SPSS software with the statistics package (SPSS Version 24). Hypotheses and analyses plans are listed below.

**Study 1**

**H1:** Individuals in the experimental condition will have greater cannabis literacy than those in the control condition. A matched-subject design from a larger data set of participants who
were exposed to the control condition was used to compare the effects of the experimental condition to the control condition. Participants were matched on age, gender, and past lifetime use of cannabis in any form. This design helps to control for individual differences a priori rather than a covariate in the analysis.

Analytic Plan: Independent samples T-tests were used to compare the experimental message to the control message on overall the overall cannabis literacy measure and individual items of the measure.

Study 2

H1: There will be differences on the pretest and posttest measures on current knowledge of edibles for those who have used versus have not used cannabis edibles prior.

Analytic Plan: 2x2 repeated measures ANOVA were used to test for the interaction of prior cannabis edible use and pre/post measures

H2: Individuals' knowledge on posttest measures will be higher than pretest measures of cannabis knowledge.

Analytic Plan: Paired t-test and ANCOVAs were conducted to assess for the effect of the intervention. Correlations were calculated to assess relationships between demographic variables of interest (i.e., age, gender, GPA, and current cannabis use in any form) predict baseline knowledge. Significant correlations were controlled for in ANCOVA models.

H3: Prior use of cannabis in any form and prior edible cannabis use will predict greater health literacy

Analytic Plan: Linear regressions will be conducted to predict if age, prior use of cannabis in any form, prior edible use, weekly cannabis use, or numeracy predicts health literacy.
Power Analysis

To ensure that the current study was adequately powered to find the between-groups effects of interest, G*Power 3.1 was used to compute the necessary sample size (Faul et al., 2009). Meta-analyses suggest that the effect size for health literacy outcomes ranges from r=0.14-0.67 (i.e., Berkman et al., 2011; Miller, 2016; Kordovski et al., 2017). There are no recorded measures of the effect of health literacy assessment and knowledge of edible cannabis use. Using conventional cut-offs for type I and type II error (b = .80, a = .05), the a priori required sample size to compute mean differences between two dependent means for a variable effect of .35 is n= 102 for each of the two conditions; n=204. Sample sizes within this range are common in health literacy and cannabis use literature (i.e., Berkman et al., 2011; Miller, 2016).
CHAPTER III

RESULTS

Preliminary Analysis

**Study 1 Demographics:** Descriptive analysis of the demographics of participants by condition appears in *Table 1*. There were no significant differences between groups on gender, race, age, GPA, past-month cannabis use, or weekly alcohol use variables.

**Study 2 Demographics:** Descriptive analysis of demographics for the sample (n=306) is presented in *Table 2*.

**Analysis of Assumptions:** Data were checked for assumptions of normality, homoscedasticity, and absence of multicollinearity for both studies. Four cases in study 1 and 1 case in Study 2 were dropped due to the presence of multivariate outliers tested by Mahalanobis distance (Tabachnick & Fidell, 2007). Visual inspection of outliers and tests of skewness and kurtosis revealed that for Study 1, individual questions that compromised cannabis literacy all had positive skew. Time to psychoactive effects (S_{time} =3.750) was adequately corrected for with square root transformations. The other four variables were not corrected for by transformations. Therefore, Mann-Whitney U tests were used to compare the differences between groups. See *Table 3* for skewness values. Numeracy showed some negative skew (S_{numeracy} =-1.220), which was adequately corrected for with a reflection and then square-root transformation (S_{numeracy} =.418). The following variables in Study 2 variables showed some positive skew: Weekly cannabis use (S=1.231), importance of knowledge, S_{pre}=-1.894, and S_{post}=-2.171. Skewness was adequately corrected for by square root transformation for weekly cannabis use (S=.669) and Ln (natural log) transformations for importance of knowledge pre (S=.243) and importance of
knowledge post (S=.243), however, there were no differences in results using the transformed versus the raw data, the raw data was kept to ease in interpretation.

**Main Analyses**

**Study 1:** Independent samples t-tests were used to test mean differences on the measure of cannabis literacy measures between participants in the experimental group compared to the control group. Results revealed a significant difference between conditions \( t(318)=2.15, p<.001 \) for the experimental (M=4.58, SD=1.26), and control (M=4.84, SD=.86) groups on cannabis literacy, however, in the opposite of the hypothesized direction. There were no significant differences between estimated time to intoxication between groups, \( t(313)=1.61, p=.108 \). The Mann Whitney U test was used to test differences between groups on the remaining questions due to significant skew. There was only a significant difference between groups on the question, "Hypothetically speaking, if you were to consume (which is NOT advised) the entire contents of this edible, how many milligrams of THC would you have consumed? The results are presented in *Table 3*. While there was no difference in participants noticing a warning label on the manufactured cannabis edible, \( t(316)=1.60, p=.111 \), qualitatively, 78.62% of participants in the experimental group and 86.34% of participants in the control group noticed a warning label on the manufactured edible. There was no difference on a pretest measure of craving between experimental (M=37.63, SD=3.60) and control group (M=31.09, SD=3.55), \( t(175)=1.293, p=.198 \).

**Study 2: Hypothesis 1:** A 2x2 repeated measures ANOVA was used to test whether there were differences on the pretest and posttest measures of current knowledge of edibles for those who have used versus have not used cannabis edibles prior. There was a significant interaction between the use of prior cannabis edibles and change in knowledge \( F(1,297) \)
=12.983, p > .001, ηp² = .045), such that those who had used edibles previously reported less change in knowledge after the intervention.

After excluding individuals with prior edible use from the analysis, significant differences were found on several pre and post questions related to information that was presented in the brief intervention. On the question, "Does smoked and ingested cannabis (marijuana) reach the brain in the same way?" there was a significant difference between pre (M=1.66, SD=.47) and post (M=1.78, 41) assessment, t(124)= -2.45, p<.05. Differences were also found on pre (M=1.75, SD=.43) and post (M=1.87, SD=.33) assessment of the question, "Which form of cannabis (marijuana) do you think takes longer for individuals to feel the effects (the "high"), with users more likely to choose ingested after the intervention, t(126)= -3.60, p<.05. Last, on the question, "Does CBD make people feel "high," users were more likely to choose "no" on post measures (M=1.78, SD=.41) compared to pre measures (M=1.69, SD=.46), t(124)= -2.24, p<.05.

Overall, Independent samples t-test revealed no difference between prior edible use (M=374, SD=.94) and no prior edible use (M=3.66, SD=.95) on how "informative" participants found the material, however, collapsed across groups, the modal response endorsed by 113 participants (37.8%) revealed that they found the information "a lot informative" followed by "moderately informative" (n=93, 31.1%), and "extremely informative" (n=65, 21.2%).

**Study 2: Hypothesis 2:** Repeated measures t-tests followed by ANCOVAs, were used to assess pre and posttest cannabis knowledge regardless of prior experience with cannabis edibles. Repeated measures t-test revealed a significant difference in the scores of pre subjective knowledge of edibles (M= 2.80, SD=1.04) and post subjective knowledge of edibles (M=2.94, SD=.96); t(298)=2.505, p = <.05. ANCOVA was used to control for demographic variables on
baseline knowledge. Weekly Cannabis use was the only demographic variable that was significantly correlated with baseline knowledge. After controlling for weekly cannabis use, there was no significant difference in knowledge before and after the intervention, $F(1,218)=3.512, p=.062$. No significant difference in scores on the question "Do you think cannabis in any form is bad for you?" pre (M= 2.22, SD=.89) or post (M=2.18 SD=.88); $t(296)=.912, p = .362$ were observed. There was a significant difference in the scores of the pre-assessment question, "Do you think cannabis edibles are dangerous" (M= 3.03, SD=1.11) and post-assessment (M=2.89, SD=1.18); $t(295)=3.11, p <.05$. After controlling for weekly cannabis use, ANCOVA analysis of "dangerous" of edibles was significant, $F(1,215)=5.915, p <.05$. There was a difference for the question how "important do you think it is to understand a substance before experimenting with it" pre (M=87.49, SD=18.36) and post (M=89.79, SD=16.98) measures, $t(293)=3.121, p<.05$, however, after controlling for weekly cannabis use, there was no significant difference on pre and post measure, $F(1,214)=.211, p=.65$. There were significant difference on the pre-assessment scores for the question “does CBD make you high” (M= 1.76, SD=.43) and post-assessment (M=1.84, SD=.37); $t(294)=3.23, p = <.05$. Controlling for weekly cannabis use, there was no significant difference in pre and post measure, $F(1,215)=3.110, p=.079$

**Study 2: Hypothesis 3:** A multiple regression analysis was used to predict cannabis literacy from age, prior use of cannabis in any form, prior edible use, weekly cannabis use, and numeracy. The multiple regression model statistically significantly predicted cannabis literacy, $F(5,221)=4.161, p<.001$, adj. $R^2=.088$. Prior use of cannabis in any form and numeracy added significantly to the prediction, $p<.05$. Regression coefficients and standard errors are found in *Table 4.*
Analysis of Qualitative data

**Smoked Cannabis Use:** The vast majority of the sample, 74.8% (n=229), endorsed using cannabis in any form in their lifetime. Out of the participants who endorsed prior use of smoked cannabis, the modal responses for the frequency of smoked cannabis were "less than once a year," 14.1% (n=32) and 2-3x/month, 13.66% (n=31). Six percent (n=15) endorsed using smoked cannabis once a day, and 6% (n=15) endorsed using smoked cannabis more than once a day. The average age of first use of smoked cannabis was 16.09 years old (SD=1.883).

**Edible Cannabis Use:** Most of the sample, 57.5% (n=176), endorsed using a cannabis edible in their lifetime. Of the individuals who endorsed prior use, the average number of prior cannabis edible use was 5.22 (SD=6.809). Seventy-six participants (43.18%) reported an uncomfortable experience with edibles. Participants overwhelmingly reported using cannabis edibles for recreational purposes (82.95%, n=146). Three participants (1.70%) reported use for medicinal purposes only, and 27 (15.34%) endorsed edible use for both medicinal and recreational purposes. Individuals generally reported not having a physician's recommendation for edible cannabis use (94.32%, n=288). All participants stated that they were from states with laws legalizing cannabis in some form (i.e., medicinal or recreational). Almost all participants (n=296, 96.73%) endorsed residing in New York State when not in school.

**Intent to use information:** Participants rated their likelihood of using the information provided in the information video on a scale of 1 "Extremely Unlikely" to 5 "Extremely likely." The overall mean was 3.25 (SD=1.27), with the modal response "Somewhat likely" being endorsed by 111 participants (37.5%).

**Response to Survey:** An open-ended question was added at the end of the survey asking if participants would like to leave any questions or comments about the survey. Of the
participants who left a comment (n=126), 35 (27.78\%) left a comment stating that they found the survey "beneficial," "useful," or "interesting." See Table 5 for examples of comments left by participants.
CHAPTER IV
DISCUSSION

The purpose of the current study was to assess knowledge and use patterns of cannabis edibles in college students with varying degrees of cannabis edible experiences. Cannabis use in college students has reached the highest rates over the past 34 years (SAMHSA, 2019). With increased state legalization of medicinal and recreational cannabis, the use of cannabis edibles in this population will also likely rise. As edible cannabis use has the potential to increase, users need to understand the differences between smoked and ingested cannabis. Understanding the route of administration of varying forms of cannabis is critical for both potential and current users due to differing effects. In addition, it has been shown previously that smoked cannabis use is a prevalent behavior among college students (Johnston et al., 2016; SAMHSA, 2019); however, less is currently known about edible cannabis knowledge and use in this population. The present study, therefore, sought to assess the prevalence and knowledge of cannabis use in a college population and to assess the utility of a brief presentation on participant's knowledge and scores on an adopted measure of health literacy to assess the ability to read a manufactured cannabis edible label.

Study 1

This study addressed differences in cannabis literacy comparing the experimental condition to the control condition. Results did not provide support for the first hypothesis as the presentation on edible cannabis compared to a control presentation did not affect cannabis literacy as hypothesized. Compared to health literacy results, cannabis literacy on this adapted measure for both the experimental and control groups was in the "adequate range" and in line with previous research on health literacy in college students (Mackert et al., 2017). While the
mean overall score of cannabis literacy was 4.72 (SD=1.09), 39.4% of the sample scored a 5, followed by 24.7% scoring a 6, and 24.1% scoring a 4. A recent online study randomized participants to one of three conditions, multi-serving edible packaging (control condition), single-serving edible packaging, and a single-serving edible packaged separately. Participants were then asked to identify standard serving sizes based on information on the label. The result showed that compared to the control condition (multi-serving edible), which is currently the primary method of edible packaging, participants were significantly more likely to identify serving size in the other two conditions. This previous study indicates that packaging does affect a user's ability to attend to the information on the label correctly. In the current study, a difference between groups was found on the question "Hypothetically speaking, if you were to consume (which is NOT advised) the entire contents of this edible, how many milligrams of THC would you have consumed," with individuals in the control group having a higher (less accurate) median rank, compared to the experimental group. These findings expand the results of previous work, highlighting the need for users to be able to read and understand a label correctly, as research has indicated that individuals with limited health literacy have less knowledge about health issues, worse health status, and higher health care costs than individuals with adequate health literacy skills (Ryan, 2007). Further investigation is needed to understand the potential correlates of cannabis health literacy and other health factor outcomes. Using adopted measures of health literacy to assess knowledge of cannabis edibles may also be an additional tool to assess users' ability to read manufactured packaging labels.

There was no difference in craving between groups or on pre and post measures of craving. In this study, the participants in the experimental groups were exposed to potential drug cues (i.e., photos) that potentially could induce craving. For example, previous work found that
cannabis-dependent adolescents reported higher levels of craving after being shown pictures of a marijuana plant compared to non-dependent users (Nickerson et al., 2011). While studies have found increased self-reported craving of cannabis following the use of visual cues (i.e., Wolfling et al., 2008), in this study, it appears that craving was not mediating cannabis knowledge.

While there were no differences between groups on noticing a warning label on the manufactured cannabis edible, an overwhelming majority of both groups, 78.62% of participants in the experimental group and 86.34% of participants in the control group noticed the warning label. Since the federal government does not currently regulate cannabis edibles, regulations on labeling of manufactured edibles can vary by state. While most of the participants noticed the warning label, it also highlights the importance of dissemination of information to the public on edibles for users who may not have access to manufactured edibles or who choose to make their edibles. Furthermore, if consumers are aware that these products should have warning labels, it may cue users to think of the purpose of the warning label and to be more informed when using other types of edibles such as homemade or ones that are not in their original packaging.

**Study 2: Hypothesis 1**

This study addressed knowledge of edibles for those with and without prior use of cannabis edibles on pre and posttest measures. Results provided support for the hypothesis. There were significant differences on the pretest and posttest measures on current knowledge of edibles for those who have used versus have not used cannabis edibles prior. Those with no prior use rated their change in knowledge higher compared to individuals who endorsed past cannabis edible use. These results provide further support for the dissemination of information to cannabis edible users who have less experience with cannabis in this form. Results indicate that those with the least background knowledge and experience may benefit the most from brief
psychoeducation on cannabis edibles. While there was no difference between prior edible users and no prior use on how "informative" they found the presentation, 88.56% of the total sample found the information "moderately" to "extremely" informative. These findings indicate that users, regardless of prior edible experience, found the information useful, further highlighting the potential utility of brief educational material. Further, after the intervention, participants were more likely to answer, "ingested cannabis" to the question, "Which form of cannabis takes longer to reach the brain? Participants were also more likely to endorse that CBD does not make people feel "high" after the intervention.

**Study 2 Hypothesis 2**

This hypothesis focused on assessing cannabis knowledge on pretest measures compared to posttest measures. Results provided partial support for the hypothesis. There were significant differences in scores on pre/post measures for the total sample on subjective knowledge of edibles and the importance of understanding a substance before experimenting with it. However, after controlling for weekly cannabis use, there were no significant pre/post differences on these measures. These findings indicate that those who are more familiar with cannabis may have had knowledge before the experimental manipulation. There was a significant difference in the scores of the pre-assessment question, "Do you think cannabis edibles are dangerous" with users rating edibles as less dangerous after the presentation, with 71% of the sample choosing "might or might not be dangerous, probably not, or definitely not dangerous." With the increase in cannabis edible use, it is essential for researchers and clinicians to understand the motives of edible cannabis users. For example, both teen cannabis users and nonusers noted that some people use edibles because they have concerns about the harmful effects of smoking (Friese et al., 2016). One study found that participants preferred edibles over smoking cannabis for several
reasons, including convenience, discreetness, longer-lasting highs, less intense highs, and edibles' ability to aid in relaxation and reduce anxiety more so than smoking cannabis (Giombi et al., 2017). Previous research has also found that among non-daily users, edible users were less likely to perceive harm from edibles and were more likely to perceive harm from smoking marijuana (Reboussin et al., 2019). Results from this study reveal that a brief educational presentation was useful in shifting individuals' perceived "dangerousness" of cannabis edible by providing information about the substance.

There was no significant difference in the scores on the question "Do you think cannabis in any form is bad for you," with the majority of the sample (36.9%) endorsing "no" on the posttest measure. Research has indicated that among 8th and 10th graders in the state of Washington after the legalization of recreational cannabis use, the perceived harmfulness of cannabis use decreased, and cannabis use increased (Cerda et al., 2017). Furthermore, one study found that adolescents described more negative consequences of cigarette use compared to cannabis and described several benefits of cannabis compared to cigarettes. Adolescents in the study described learning from multiple sources about the risks of using cigarettes and reported receiving much less and often incorrect information regarding cannabis (Roditis, 2015). The results from this study are in line with past work, indicating that as legalization continues to occur across the country, perception of risk of cannabis may be decreasing. Further, where individuals are obtaining information on cannabis edibles is important to understand, as information from friends/family/social media may not be the most accurate, necessitating the need for the dissemination of information on cannabis edibles.

**Study 2 Hypothesis 3**
This hypothesis focused on whether prior use of cannabis in any form predicts greater health literacy. Results provide support for hypothesis 3. Age, prior use of cannabis in any form, prior edible use, weekly cannabis use, and numeracy predicted cannabis literacy in this sample. These results are in line with previous research on health literacy indicating demographic variables (i.e., age, education level, reading level) alone does not predict a patient's health literacy (Wallace et al., 2006; Sheridan, et al., 2004), further evidence that other factors are essential to assess for health literacy. In this study, using an adapted measure of health literacy to predict cannabis literacy, prior cannabis use in any form, and numeracy predicted higher levels of cannabis literacy.

Additionally, in previous research on health literacy, the Degree of comprehension of food labels was highly correlated with literacy and numeracy skills (Rothman et al., 2006). Also, the available research indicates that education is not necessarily an indicator of high health literacy skills (American Institutes of Research, 2006). These results provide further support for the dissemination of knowledge for users who may not have had prior experience with cannabis.

Study 2 Qualitative Data

An examination of the qualitative responses helped illuminate a few key questions. The average age of first use of smoked cannabis was approximately 16 years old in this sample, indicating that participants are experimenting with cannabis use in high school. Early age of first cannabis use in this study is further evidence that information about cannabis in any form is essential for individuals to have, possibly even earlier than college, which was the focus sample of this study. One aim of this study was to examine the prevalence of edible use in a college sample at a large northeastern university. Over half of the sample (n=176) endorsed using
cannabis edibles in their lifetime, indicating that college students are indeed using cannabis edibles.

Interestingly, all participants indicated that they reside (while out of school) in states that currently do not have laws that allow for recreational cannabis use. This predicament may place users at greater risk for adverse consequences due to the lack of availability of regulated cannabis products with mandated packaging (Reboussin et al., 2019). This point is crucial as this lack of a regulated source indicates that individuals are indeed using cannabis edibles and are potentially using in states where cannabis edibles are not available for purchase. There is a critical need for the availability and access to educational information for cannabis edibles, especially for individuals who are consuming edibles in non-legalized markets who may not have access to manufactured edibles or those who may be consuming homemade edibles which lack information. Furthermore, almost 50% of the sample endorsed having an aversiveness experience with prior cannabis edibles. Recent research indicates that dose and lack of information on cannabis edibles is a driving factor in uncomfortable experiences (Farmer et al., 2019), necessitating the need for easily understood and widely available information on edible cannabis.

**Importance of Findings**

As cannabis use has increasingly become legal in most states, there has been a shift away from traditional methods of consumption (i.e., smoked cannabis) to new methods of consumption (Ghosh et al., 2015; Schauer et al., 2016). As alternative methods to cannabis consumption are becoming more popular (Borodovsky et al. 2016), the importance of dissemination of information regarding the differences in consumption methods is crucial. While information on different forms of cannabis administration is a limited area of knowledge
in the scientific literature (Meacham et al., 2018), studies have started to investigate the availability of information on the Internet. Studies that have analyzed twitter conversations found that among a randomized sample of tweets containing edible-related keywords, a large proportion either normalized or encouraged use (Cavazos-Rehg et al., 2018). Another study analyzed posts on a popular Internet website, Reddit, and found that posts about cannabis forms of use were common and increasing. Specifically, over six years, there was increased online discussion of alternative cannabis forms such as dabbing, butane hash oil, and edible use (Meacham et al., 2018). As the studies discussed above indicate, information about cannabis edibles is widely available on the Internet, and a vast majority of individuals are interacting with the material. Research also indicates that the information is presented in various forms across the Internet (i.e., tweets, discussion boards, and videos) with varying degrees of information. Currently, there is a lack of validated content material that documents changes in an individual's knowledge of edibles in readily accessible forms.

Based on findings in the limited literature on cannabis edibles and the more extensive literature on health literacy, it can be hypothesized that consumers of edible cannabis products may not fully understand the information provided on the label regarding content and dosing. While manufactured edibles sold in legalized markets are mandated to include ingredients and dosing information, the ability to read and use the information on the label for safe use of cannabis edibles is an area of limited research. Very recent research indicates that the packaging of cannabis edibles impacts the understanding of the dosing of cannabis edibles (Goodman & Hammond, 2020). Another recent study found that using a measurement of doses to indicate standard serving sizes of cannabis cookies was more easily comprehended by young adults than were THC amounts (Leos-Toro et al., 2020). While these studies provide valuable information to
guide recommendations for packaging of cannabis edibles, the Goodman & Hammond study (2020) found that only about half of respondents could correctly identify a standard serving of the cannabis edibles and approximately only 6 percent reported knowing the amount of THC in a standard service.

Additionally, Leos-Toro and colleagues (2020) found that only 7% of young adults in their study were able to identify a serving size of an edible cooking with no THC information, and approximately 13% were able to identify serving size when THC information in grams was presented. These findings along with other research, suggest that understanding of THC dosing and edible servings is generally low (Hammond, 2019). Analyzing data from the control group in Study 1 of this paper indicated that approximately 54% of participants answered the question, "How many milligrams (mg) of THC are contained in each serving" correctly. While this percentage is higher than recent studies (i.e., Goodman & Hammond, 2020; Leos-Toro, 2020), almost half of the sample was unable to identify the content of THC in a serving correctly. These findings taken together support the need for easily understandable labels on manufactured labels and increase the information provided to consumers of edibles. Further, this study, taken together with previous research, provides increasing support for legislation that mandates standard labeling across all manufactured edibles.

Results from this study and other recent research indicate that a more granular assessment of cannabis use for individuals with and without prior cannabis edible experience is warranted. With increased legalization, there is a potential for cannabis use to increase and for perceptions of cannabis to change. It is imperative for the assessment of cannabis across settings to inquire about methods of use, perception of risk, and knowledge of different methods of use. This study provides preliminary support for the use of a cannabis literacy measure to quickly assess
knowledge in settings that treat individuals with problematic substance use such as college counseling centers. After assessing for health literacy, providers must provide psychoeducation to individuals about safe cannabis edible use. The information provided in the experimental manipulation in Study 1 and Study 2 is an example of information that may be beneficial to provide to potential and current consumers. Indeed, over 50% of the sample reported that they were "somewhat" or "extremely" likely to use the information.

The findings from this study provide additional information and guidance to the growing body of literature on harm reduction strategies for cannabis use. Previous research has shown that strategies such as delaying morning use of cannabis (Earleywine et al., 2016), the use of alternative methods of cannabis consumption, such as using a vaporizer, (Earleywine & Barnwell, 2007; Van Dam & Earleywine, 2010; Malouff et al., 2014) and having knowledge of ingested cannabis edibles (Farmer et al., 2019) are effective in limiting negative consequences related to use. Harm reduction techniques extend to the legalized market, including limiting THC potency and having restrictions on how the products are marketed (Subritzky et al., 2016). However, a critique of these harm reduction strategies is that commercial markets are just one place where cannabis can be consumed (Subritzky, 2018). Information on cannabis and specifically cannabis edibles needs to be widely available and disseminated not only to current users but to those who have the potential to become users (i.e., college students). The findings from the current study aim to provide information on cannabis edibles to a large and diverse population in terms of current use patterns.

**Limitations and Future Directions**

Some limitations should be considered when interpreting results from this present study. While a college sample was the target population for this study, the results may not generalize to
other samples of individuals who may be using cannabis edibles. The study was conducted online and relied on self-report measures. While administration of the informational video in person may help reduce some issues with online administration, a recent study revealed that several videos on the subject on edibles were identified on YouTube with over 9 million views (Krauss et al., 2017) indicating that individuals are producing and consuming information about edibles online. Another limitation of this study is the ability to ensure that participants sufficiently interacted with the experimental material. While timing measures imbedded in the study indicated that participants watched the duration of the intervention, we cannot be sure that the participant's attention was on the information video for the duration of the task. To further evaluate interaction with the video, a self-report question was included that participants to answer if they watched the video. Participants were excluded from the final analysis if they answered "no" to this question. In this study, participants were asked to self-report on their cannabis use. Collateral reports of substance use might minimize some of the biases inherent in self-report.

Nevertheless, we chose to have the study set up as a self-report to protect the anonymity of participants to increase honest reporting. Alternative strategies, such as experience sampling techniques and diaries, could chronicle cannabis use. A detailed log could also give insight to individuals to understand their use. While participants in this sample endorsed a range of both smoked and edible use, the current study did not ask participants additional questions regarding motivation in addition to recreational or medicinal reasons. Future studies should further address an individual's motivations for use.

While this is the first study to the author's knowledge that assesses an individual's literacy of cannabis edibles and correlates in individuals with and without past cannabis edible
experiences, future work on validating this measure of edible cannabis literacy is needed. This study used the ability of individuals to read a manufactured cannabis label as an outcome variable. Futures studies may seek to understand the utility of the reading and answering questions on the manufactured cannabis edible label as an intervention itself. This approach may be particularly important in a variety of settings, including where individuals are using edibles for recreational or medicinal purposes.
References


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Substance Abuse and Mental Health Services Administration [SAMHSA]. Results from the 2018 National Survey on Drug Use and Health. Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, Rockville, MD (2019)


https://doi.org/10.1001/jama.2015.6613


Table 1
*Study 1 Demographics by Condition*

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Table 2
*Study 2 Demographics*
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<td>50.7</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>56</td>
<td>18.3</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>2.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year in School</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>137</td>
<td>44.8</td>
</tr>
<tr>
<td>Sophomore</td>
<td>93</td>
<td>30.4</td>
</tr>
<tr>
<td>Junior</td>
<td>50</td>
<td>16.3</td>
</tr>
<tr>
<td>Senior</td>
<td>26</td>
<td>8.5</td>
</tr>
</tbody>
</table>
Table 3
*Individual Questions of Cannabis Literacy Measure by Condition*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental (n=159)</th>
<th>Control (n=161)</th>
<th>U</th>
<th>p</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>60.12</td>
<td>63.13</td>
<td>12168.00</td>
<td>.130</td>
<td>16.93</td>
</tr>
<tr>
<td>Q2</td>
<td>63.98</td>
<td>58.57</td>
<td>12174.50</td>
<td>.135</td>
<td>11.96</td>
</tr>
<tr>
<td>Q3</td>
<td>55.55</td>
<td>65.36</td>
<td>10675.50</td>
<td>.018*</td>
<td>16.45</td>
</tr>
<tr>
<td>Q4</td>
<td>58.08</td>
<td>60.11</td>
<td>11219.00</td>
<td>.818</td>
<td>12.99</td>
</tr>
<tr>
<td>Q6</td>
<td>163.82</td>
<td>157.22</td>
<td>12271.00</td>
<td>.354</td>
<td>-1.53</td>
</tr>
</tbody>
</table>

*= significant at p<.05

Q1- What is the suggested single serve dose of the edible in grams?
Q2- How many total servings are in this cannabis product?
Q3- Hypothetically speaking, if you were to consume (which is NOT advised) the entire contents of this edible, how many milligrams of THC would you have consumed?
Q4- How many milligrams of THC is contained in each serving?
Q6- What psychoactive ingredient(s) are in this cannabis edible?
Table 4
Summary of Multiple Regression Analyses for Variables Predicting Cannabis Literacy

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E. B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-.004</td>
<td>.007</td>
<td>-.037</td>
</tr>
<tr>
<td>Prior use of cannabis in any form</td>
<td>-2.520</td>
<td>.932</td>
<td>-1.81*</td>
</tr>
<tr>
<td>Weekly cannabis use (smoked)</td>
<td>-.004</td>
<td>.036</td>
<td>-.007</td>
</tr>
<tr>
<td>Prior use of cannabis in an edible form</td>
<td>-.202</td>
<td>.203</td>
<td>-.067</td>
</tr>
<tr>
<td>Numeracy</td>
<td>.017</td>
<td>.006</td>
<td>.182*</td>
</tr>
</tbody>
</table>

*p<.01
Table 5
Sample of Qualitative responses

| “Good Survey”                                      | “I enjoyed this survey. It did a wonderful job at keeping me engaged.” |
| "Interesting Topic"                                | “Very informative and interesting.”                                    |
| "Very Informative"                                 | “Really cool survey.”                                                  |
| "It taught me a lot about edibles."                | “I loved the survey.”                                                  |
| “Survey was beneficial.”                            | “The survey helped in giving me more knowledge about edibles.”         |
| “Survey was educational.”                           | “The presentation was very informative and made me realize how little I knew about edibles and marijuana in general.” |
| “Very informative and interesting, enjoyed the PowerPoint.” | “I loved the survey, it showed me certain things about cannabis that might have been previously not been known. These are some facts that should be spread to the common public in some way.” |
| “Great presentation and questions.”                 |                                                                       |