

DETERMINATION OF CAFFEINE USE AND ITS EFFECTS ON UNIVERSITY STUDENTS

by

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DETERMINATION OF CAFFEINE USE AND ITS EFFECTS ON UNIVERSITY STUDENTS

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ABSTRACT

Determination of Caffeine Use and its Effects on University Students

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Background

Many studies have observed caffeine intake of university students. Investigators have found that the majority of consumers who over consume caffeine were not aware of the FDA recommended limit of 400 mg caffeine/day. Purposes of this research were to determine the level of caffeine consumption among students attending Texas Christian University (TCU) and the perceived effects that users experienced related to sleep, stress, and withdrawal symptoms. A desired outcome of this research was to clarify confounding values of average caffeine consumption in the university population that varied from 124 mg/day to 228 mg/day in the existing literature.

Methods

A survey questionnaire was created to assess the quantity, modality, and situational scenarios of caffeine consumption, as well as caffeine's perceived effect on sleep, energy, and stress. Caffeine withdrawal effects felt by students were also ascertained in the survey. The survey was administered via Survey Monkey® and distributed via the TCU email system to approximately 1000 students. Basic descriptive and frequency statistics were calculated using the Survey Monkey® software.

Results

The 217 respondents were 76.5% female with 94% between the ages of 18-25 years old and 94.0% current undergraduate students. Of the total respondents, 70.1% consumed 1-2 caffeinated beverages per day, 66.5% used caffeine to help study, and 67.5% used caffeine to increase energy. Negative perceptions of caffeine's impact on sleep were reported by 30%; while 18.5% reported a negative impact on stress, and 73.7% reported withdrawal symptoms.

Conclusions

The consumption of 95-190 mg caffeine/day by the majority (54.9%) of study participants was consistent with reported scientific literature. While only 1.8% of those surveyed consumed more than the FDA recommendation of 400 mg caffeine/day, reasons for this are unknown. Additionally, of the 70% who stated they experienced withdrawal symptoms, it is uncertain if these symptoms were indeed caused from the caffeine withdrawal or from another unrelated cause. It is advised that the research survey be revised to include questions that more acutely seek information sought in the stated purpose of the study. Further research regarding caffeine consumption by consumers is also warranted to better assist registered dietitian nutritionists and other health professionals when assessing diet and lifestyle habits of patients.

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CHAPTER I

INTRODUCTION

Caffeine is one of the most widely consumed psychoactive drugs in the world. Different modalities of consumption include but are not limited to coffee, tea, soda, energy drinks, “natural energy” beverages (such as Bang and Reign), powder mixtures (like C4), and pill capsules. Reasons behind the intake of this stimulant differ over a variety of purposes, both functional and therapeutic. University students are one of the highest consumer demographics, with the purpose for consumption ranging anywhere from a study aid to part of one’s morning routine, or even as a component in alcoholic beverages. Studies even show disparities of consumption between various demographics, including age, gender, and religion.^{1,2}

Over the last decade, caffeine consumption has risen through increased access and intake of coffee and energy drinks. Regardless of the form of caffeine consumed, adverse effects of overuse can be signs and symptoms of stimulant intoxication and withdrawal, such as headache, tremors, and sleep disruption. A study of 300 freshmen at a southeastern university found that 83% of students reported at least one indication of caffeine intoxication in the past.² The same study discovered that 51% of these students reported at least one sign/symptom of caffeine withdrawal.² The researchers concluded that most students were unaware of the fact they consumed three to five times the recommended amount of caffeine.²

CHAPTER II

LITERATURE REVIEW

Caffeine use is extremely prevalent amongst college students for a myriad of reasons. Upon deeper investigation of the reasons for college student's caffeine use, evidence suggests that the stress of school may lead to increased intake.³ According to Malinauskas et al, coping with the demands of college is one of the most reported reasons for energy drink consumption.³ In a sample of 496 participants from a state university in the Central-Atlantic US, a majority of users consumed energy drinks for insufficient sleep (67%) and to increase energy (65%).³ When it came time to study or work on a major project, 46% of females and 56% of males reported using energy drinks for the improvement of energy, cognitive performance, or mood.³ Overall, if students consumed energy drinks for three or more of the six situations that were assessed, it was found that the majority of them drank three or more energy drinks for a given situation.³ A cross-sectional study of 439 college seniors from three different majors questioned participants about the reasoning behind their habits.⁴ According to Attila and Banu, motives for consumption included restoring energy, staying awake, boosting athletic performance, or to enhance alcoholic beverages.⁴ About 40% of energy drink users reported mixing them with alcohol.⁴

Overconsumption of caffeine can produce negative outcomes effecting dental integrity, the cardiovascular system, the neurological system, the gastrointestinal system, the metabolism, and the renal system.⁵ Drinks with high sugar can cause cavities; that combined with low pH has been associated with a 2.4-fold increase in erosion of the teeth.⁵ A 2014 review of cardiovascular incidents after ingestion of energy drinks from Goldfarb et. al, found significant increases in heart rate and arterial blood pressure after energy drink consumption, attributed to the ergogenic effects of the caffeine in energy drinks.⁶ Further, heart problems such as ventricular arrhythmias,

ST segment height and QT prolongation have been reported after overconsumption of caffeinated drinks.⁶ Caffeine intoxication can affect the nervous system and lead to itching, anxiety, restlessness, and insomnia. Many frequent users also report withdrawal symptoms in the forms of headaches, shakiness, and over exhaustion. The presence of sucrose, glucose, or high fructose corn syrup gives most energy drinks their sweetness. Therefore, acute caffeine intake can decrease insulin sensitivity and long-term intake may increase the risk of obesity and type 2 diabetes.⁶ Sugary caffeinated beverages may also lessen the movement, variety and gene expression of intestinal microbes bringing about expanded risk of obesity and metabolic syndrome.⁶ In the kidneys, caffeinated drinks have been linked to diuresis and could be a risk for dehydration, especially in athletes.⁶

Another contributing factor to caffeine use is consumers relationship with sleep and exhaustion. A 1983 study by Hicks et. al was conducted on the relationship between caffeine and sleep.⁷ This San Jose State University showed an inverse relationship between daily caffeine intake and habitual sleep duration.⁷ This was shown in a 1983 study by Hicks et al, also finding an insignificant relationship with intake and sleep satisfaction.⁷ In a 2017 systematic review of coffee, caffeine and sleep, Clark et al found that “caffeine typically prolonged sleep latency, reduced total sleep time and sleep efficiency, and worsened perceived sleep quality.”⁸ A consistent correlation pattern for the inverse relationship of caffeine and sleep quality has been established for quite some time in nutrition science.⁸ It is evident that the more caffeine people usually consume, the worse they sleep. A study of 120 college students in Northern Indiana proposed 19 Likert-scale statements about caffeine and wellness; the highest agreement was for the statement “Regularly consuming caffeine can have long-term negative effects on health.”¹⁰ Despite this consensus, 75% of participants consumed one or more caffeinated drinks per day,

some exceeding five servings on a regular basis.⁹ A similar study at the University of Kentucky used Cohen's Perceived Stress Questionnaire to assess the correlation between caffeine consumption, beliefs about caffeine, workload inside and outside the classroom, and GPA.¹⁰ College can be a stressful transition in life due to an increase in subjection to potential stressors. According to Simpson et al, "average stress scores increased from 15.95 ± 6.34 at the beginning of the semester to 18.89 ± 6.94 at midterms," possibly as a result of increased workload and weight of exams toward one's grades.¹⁰ When comparing caffeine users and non-users, there was not a significant association between daily consumption and GPA; yet interestingly, amongst the caffeine users the timing and volume of consumption showed positive association between their performance and GPA.¹⁰ Additionally, the number of students consuming caffeine for school increased 2% from the beginning of the semester to midterms.¹⁰ University students may be aware of the negative effects of caffeine, but that does not stop certain individuals from over-consuming caffeinated beverages.

A key outcome of our proposed research is to clarify contradictory results from previous studies on the topic of caffeine, specifically regarding the TCU student population. For example, the average daily caffeine consumption being reported varies significantly from 124 mg/day to 228 mg/day.^{11,12} Overall effects, both positive and negative are also contradicted in the current literature, sleep being a major issue. Pattison et al produced research in 2016 showing an insignificant correlation with sleep and caffeine consumption but also a negative correlation with greater than 600 mg/day consumed and overall GPA, both going against research mentioned above.¹³ A more diverse population polled needs to be observed as well, which we hope to achieve. The current research available shows an overwhelming female majority of respondents ranging from two thirds of the study to more than 87%.^{14,15} Even sources of caffeine show

inaccuracies throughout the studies, some claiming energy drinks rising to the top and others showing coffee and tea still being the significant majority.¹⁶ For these reasons, further clarification is needed on the subject of caffeine consumption among the college population to determine the student's stress levels, sleep behavior and the health effects related to caffeine.

CHAPTER III

METHODS

This survey was created using the Survey Monkey® website. The Texas Christian University Institutional Review Board approved the distribution of this survey to all graduate and undergraduate students attending the university over the age of 18. The survey was distributed via email to over 1000 students with 217 responses in the time period between May and September of 2020. The average time taken by students to complete the survey was approximately 3 minutes and the survey consisted of 17 questions. Written consent was obtained from all participants on the first question of the survey and no personally identifying information was obtained. The next 6 questions were demographic questions that included age, race, gender, religion, national location, and education level. The remaining 10 questions were designed to assess the number of caffeinated beverages consumed in a day and week, the types of beverages consumed (coffee, tea, etc.), what time of day caffeine is consumed, caffeine's perceived effect on sleep and energy, withdrawal effects felt by students and caffeine's perceived effect on stress. Inclusion criteria was the respondent be a student at Texas Christian University's undergraduate or graduate programs. Respondents were excluded if they were under the age of 18.

Data Analysis

Basic quantitative analysis and frequency statistics were calculated using the Survey Monkey® software. Descriptive statistics for percentages were calculated for the demographics section. The questionnaire data was analyzed to determine the typical quantity and modality of caffeine consumption within the study population and the perceived effects of caffeine consumption on participant's sleep, stress, and withdrawal symptoms.

Sample

Two hundred twenty students completed all of the questions on the survey. Three respondents under the age of 18 years old were excluded, resulting in a sample of n=217. The respondents' reported gender breakdown was 50 (23%) male and 166 (77%) female. For comparison, the 2019 demographics of TCU were 58.2% female and 58.6% White. The overwhelming majority of respondents, 204 (94.0%) were between the ages of 18-25 years old. There were 7 categories of race and ethnicity, including Asian (2.7%), Black/African (6.0%), White/Caucasian (72.2%), Hispanic/Latinx (15.7%), Native American (0%), and Pacific Islander (0.4%). Three respondents stated they were multiracial, and 7 respondents chose not to answer. The age of the population ranged from 18-54 years old. The questionnaire's age group selections were 18-25 (94.1%), 25-34 (3.2%), and 35-54 (2.7%). Most of the respondents were current undergraduate students (94.0%) and 13 respondents were pursuing advanced degrees. There were 13 options to select for religion, including Roman Catholic (22.1%), Greek/Russian Orthodox (1.8%), Seventh Day Adventist (0%), Judaism (0.4%), Islam (0.4%), Protestant (6.9%), Mormon (0.4%), Buddhism (0.9%), Hindu (0%), Christian non-denomination (46.5%), None (12.9%), Prefer not to answer (2.7%) and Other (4.6%). The region of the United States the respondents report as their home of record were reported as New England (2.3%), Mid-Atlantic (2.8%), Mid-West (12.3%), Southern (6.16%), South-West (53.5%), Rocky Mountain (4.2%), Pacific Coastal (18.4%) and 5 respondents were international students.

CHAPTER IV

RESULTS

The survey was sent to approximately 1000 recipients who were TCU undergraduate and graduate students. Results were analyzed question to question and all responses were considered. Questions 1 through 7 were the demographic questions of the survey. The demographic profile of the participants included 76.5% females, 94% ages 18-25, and 72.2% White/Caucasian ethnicity. The demographic breakdown of race and ethnicity is represented by Figure 1. A majority (53.5%) of the participants came from the southwest region of the United States. There were 217 responses to Question 17, and 78% of those surveyed agreed that the effects of over-consuming caffeine would have negative impacts on a person's health overall, while only 8% disagreed.

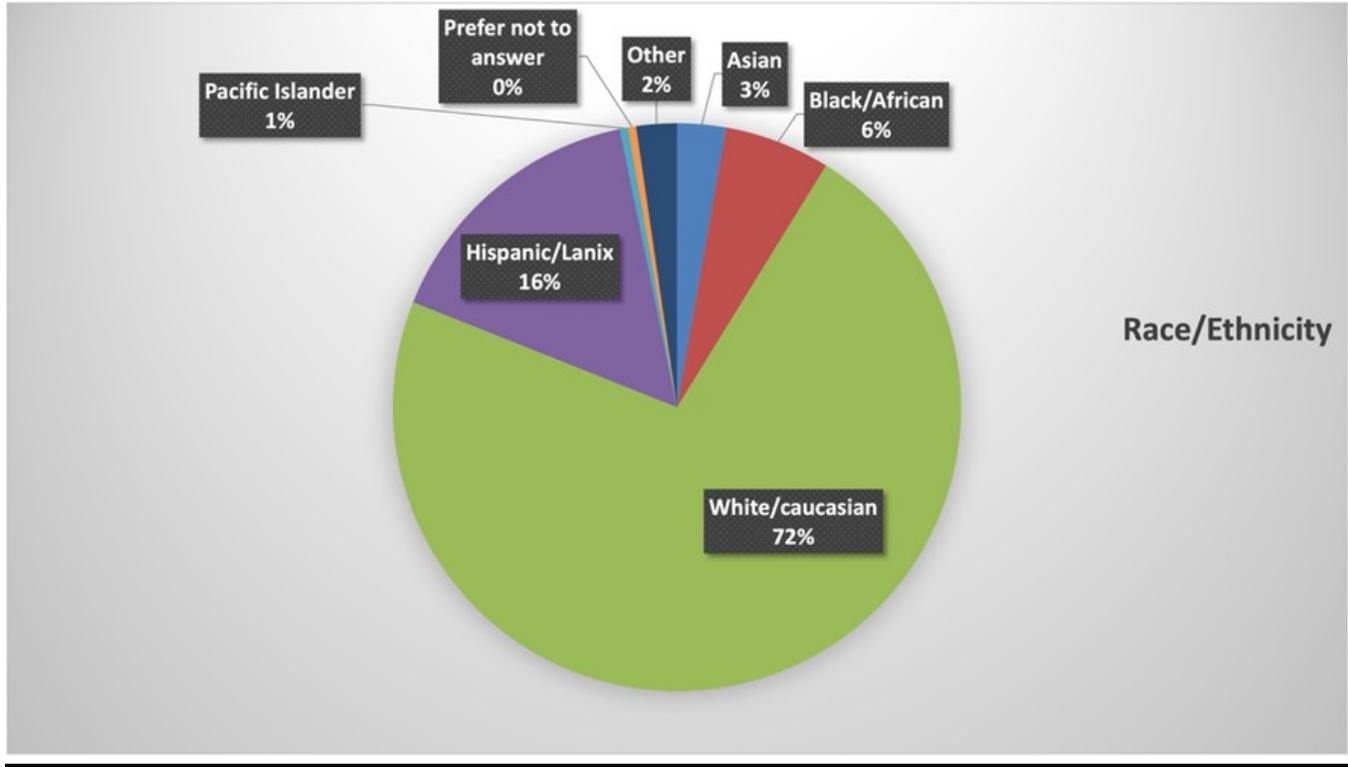


Figure 1

Question 8 of the survey asked participants how many caffeinated beverages they consumed in an average day; there were 217 responses. A majority (70.1%) of this population consumed 1-2 caffeinated beverages per day, and 0 beverages per day made up the next largest category (14.3%). High intake was more uncommon among this TCU population, with only 11.5% of those surveyed consuming 2-3 drinks per day, 2.3% consuming 3-4 drinks per day, and 1.8% consuming 4 or more drinks per day. The results of student caffeine intake estimated as drinks per day are represented in Figure 2.

Drinks Per Day

n=217

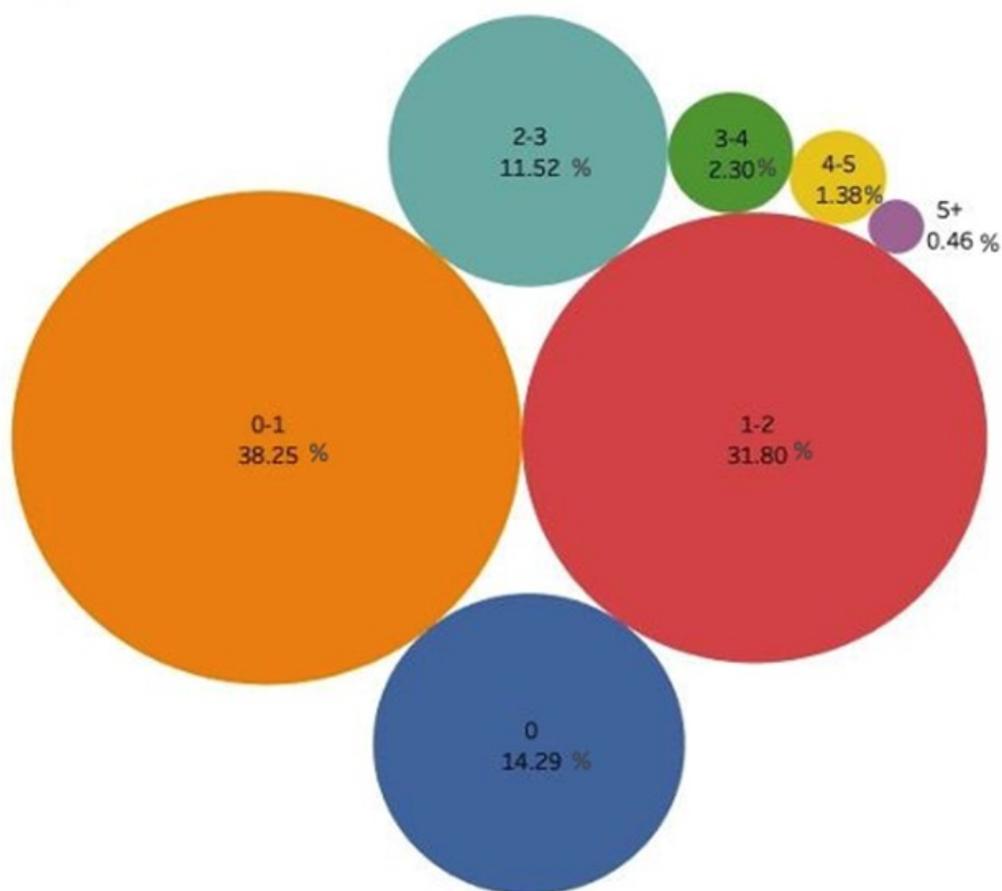


Figure 2

Question 9 asked about caffeinated beverages consumed in an average week (n = 217). There were 20.74% of participants (n = 45) in the categories of 0-3 per week, 3-6 per week, and 6-9 per week. Most of the other participants were scattered across the categories, with responses from 0 per week (n = 21) all the way up to 30+ per week (n = 2). Data analysis from SurveyMonkey comparing the responses for Question 8 with the gender demographic shows that out of the participants that consumed 1-2 beverages per day, approximately 85.5% were female and 14.5% were male.

Question 10 asked participants to indicate all the ways that they consume caffeine on a regular basis (Figure 3). This question allowed participants to select more than one answer choice, so each bar indicates the portion of the 207 that responded to the question. Since there was not an answer choice for those that did not consume caffeine, the investigators believe those are the 10 individuals that skipped this question. Coffee was the most popular answer, as 74.4% of students selected it. Following coffee, 52.7% of students consume tea, 44% enjoy soda/pop, 11.1% drink energy drinks, and 10.6% will choose “Natural Energy” drinks, like Bang. As shown in the figure, supplement power mixtures (like C4 pre-workout) and caffeine pills were selected by 5.3% and 1.5% of respondents, respectively. By comparing the male and female responses for Question 10, one can see that 14.9% of the male students consumed supplement powder mixtures, while only 2.5% of the females chose this modality of caffeine consumption. While only 2 participants reported the consumption of caffeine pills, neither were female.

Q10 What are the ways you might consume caffeine on a regular basis? (Choose all that apply)

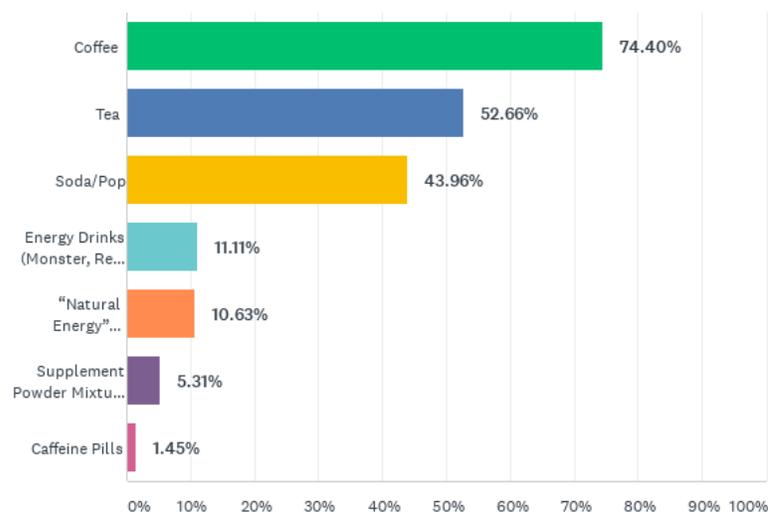


Figure 3

Question 11 looked at possible situations in which students may consume caffeine, and it also allowed for more than one answer selection. Out of the 206 that responded to this question and consume caffeine, 67.5% did so to increase energy, 66.5% to help with school, 60.2% as part of a morning routine, 19.9% to mix with alcohol at a party, and 9.7% to enhance athletic performance. 6.8% of those that answered indicated that they do not consume caffeine.

Questions 12 and 13 asked participants about their perceived relationships with caffeine and stress. On Question 12, 65.7% said that caffeine has a neutral effect on their stress levels, while 18.5% felt a negative effect on their stress levels, and 15.7% reported a positive effect on stress levels (Figure 4). Stress was rarely a trigger for caffeine consumption for 49.5% of students, a neutral trigger for 31.5% of students, and often a trigger for approximately 19% of students.

Q12 How do you perceive that your caffeine consumption affects your stress levels?

Answered: 216 Skipped: 1

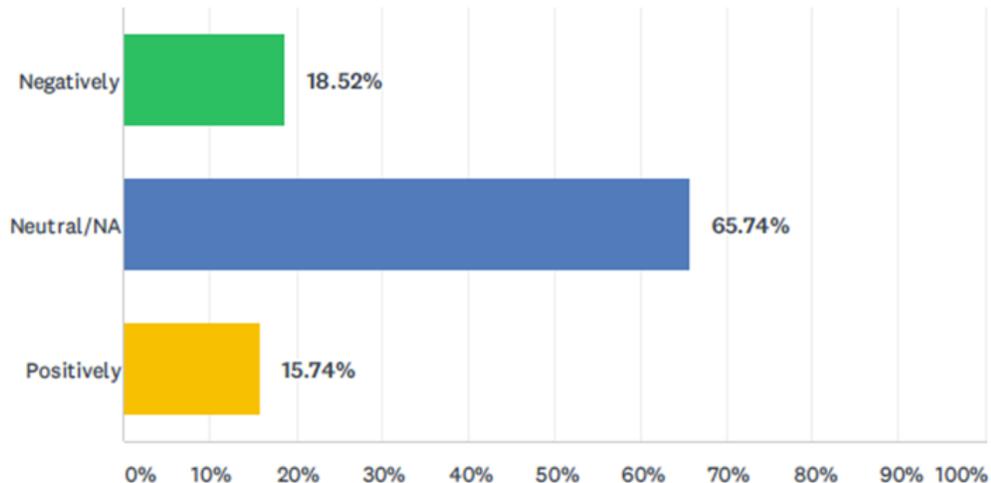


Figure 4

Questions 14 and 15 looked at the perceived impact of caffeine consumption on sleep quality and wakefulness, respectively. Most students felt that caffeine intake had either a neutral (65.9%) or negative (30%) effect on sleep quality, with only 4.2% reporting a positive impact. When asked about how caffeine affects wakefulness, almost 28% thought that caffeine consumption rarely prolonged their wakefulness, 21.3% responded neutral/NA, and 50.9% responded that it often prolonged, or extended, wakefulness.

There were 160 responses to Question 16, which asked about caffeine withdrawal symptoms experienced by survey participants (Figure 5 and 6). The most experienced symptom was headaches at 64.4%. The most common remaining symptoms, in order, were exhaustion (38.8%), fatigue (33.8%), irritability (29.4%), difficulty concentrating (28.8%), shakiness (23.8%), anxiety (18.1%), sweating (7.5%), nausea (6.9%), depression (4.4%), and fever (1.3%).

Again, there was no answer choice for those that do not consume caffeine, nor for those that have never experienced caffeine withdrawal symptoms despite consuming the substance. When comparing Questions 16 and Question 8 in SurveyMonkey, the data shows a connection between average number of caffeinated beverages consumed per day and the appearance of various withdrawal symptoms. Out of the participants that consume an average of 2-3 caffeinated drinks per day, there were different reports of experiencing each symptom listed, except for fever.

ANSWER CHOICES	RESPONSES	
Shakiness (1)	23.75%	38
Headaches (2)	64.38%	103
Exhaustion (3)	38.75%	62
Anxiety (4)	18.13%	29
Fatigue (5)	33.75%	54
Difficulty concentrating (6)	28.75%	46
Irritability (7)	29.38%	47
Depression (8)	4.38%	7
Sweating (9)	7.50%	12
Fever (10)	1.25%	2
Nausea (11)	6.88%	11
Total Respondents: 160		

Figure 5

Q16 Which of the following caffeine withdrawal symptoms have you experienced? (Check all that apply).

Answered: 160 Skipped: 57

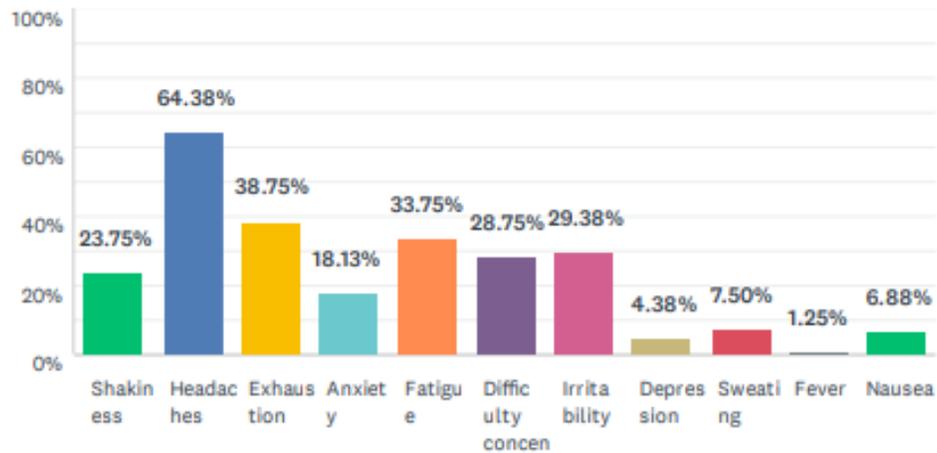


Figure 6

CHAPTER V

DISCUSSION & CONCLUSIONS

The results of this research helped to clarify contradictory results found during the literature review, and to observe trends of caffeine intake among TCU students. Findings from this study support published research that investigated modalities of caffeinated beverage intake.¹⁶ Research conducted in 2019 found that coffee was the preferred caffeinated beverage among those surveyed (70.9%), and tea was the second most chosen (50.2%) by participants who consumed caffeine. The survey conducted at TCU had a similar outcome, so it is fair to say that coffee and tea are the most popular caffeinated drinks. The researchers were able to estimate that 77.2% of coffee drinkers consumed between 95 mg and 190 mg of caffeine each day by using the SurveyMonkey® filter and analysis tools. This indicates that study participants were consuming less than the average per day consumption (124 - 228 mg/day) reported in current literature.^{11, 12} Another study cited found that substantial numbers of university students consumed 3-5 times more than the recommended limit of 400 mg of caffeine/day.² Contrary to these findings, the present study shows only 1.8% of respondents in excess of the FDA's daily caffeine recommendation.

On the question regarding withdrawal symptoms, each answer choice is a very common ailment. Things like headaches, irritability, and fatigue can be caused by many different sources and are not necessarily solely linked to caffeine withdrawal. Even among students that claimed to consume zero caffeinated beverages per day, some of these students still experienced symptoms associated with caffeine withdrawal. The demographic distribution of the study population was not completely reflective of TCU's population, and males were underrepresented. Energy drinks are almost exclusively advertised to men, and if more males

filled out the survey the results would have likely shown higher numbers of students consuming energy drinks.

During the data analysis phase of the project, the researchers noticed several limitations presented by the wording and phrasing of the questionnaire responses. The demographic question regarding education did not provide insight to the college grade level of the respondents, which could have been used to observe trends regarding the intake of freshmen, sophomores, juniors, and seniors. Errors also were made throughout the survey related to respondents that did not consume caffeine. For example, when asking about withdrawal symptoms, the researchers did not provide the opportunity for respondents to choose that they have not experienced withdrawal symptoms, nor the option that they do not consume caffeine. The most complicating limitation of the questionnaire was the answer choices regarding the quantities of caffeinated beverages consumed in an average day and week. The answers for both questions were presented as overlapping ranges rather than independent values. In future surveys it would be better to list the answer choices individually. This would allow for more precise calculations regarding the quantity of caffeine consumed on a daily and weekly basis. In the future, an ideal replication of this project would have a larger, more balanced sample size. It would also be beneficial to data analysis to have a larger sample population, in order to determine correlation between responses to the questions in the survey.

This study provides information that could be utilized by registered dietitian nutritionists (RDN). It is clear to see from both the literature and our results that coffee and tea are still very popular among college students. Even though the average intake for our study population was low, it was still rare that those surveyed drank no caffeine in a week ($n = 21$). When conducting a nutrition assessment, it would be pertinent for an RDN to ask college age clients/patients if they

consume caffeine, including, but not limited to coffee, tea, energy drinks, and the other sources listed in the questionnaire. Knowing the recommended UL for bioactive substances is important, and the RDN should implore those under their care to consume less than the FDA recommended limit of 400 mg per day. As a stimulant, it was observed that caffeine has many symptoms that can make users uncomfortable or ill, and it should always be consumed in moderation.

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**APPENDIX A: PROTOCOL AND CONSENT FORM
PROTOCOL REVIEW REQUEST**



The TCU Institutional Review Board (IRB) is responsible for protecting the welfare and rights of the individuals who are participants of any research conducted by faculty, staff, or students at TCU. Approval by the IRB must be obtained prior to initiation of a project, whether conducted on-campus or off-campus. While student research is encouraged at both the undergraduate and graduate level, only TCU faculty or staff may serve as Principal Investigator and submit a protocol for review.

Please submit this protocol electronically to [IRBFacultySubmit](#) (pdf preferred). Include the Protocol Approval Form as a word document with highlighted sections filled in. Also submit a consent document, HIPAA form if applicable, Protecting Human Research Participants Training certificates, recruitment materials, and any questionnaires or other documents to be utilized in data collection. A template for the consent document and HIPAA form, instructions on how to complete the consent, and a web link for the Protecting Human Research Participants Training are available on the TCU IRB webpage at www.research.tcu.edu. Submission deadline for protocols is the 15th of the month prior to the IRB Committee meeting.

1. **Date:** 1/10/2020
2. **Study Title:** Determination of Caffeine use and its effects on University Students
3. **Principal Investigator (must be a TCU faculty or staff):** Anne VanBeber, Professor and Chair, Department of Nutritional Sciences
4. **Department:** Nutritional Sciences
5. **Other Investigators:** List all faculty, staff, and students conducting the study including those not affiliated with TCU.

Jason Balters, Junior – Coordinated Program in Dietetics
Jordan Pitts, Junior – Coordinated Program in Dietetics
6. **Project Period:** 08/2019 – 05/2021
7. **Funding Agency:** None
8. **Amount Requested From Funding Agency:** N/A
9. **Due Date for Funding:** N/A

10. Purpose: Describe the objectives and hypotheses of the study and what you expect to learn or demonstrate:

Purpose: To determine the effects of caffeine use on TCU students

Objectives:

1. To determine how caffeine use effects sleep of TCU students.
2. To determine how caffeine use effects perceived stress.
3. To determine modalities of caffeine consumption by TCU students.
4. To determine quantity of caffeinated beverages by TCU students.
5. To determine perceived effects of caffeine withdrawal among TCU students.

11. Background: Describe the theory or data supporting the objectives of the study and include a bibliography of key references as applicable.

Caffeine is one of the most widely consumed psychoactive drugs in the world. Different modalities of consumption include but are not limited to coffee, tea, soda, energy drinks, “natural energy” beverages (such as Bang and Reign), powder mixtures (like C4), and pill capsules. Reasons behind the intake of this stimulant differ over a variety of purposes, both functional and therapeutic. University students are one of the highest consumer demographics, with the purpose for consumption ranging anywhere from a study aid to part of one’s morning routine, or even as a component in alcoholic beverages. Studies even show disparities of consumption between various demographics, including age, gender, and religion

Over the last decade, caffeine consumption has risen through increased access and intake of coffee and energy drinks. Regardless of the form of caffeine consumed, one adverse effect of overuse can be signs and symptoms of stimulant intoxication and withdrawal. A study of 300 freshmen at a southeastern university found that 83% of students reported at least one indication of caffeine intoxication in the past. The same study discovered that 51% of these students reported at least one sign/symptom of caffeine withdrawal. The researchers concluded that most students were unaware of the fact they consumed three to five times the recommended amount of caffeine, which could lead to negative health outcomes

12. Subject Population: Describe the characteristics of the participant population including the inclusion and exclusion criteria and the number of participants you plan to recruit:

The study population will encompass students attending Texas Christian University at Undergraduate and Graduate levels. Inclusion criteria will not discriminate between age, gender, race, ethnicity, family income, employment status, or education level. Exclusion criteria include any individual younger than 18 years of age, survey respondents that are not students, and/or any individual who does not have access to the Internet. The goal of the research is to have 500 participants who successfully complete the entire questionnaire. The study questionnaire, including the consent form, should take no more than 15 minutes to complete.

13. Recruitment Procedure: Describe your recruitment strategies including how the potential participants will be approached and precautions that will be taken to minimize the possibility of undue influence or coercion. Include copies of the recruitment letters, leaflets, etc. in your submission.

Recruitment strategies include dispersing a weblink via email for a survey that will be completed individually on Survey Monkey®, inviting individuals to participate through social media outlets, and advertising to students at Texas Christian University in class.

14. Consenting Procedure: Describe the consenting procedure, whether participation is completely voluntary, whether the participants can withdraw at any time without penalty, the procedures for withdrawing, and whether an incentive (describe it) will be offered for participation. If students are used as participants, indicate an alternative in lieu of participation if course credit is provided for participation. If a vulnerable population is recruited, describe the measures that will be taken to obtain surrogate consent (e.g., cognitively impaired participants) or assent from minors and permission from parents of minors.

Participation in the study is voluntary. Consent for the survey will be presented before proceeding to survey questions. Consent will acknowledge that the participant has the ability to stop the survey at any time and is answering voluntarily with their personal experience. No incentive will be administered for participation. The study participants will remain anonymous, not disclosing personal information. The surveys will be observed, organized, and managed with randomly assigned numbers and stored online in the Department of Nutritional Sciences' Survey Monkey® for a minimum of five years.

15. Study Procedures: Provide a chronological description of the procedures, tests, and interventions that will be implemented during the course of the study. Indicate the number of visits, length of each visit, and the time it would take to undergo the various tests, procedures, and interventions. If blood or tissue is to be collected, indicate exactly how much in simple terms. Flow diagrams may be used to clarify complex projects.

1. Create study questionnaire.
2. Gain approval from Nutritional Sciences Departmental Review Board and the TCU Institutional Review Board.
3. Recruit participants via email, social media messaging, and in-person advertising.
4. Completion of the consent form and questionnaire by participants.
5. Analyze statistics to determine the validity of findings.

16. Data Analyses: Describe how you will analyze your data to answer the study question.

Questionnaire data will be analyzed to reflect the study objectives. Analysis will assess the typical quantity and modality of caffeine intake by Texas Christian University students in order to determine the most common forms of intake among the study population. This study will also investigate the perceived effects of caffeine consumption on participant's sleep, stress, and withdrawal symptoms. The resulting data will determine the various effects that

caffeine can have on University Students, and the modal distribution of each response category.

- 17. Potential Risks and Precautions to Reduce Risk: Indicate any physical, psychological, social, or privacy risk which the subject may incur. Risk(s) must be specified. Also describe what measures have been or will be taken to prevent and minimize each of the risks identified. If any deception is to be used, describe it in detail and the plans for debriefing.**

Potential risks include participants feeling uneasy about their privacy or lifestyle habits, as well as whether their privacy is being protected by researchers. To diminish this risk, we will ensure that the participants' responses are completely anonymous.

- 18. Procedures to Maintain Confidentiality: Describe how the data will be collected, de-identified, stored, used, and disposed to protect confidentiality. If protected health information is to be re-identified at a later date, describe the procedure for doing so. All signed consents and hard data must be stored for a minimum of 3 years in a locked filing cabinet (and locked room) in the principal investigator's office, lab, or storage closet at TCU. Your professional society may recommend keeping the materials for a longer period of time.**

Data will be collected anonymously through a questionnaire on Survey Monkey®. Collected data will be utilized by researchers to determine the most common methods of caffeine consumption and their subsequent effects on TCU students.

- 19. Potential Benefits: Describe the potential benefits of the research to the participants, to others with similar problems, and to society.**

Participants may gain awareness of how their caffeine intake compares to their peers and the resulting effects of different levels of consumption. In addition, participants may have the opportunity to change their lifestyle to improve overall satisfaction. Potential benefits to society include possible improvement of the lifestyle habits of society as a whole, which could decrease stress and withdrawal symptoms, as well as improve sleep quality.

- 20. Training for Protecting Human Research Participants: Submit training certificates for all the study investigators. The training link is available on the TCU IRB webpage at**

<http://www.research.tcu.edu/default.asp?id=page&pid=sp94&parent=94>.

CERTIFICATES SUBMITTED

- 21. Check List for the Items That Need to be Submitted: Please combine all the files into one pdf document before submitting the materials electronically to the IRB. To prevent any delay in the approval of your protocol, use the most recent template for the protocol, consent document, and HIPAA form by downloading them from www.research.tcu.edu each time you prepare your materials.**

- | | |
|--|-------------------------------------|
| a. Protocol | <input checked="" type="checkbox"/> |
| b. Consent document | <input checked="" type="checkbox"/> |
| c. HIPAA form if applicable (N/A) | <input type="checkbox"/> |
| d. Protecting Human Research Participants Training certificate for each investigator | <input checked="" type="checkbox"/> |
| e. Recruitment emails | <input checked="" type="checkbox"/> |
| f. Questionnaires or other documents utilized in screening and data collection | <input checked="" type="checkbox"/> |

Principal Investigator Assurance

22. By signing below, I certify to the following:

- The project described herein will be conducted in accordance with applicable TCU policies and procedures, as determined by the IRB of record. All Human Subject Research projects occurring at TCU must be conducted in compliance with the Office of Human Protection (“OHRP”) regulations at 45 CFR 46 and all other applicable federal and state laws and regulations (collectively “Applicable Law”)
- I have a working knowledge of Applicable Law
- All personnel who work with human participants under this protocol have received, or will receive, appropriate training in protocol procedures and protection of human subjects prior to working with humans.
- All experiments involving human participants will be performed only by the qualified individuals listed in this protocol and individuals not listed in this protocol will not participate in the protocol experiments.
- Procedures on experimental subjects described in this IRB protocol accurately reflect those described in the funding applications and awards, if externally supported.
- I and all personnel have read and will comply with any pertinent safety information, IRB requirements, and security procedures.
- I will maintain records of all human participants and the procedures carried out throughout the entire term of my project.
- As Principal Investigator, I am aware that I have the ultimate responsibility, on a day-to-day basis, for the proper care, treatment, and protection of the human participants.

Kelly Fisher

Signature of Principal Investigator



Texas Christian University
Fort Worth, Texas

CONSENT TO PARTICIPATE IN RESEARCH

Title of Research: Determination of Caffeine use and its effects on University Students

Funding Agency/Sponsor: None

Study Investigators:

Anne VanBeber – Professor and Chair, Department of Nutritional Sciences

Jason Balters, Junior – Coordinated Program in Dietetics

Jordan Pitts, Junior – Coordinated Program in Dietetics

What is the purpose of the research?

To determine the effects of caffeine use on Texas Christian University students.

How many people will participate in this study?

500-1000

What is my involvement for participating in this study?

Participants will complete an online anonymous questionnaire on Survey Monkey®. Gathered data will be analyzed to compare the participants' caffeine usage and reasons behind various modalities, quantities, and effects of intake.

How long am I expected to be in this study for and how much of my time is required?

Participants will voluntarily complete a questionnaire on Survey Monkey® which takes approximately 10 minutes.

What are the risks of participating in this study and how will they be minimized?

Potential risks include participants feeling uneasy about their privacy or lifestyle habits, as well as whether their privacy is being protected by researchers. To diminish this risk, we will ensure that the participants' responses are completely anonymous.

What are the benefits for participating in this study?

Participants may gain awareness of how their caffeine intake compares to their peers and the resulting effects of different levels of consumption. In addition, participants may have the opportunity to change their lifestyle to improve overall health. Potential benefits to society include possible improvement of the health habits of society as a whole, which could decrease stress and withdrawal symptoms, as well as improve sleep quality.

Will I be compensated for participating in this study?

No, participants will not be compensated.

What is an alternate procedure(s) that I can choose instead of participating in this study?

There is no alternate procedure.

How will my confidentiality be protected?

Data will be collected anonymously through a questionnaire on Survey Monkey®. Participants will remain anonymous and each questionnaire submitted will be organized according to a given number. Collected data will be utilized by researchers to determine caffeine use and its perceived effects on University Students at TCU.

Is my participation voluntary?

Consent may be withdrawn at any time during the study, and participation is completely voluntary.

Can I stop taking part in this research?

Participants have the right to withdraw from this study at any time.

What are the procedures for withdrawal?

Depending on time of withdrawal, participants will either choose to not take the survey or leave the questionnaire by exiting out of the Survey Monkey® website.

Will I be given a copy of the consent document to keep?

If a participant would like a copy of the consent form, please email Dr. Anne VanBeber at a.vanbeber@tcu.edu.

Who should I contact if I have questions regarding the study?

Anne VanBeber, Professor and Chair, Department of Nutritional Sciences,
817.257.7518

Jason Balters, Junior, Coordinated Program in Dietetics, 402.889.1594

Jordan Pitts, Junior, Coordinated Program in Dietetics, 817.845.0788

Who should I contact if I have concerns regarding my rights as a study participant?

Michael Faggella-Luby, Chair; m.faggella-Luby@tcu.edu; 817-257-4355

Dru Riddle, Chair-elect; d.riddle@tcu.edu; 817-257-6811

Your signature below indicates that you have read or been read the information provided above, you have received answers to all of your questions and have been told who to call if you have any more questions, you have freely decided to participate in this research, and you understand that you are not giving up any of your legal rights.

APPENDIX B: SURVEY MONKEY® QUESTIONNAIRE

Jason Balters, Junior, Coordinated Program in Dietetics, 402.889.1594

Jordan Pitts, Junior, Coordinated Program in Dietetics, 817.8

* 1. By selecting "I Agree" below, you indicate that you have read or been read the information provided above, you have received answers to all of your questions and have been directed who to call if you have any other questions, you have freely decided to participate in this research, and you understand that you are not giving up any of your legal rights.

I Agree

Determination of Caffeine Use and its Effects on University Students

2. Specify your gender

- Male
- Female
- Prefer not to answer

3. What is your age?

- a. Under 18 years old
- b. 18-25 years old
- c. 25-34 years old
- d. 35-54 years old
- e. 55-74 years old
- f. 75 or older
- Prefer not to answer

4. What is your race/ethnicity?

- a. Asian
- b. Black/African
- c. White/Caucasian
- d. Hispanic/Latinx
- e. Native American
- f. Pacific Islander
- g. Prefer not to answer
- Other (please specify)

5. What is the highest level of education you have completed?

- Some college credit, no degree
- Associate degree (two-year junior/community college)
- Bachelor's degree (four-year college/university)
- Master's degree
- Doctorate degree

6. What is your religious preference?

- Roman Catholic
- Greek/Russian Orthodox
- Seventh-Day Adventist
- Judaism
- Islam
- Protestant
- Other (please specify)
- Mormon (Church of Jesus Christ of Latter-Day Saints)
- Buddhism
- Hindu
- Christian non-denomination
- None
- Prefer not to answer

7. What region of the United States are you from?

- | | |
|--|--|
| <input type="radio"/> New England (CT, ME, MA, NH, RI, VT) Region | <input type="radio"/> South-West (AR, LA, OK, TX) Region |
| <input type="radio"/> Mid-Atlantic (NJ, NY, PA) Region | <input type="radio"/> Rocky Mountain (AZ, CO, ID, MT, NV, NM, UT, WY) Region |
| <input type="radio"/> Mid-West (IL, IN, MI, OH, WI, IA, KS, MN, MO, NE, ND, SD) Region | <input type="radio"/> Pacific Coastal (AK, CA, HI, OR, WA) Region |
| <input type="radio"/> Southern (DE, FL, GA, MD, NC, SC, VA, DC, WV, AL, KY, MS, TN) Region | |

International Student (please specify)

8. How many caffeinated beverages (tea, coffee, cola, chocolate, energy drinks, etc.) do you consume in an average day?

- | | |
|---------------------------|---------------------------|
| <input type="radio"/> 0 | <input type="radio"/> 3-4 |
| <input type="radio"/> 0-1 | <input type="radio"/> 4-5 |
| <input type="radio"/> 1-2 | <input type="radio"/> 5+ |
| <input type="radio"/> 2-3 | |

9. How many caffeinated beverages (tea, coffee, cola, chocolate, energy drinks, etc.) do you consume in an average week?

- | | |
|-----------------------------|------------------------------|
| <input type="radio"/> 0 | <input type="radio"/> 15-18 |
| <input type="radio"/> 0-3 | <input type="radio"/> 18--21 |
| <input type="radio"/> 3-6 | <input type="radio"/> 21-24 |
| <input type="radio"/> 6-9 | <input type="radio"/> 24-27 |
| <input type="radio"/> 9-12 | <input type="radio"/> 27-30 |
| <input type="radio"/> 12-15 | <input type="radio"/> 30+ |

10. What are the ways you might consume caffeine on a regular basis? (Choose all that apply)

- | | |
|--|---|
| <input type="checkbox"/> Coffee | <input type="checkbox"/> *Natural Energy* Beverages (Bang, Reign, etc.) |
| <input type="checkbox"/> Tea | <input type="checkbox"/> Supplement Powder Mixtures (C4) |
| <input type="checkbox"/> Soda/Pop | <input type="checkbox"/> Caffeine Pills |
| <input type="checkbox"/> Energy Drinks (Monster, Red Bull, etc.) | |

11. In which of the following situations would you consume caffeine? (choose all that apply)

- | | |
|---|--|
| <input type="checkbox"/> To help with school (studying, projects, etc.) | <input type="checkbox"/> Mixed with alcohol/at a party |
| <input type="checkbox"/> To increase energy | <input type="checkbox"/> To enhance athletic performance |
| <input type="checkbox"/> As part of a morning routine | <input type="checkbox"/> I do not consume caffeine |

Other (please specify)

12. How do you perceive that your caffeine consumption affects your stress levels?

- | | |
|---------------------------------------|---------------------------------------|
| <input type="radio"/> Very Negatively | <input type="radio"/> Positively |
| <input type="radio"/> Negatively | <input type="radio"/> Very Positively |
| <input type="radio"/> Neutral/NA | |

13. To what extent do you perceive that stress triggers your caffeine consumption?

- | | |
|----------------------------------|------------------------------|
| <input type="radio"/> Never | <input type="radio"/> Often |
| <input type="radio"/> Rarely | <input type="radio"/> Always |
| <input type="radio"/> Neutral/NA | |

14. On days you consume caffeine, how do you perceive that caffeine affects your sleep quality?

- | | |
|---------------------------------------|---------------------------------------|
| <input type="radio"/> Very Negatively | <input type="radio"/> Positively |
| <input type="radio"/> Negatively | <input type="radio"/> Very Positively |
| <input type="radio"/> Neutral/NA | |

15. On days you consume caffeine, does caffeine prolong your wakefulness?

- Never Often
- Rarely Always
- Neutral/NA

16. Which of the following caffeine withdrawal symptoms have you experienced? (Check all that apply).

- Shakiness Irritability
- Headaches Depression
- Exhaustion Sweating
- Anxiety Fever
- Fatigue Nausea
- Difficulty concentrating

Other (please specify)

17. Please choose your agreement level with the following statement: "The effects of over consuming caffeine would have negative impacts on a person's overall health."

- Strongly Disagree Agree
- Disagree Strongly Agree
- Neither Agree nor Disagree

APPENDIX C: CITI TRAINING CERTIFICATE



Completion Date 01-Sep-2019
Expiration Date 31-Aug-2023
Record ID 33035202

This is to certify that:

Jason Balters

Has completed the following CITI Program course:

Human Subjects Research

(Curriculum Group)

Human Subjects Researcher (social-behavioral-educational)

(Course Learner Group)

1 - Basic Course

(Stage)

Under requirements set by:

Texas Christian University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w45ab68da-a4fe-471f-b2b1-03ae99bc55d8-33035202

APPENDIX D: EVIDENCE ANALYSIS LIBRARY CERTIFICATE

[Click to Print Completed Certificate](#)

CPE Accredited Provider Commission on Dietetic Registration <small>the credentialing agency for the Academy of Nutrition and Dietetics</small> 	Continuing Professional Education Certificate of Attendance -Attendee Copy-	
	Participant Name:	Jason Balters
	RD/RDN/DTR Number:	
	Session Title:	Evidence Analysis Library Tutorial
	CDR Activity Number:	110257
	Date Completed:	9/5
	Learning Need Code:	
	CPEUs Awarded:	1.0
	CPE Level:	2
 _____ Provider Signature		PROVIDER #: AM003

RETAIN ORIGINAL COPY FOR YOUR RECORDS
**Refer to your Professional Development Portfolio Learning Needs Assessment Form (Step 2)*

APPENDIX E: TCU INSTITUTIONAL RESEARCH BOARD APPROVAL

**TCU Institutional Review Board
3101 Sadler Hall
Fort Worth, Texas 76129**

DATE: 30-March-2020

TO: Kelly Fisher, Jason Balters & Jordan Pitts

FROM: TCU Institutional Review Board

RE: Exempt Approval of Protocol 1920-187

Dear Kelly, Jason & Jordan:

In accordance with applicable federal law governing the use of human subjects in research, the TCU Institutional Review Board ("IRB") has reviewed your proposed project entitled " Determination of Caffeine use and its effects on University Students " and determined that your study is considered minimal risk, qualifying for an exemption from further IRB review under category 2. Specifically, 45 CFR 46.104(d)(2)(ii) identifies studies that are exempt from further IRB review, including; research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording), where any disclosure of the human subjects' responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, educational advancement, or reputation.

The IRB has determined that your proposed project qualifies under 45 CFR 46.104(d)(2)(ii). For these reasons, the IRB has determined that your proposed study is exempt from further IRB review.

Remember that even though your project is exempt from further IRB review, the research must be conducted according to the proposal submitted to the IRB. Minor changes to this study generally will not require IRB review. Substantive modifications, however, will need IRB review, since the review category might change as a result of modification. Some examples of substantive modifications include: change in PI, study purpose, procedures, funding source, study population, level of risk, or identifiability of collected data. If at any time you are unsure as to whether a change is minor or substantive, please submit a question to Research Compliance for assistance.

If you wish to make substantive changes to the approved protocol, you must submit a [Request for Amendment/Modification to Protocol](#) form to the IRB. You may not implement any changes until you have received IRB approval of such changes. Also, please be



**TCU Institutional Review Board
3101 Sadler Hall
Fort Worth, Texas 76129**

aware that changes to the research protocol may prevent the research from qualifying for exempt review and require submission of a new IRB application or other materials to the IRB.

Please contact Research Compliance at research@tcu.edu or (817) 257-5070, if you need any additional information.

Sincerely,

Research Compliance on behalf of TCU Institutional Review Board