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Drug of Choice: An Exploration of Coping with Caffeine

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DRUG OF CHOICE: AN EXPLORATION OF COPING WITH CAFFEINE

by

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(Under the Direction of Jessica Brooks)

ABSTRACT

Introduction: Caffeine is the most widely used drug in the world. It is deemed socially acceptable and is associated with many benefits; however, some research suggests that caffeine can cause significant impairments in functioning if consumed in excess. Caffeine-related disorders are now included in the Substance Use Disorders section of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), though not much is known about the negative effects of caffeine, as substance abuse theories and coping models have not been applied to caffeine. **Purpose:** This study seeks to provide knowledge about the abuse of caffeine and to explore any similar properties it shares with illicit substance abuse disorders, specifically, if it is used as a coping mechanism in the same way other drugs are used. Additionally, the study seeks to determine whether specific facets of impulsivity lead to increased caffeine use. **Method**: 180 undergraduate student participants anonymously completed the questionnaires online using Qualtrics software. Demographic information was gathered along with measures of caffeine intake, effects of caffeine intake, coping behaviors, psychological mood symptoms, impulsivity, and negative consequences of caffeine use. **Results:** Overall caffeine consumption was significantly and positively correlated with the total amount of negative consequences and negative physiological and psychological effects. No significant results were found between caffeine use and reports of anxiety, depression, stress, or coping strategies. No facets of impulsivity were found to be correlated with or predictive of caffeine use. No difference was

found between non-rural and rural participants' caffeine consumption. **Significance**: Gaining knowledge about caffeine disorders can have significant implications on diagnosis and treatment and will be beneficial to gain more understanding of those at risk for caffeine-related disorders.
INDEX WORDS: Caffeine; Coping; Caffeine Use Disorder; Impulsivity, Individual differences

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DEDICATION

This dissertation is dedicated to my family. Those still on Earth and those in a better place. I love and appreciate you all and words cannot express how much. Dad, Nana, Papa, Aunt Stacy – You all always believed in me and pushed me to go for it. Mom – thank you for supporting me through all of this in the midst of all of the other stress and hard life stuff. Not to mention for our brainstorming session that gave me the idea for this dissertation. And of course, Jasmine. You inspire me. Still. Even though you aren't with me anymore. Thank you for making me a better person and in your own way reminding me why I do what I do and to find joy in every moment.

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CHAPTER ONE

INTRODUCTION

Caffeine is the most widely used substance in the world (Hughes, Oliveto, Liguori, Carpenter, & Howard, 1998; Meredith, Juliano, Hughes, & Griffiths, 2013). Caffeine accessibility and general social acceptance make it easy for individuals to use caffeine on a daily basis. Over 85% of the United States population consume over 200 mg of caffeine every day (Juliano, Evatt, Richards, & Griffiths, 2012; Meredith et al., 2013). Typically, caffeine is consumed through beverages (i.e., coffee, soda, and tea); however, it is also included in snack foods, such as chocolate. In recent years, caffeinated products have become increasingly popular. For instance, caffeine powder and caffeine pills are easily found in grocery stores or online stores. Use of caffeine powder has raised concern due to its high potency (200 mg of caffeine equals a "rounded 1/32-teaspoon;" U.S. Food and Drug Administration, 2015) and it has demonstrated highly negative sometimes fatal effects (Ebbs, 2016). Additionally, many chocolate and coffee companies have added products to their lines that include added caffeine beyond that in their original products, specifically marketing these new products as having increased benefits. For example, Maxwell House Coffee Max Boost contains 111 mg of caffeine, with the original brew delivering 63mg of caffeine per serving. The increased potency of caffeine, combined with the easy access for any individual due to the lack of an age limitation for purchase, has caused excessive caffeine use to be of more concern. However, the low cost and mostly desirable effects of caffeine maintain positive perceptions in the general population.

Caffeine is associated with a number of positive effects, including increased alertness, improved concentration, improved mood, and increased energy (Meredith et al., 2013). Researchers have attempted to identify demographic information related to caffeine use;

however, findings have been mixed with regards to age and gender (Norton, Lasev, & Sullivan, 2011).

Furthermore, information regarding caffeine use in rural and non-rural areas has been largely unaddressed in the literature. Scant existing research on geographical differences has shown that nicotine, another accessible, legal stimulant, is more common in rural areas (Cepeda-Benito et al., 2018).

Empirical evidence has found common personality traits and individual differences that are associated with excessive caffeine use. In relation to caffeine use, impulsivity has been found to play a role. Penolazzi, Natale, Leone, and Russo (2012) and Jones and Lejuez (2005) found that individuals with higher impulsivity and higher sensation seeking reported higher caffeine use. These two traits are known to be factors in other addiction disorders (Di Nicola, et al., 2015). Jones and Lejuez (2005) also found that the two personality traits were associated with caffeine dependence.

For years, caffeine-related disorders were included in the Diagnostic and Statistical Manual of Mental Disorders (DSM) as a topic for further study. In the fifth version of the DSM (DSM-5), caffeine-related disorders were officially included as a set of formal diagnoses. Due to its recent addition, little is known about the prevalence and trajectory of caffeine-related disorders. Therefore, information regarding its presentation, as well as treatment options and prognosis, is limited. In general, caffeine is seen as a potentially problematic substance, yet it is not seen as a “hard” drug or an addictive drug. Thus, caffeine use is often not questioned by health professionals as compared to alcohol and other drugs (Pohler, 2010).

The current study seeks to address gaps in the addiction literature regarding caffeine use, including the identification of underlying mechanisms that contribute to the development and

maintenance of problematic caffeine use. Specifically, this study seeks to determine if people use caffeine as a means of coping when they are stressed, as a primary and well-established motivator of substance use generally is the regulation of mood (Cooper, Russell, Skinner, Frone, & Mudar, 1992; Khantzian, 1985). Based on the work of Pettit and DeBarr (2011) with college students, stress was associated with consumption of at least one caffeinated energy drink. Additionally, a body of research has established a positive relationship between substance use and impulsivity (Amlung, Few, Howland, Rohsenow, & Metrik, 2013; Jones & Lejuez, 2005; Penolazzi et al., 2012). First, this study seeks to validate existing measures of problematic caffeine use, as well as a substance abuse measure modified towards caffeine abuse. This study also aims to pinpoint the specific facets of impulsivity associated with excessive caffeine use, and the extent to which impulsivity traits are predictive of excessive use of caffeine. Lastly, individual differences in relation to excessive caffeine use are largely underrepresented in the research, especially as it may relate to prevalence by geographical location. Thus, the current study seeks to determine differences in caffeine use based on rural status.

List of Terms

Caffeine. It is the most commonly used stimulant drug used worldwide (Meredith et al., 2013). Caffeine use is associated with several benefits including improved concentration, better mood, and combating fatigue (Meredith et al., 2013; Penolazzi et al., 2012). Though a licit substance, caffeine has similar neurological reward system to illicit substances such as cocaine (Daly & Fredholm, 1998).

Coping. Coping strategies are used to alleviate negative emotional states. Coping theories explore how people assess distressful events and how they react to them. Specific coping strategies differ among people and the strategies can be positive or negative. Positive

coping strategies include seeking out social support or reading a book while negative coping strategies include abusing substances. Further, coping as an attempt to relieve negative emotions can be focused from a way to change the environment or the problem or focus on changing internal emotions (Krohne, 2002; Lazarus & Folkman, 1984).

Caffeine Use Disorder. The DSM-5 (American Psychiatric Association [APA], 2013) includes Caffeine Use Disorder as a condition of further study. The proposed criteria state caffeine use must cause clinically significant impairment or distress. Individuals must experience a "persistent desire or unsuccessful efforts to cut down or control caffeine use," (p. 792) continued use even if they experience an ongoing physical or psychological problem caused or exacerbated by caffeine, and withdrawal symptoms in a 12-month period. Other optional criteria affecting severity include consuming more caffeine and over a longer amount of time than was intended, continued use that interferes with daily responsibilities at work, home, or school, continued use even when having social and interpersonal problems because of caffeine use, tolerance (needing more caffeine to get desired effect and feeling a lower effect with continued use of the same amount), spending a great deal of time to obtain caffeine, and craving.

Excessive Caffeine Use. Excessive caffeine consumption as defined by the DSM-5 is noted as being "well in excess of 250 mg" (APA, 2013, p. 538). Research has not identified a specific amount believed to be a problematic amount, though negative consequences of caffeine have been found when over 300mg of caffeine is consumed in a day (Juliano et al., 2012). Additionally, withdrawal symptoms have been found in a sample with an average intake of 222 mg per day (Hughes, Oliveto, Liguori, Carpenter, & Howard, 1998).

Impulsivity. Generally, impulsivity is understood as taking action without prior reflection or thought. It is typically discussed with a wide variation from "risky" behavior to an

action that is “inappropriate to the situation” (Evenden, 1999, p. 348). Depending on the context, impulsivity can be described differently. For example, it can be defined as an “urge,” “a blind obedience to internal drives,” or acting without thinking through consequences (Evenden, 1999, p. 349). However, the UPPS-P Impulsive Behavior Scale identifies five facets of impulsivity that include both positive and negative aspects of urgency and lack of premeditation (Cyders et al., 2007; Whiteside & Lynam, 2001).

Rural. An area is designated as “rural” if it contains less than 2,500 people (United States Census Bureau, 2016). Rural areas are known to have more socioeconomic disparity and less access to education and physical and mental health services (Cepeda-Benito et al., 2018).

Stress. Stress is described as anxiety-based tension, such as difficulty relaxing, nervous tension, irritability and agitation (Lovibond & Lovibond, 1995). It is known to be an inevitable human experience that can be healthy in some respects as a motivating factor to complete a task, for example; however, chronic stress can be harmful and can lead to issues with regulating emotions, avoidance, eating disturbances, and problematic coping (Butler, 1993).

CHAPTER TWO

LITERATURE REVIEW

Caffeine is a substance used by the majority of adults in the U.S. (Juliano, Evatt, Richards, & Griffiths, 2012; Meredith, Juliano, Hughes, & Griffiths, 2013). Although caffeine is a psychoactive drug it is generally not considered a "problem drug" (Ralph, 2015). Generally, low-to-moderate consumption of caffeine has been shown to have beneficial effects, such as increased alertness; whereas more negative effects are associated with higher levels of caffeine consumption, including physical health concerns, such as cardiovascular problems, and psychological issues, such as dependence and increased anxiety (Meredith et al., 2013; Ralph, 2015; Smith, 2002). However, many people do not consider negative effects of caffeine. The mainstream view of caffeine as a 'helpful' substance may contribute to the population's lack of concern regarding excessive caffeine consumption. The level of acceptance of the use of caffeine, in combination with the lack of fear of any detrimental consequences of caffeine, is a primary reason more information related to caffeine misuse is needed. Further, Caffeine Use Disorders have been included in the DSM-5 (APA, 2013) under the Substance Abuse Disorder section and research is severely lacking in describing what caffeine related disorders entail. This study will address the gaps of information regarding factors associated with excessive caffeine use, such as reasons for use, and expectations of caffeine use.

Theoretical Underpinnings of Substance Use

Several theories regarding substance use including methods of coping, biological effects, and psychological effects exist. For the purpose of this study, the psychosocial theories will be primarily discussed. Many psychosocial theories on substance abuse focus on alcohol or "harder" drugs. Unfortunately, a theory solely developed for caffeine does not exist. Thus,

theories of other drugs (stimulants in particular) can be assumed to apply to caffeine use, and these theories will be reviewed in greater detail in this section.

Psychosocial Theories of Substance Use

A number of theories posit that the use of psychoactive substances is the result of the psychological effects that a particular drug invokes. These theories often focus on drugs that are seen as risky or "hard" instead of something considered mild, such as caffeine. However, some theories that will be discussed can be adapted to include an understanding of caffeine's use and psychological effects.

The tension reduction theory (TRT) is a psychological model originally developed to explain alcohol use. The model explains that individuals use alcohol as a means to reduce stress (Cooper, Russell, Skinner, Frone, & Mudar, 1992). Because the sedative properties of alcohol work to reduce the experience of stress, the behavior of drinking when stressed is reinforced to be used in future stressful situations (Levenson, Sher, Grossman, Newman, & Newlin, 1980). However, studies focusing on the efficacy of the TRT have been mixed. Issues of methodology have been of particular concern. Specifically, researchers have had difficulty identifying what stressor to use to test alcohol's effects. It was found that a certain type of stressor (i.e., a social stressor versus a physiological stressor, such as an electrical shock) could confound the results of any tension reduced from alcohol. A major limitation to the TRT model is its application to alcohol and other drugs that decrease cognitive and behavioral effects, such as opioids and morphine, but not drugs that increase central nervous system activity (Greeley & Oei, 1999). Thus, the TRT framework cannot be applied to the understanding of caffeine use, a stimulating drug.

The self-medication model of alcohol use rests in the idea that people use substances to achieve a combination of both decreasing their experience of negative emotions and obtaining the intended the pharmacological effects of the drugs. The expectancy of the drug being able to relieve negative emotional states contributes to increased use of substances (Colder, 2001), and thus can cause an increase in substance abuse and risk of addiction (Khantzian, 1985). The perceived benefits of alcohol consumption cause use to be a coping strategy. However, this model has also been applied to stimulant drugs. Khantzian (1985) discussed his experience of seeing the self-medication model at work in patients he treated with cocaine dependency. He discussed two particular patients: one patient who enjoyed the effect of feeling "euphoric," while the other patient felt as though he was able to better concentrate after using cocaine (p. 1263). Khantzian (1985) reported both the mentioned patients had issues with impulsivity, significant depression, and self-esteem. The stimulating effects of cocaine are similar, though to a lesser extent, to the effects of caffeine. More recently, Suh, Ruffins, Robins, Albanese, and Khantzian (2008) found confirming evidence for the self-medication hypothesis in cocaine use; participants reported the need for more energy as a motivator for use and "restlessness" was predictive of cocaine use (p. 527).

The social learning theory originally proposed by Bandura in the 1960s outlines that the behaviors we engage in have been learned. Humans have been exposed to certain behaviors and situations in which those behaviors have been used. Additionally, these past experiences could simply be an individual observing another individual's behavior (Niaura, 2000). We use information from our environment as well as our past experience to determine how we will behave.

Social learning theory has also been used to describe substance abuse, known as Akers' social learning theory (Akers, 1985). It posits that using substances in order to cope with stress is a learned behavior. It explains that using drugs is a coping mechanism that is implemented when no other coping skill seemingly exists and when positive expectancies are related to the drug of choice (Colder, 2001). Niaura (2000) explains that this thought process of expecting a positive effect from the drug will reduce distress as an "if-then" framework. For example, "If I drink alcohol, then I will feel calmer." Further, relationships with others who engage in problematic behaviors such as substance use is a predominant feature of Akers' social learning theory. If a person has significant relationships with others who engage in substance abuse, that individual is more likely to also engage in substance abuse. The combination of being around substance use paired with the reinforcement of being in perceived positive relationships with those who engage in substance abuse is what drives a person's decision to also engage in substance abuse according to Akers' social learning theory (Ford & Ong, 2014). Akers' theory is supported in college students' use of stimulants, specifically for academic purposes. Because caffeine is a socially acceptable stimulant and perceived helpful substance, Akers' theory may be applicable to problematic caffeine use.

In summary, many substance use theories focus on alcohol use; however, some have been adapted to encapsulate use of other classes of drugs, such as stimulants. Though caffeine is a stimulant drug, it is not typically included in substance use discussions due to perceptions of caffeine being a harmless drug. Given that other stimulants have been addressed in substance abuse theories, these theories may provide a basis for understanding excessive caffeine use as well. In particular, social learning theory can take into account that caffeine use is a highly probable learned behavior. Most Americans drink caffeine on a daily basis (Meredith et al.,

2013); thus, it is a common behavior people see. Further, caffeine consumption is affiliated with positive associations such as comforting coffee shops and beneficial cognitive and psychological effects. These perceived benefits and effects will be further discussed.

Theories of Coping

Coping with distress plays a significant role in overall wellbeing, and the way coping is conceptualized varies across theorists. Lazarus and Folkman's (1984) transactional model of stress is broken down into two main parts; appraisal and coping. *Appraisal* is a determination of whether an event is important to an individual's well-being, while *coping* is how the person handles that decision with their thoughts and actions (Krohne, 2002). The appraisal component is known to be more of the cognitive part of the model. It is broken down into two stages: primary assessment and secondary assessment. The primary assessment is simply a person's decision regarding an event's importance. For example, assessing whether the event is sad, happy, etc. The secondary assessment encapsulates the identification of the resources available to help or control that event (Mistrousi, Travlos, Koukia, & Zyga, 2013). Lazarus describes the relationship between appraisal and coping as the determining factor of whether stress will take place. If there is an imbalance between appraisal and coping resources, psychological stress results. For example, if an individual appraises a situation as sad and they do not have the skills to cope with the situation, they experience distress (Krohne, 2002). Thus, the activation of stress is an individualistic experience that differs from person to person, as well as across different events within an individual. Some may find strategies to change the event itself, while others may focus on ways to change their emotions (Mistrousi et al., 2013).

Somewhat similarly, the Model of Coping Modes (MCM) focuses on individual differences in coping strategies (Krohne, 2002). Within this model, two personality-linked

characteristics—aversive stimulation and ambiguity—define a person's experience of a highly stressful situation. *Aversive stimulation* refers to the emotional arousal that causes more avoidant coping strategies to decrease the likelihood of encountering that stressful event again. On the other hand, *ambiguity* refers to the uncertainty of the event and how to respond, resulting in strategies that focus more on vigilance to decrease the likelihood of being surprised by another stressful event (Krohne, 2002). Four coping modes have been described in the context of these two constructs. First, are sensitizers. *Sensitizers* are high on vigilance but low on aversion; therefore, they focus more on information about the stressful event. Alternatively, *repressers* are high on aversion but low on vigilance. They simply avoid information related to the event, so they can avoid or decrease any future stress. The third mode is deemed as nondefensive. *Nondefensives* are low on both constructs. Thus, they tend to be more adaptable in how they handle a stressful event. Certain events may call for a different strategy for nondefensives. The final mode is high anxious. *High anxious* people are high in both vigilance and avoidance. These individuals attempt to both not put themselves in contact with stressful information and also take in any relevant information about the event. Understandably, the ability to do both of the strategies at the same time is counterintuitive, leading to a higher level of anxiety as one would have to remain vigilant in identifying and avoiding stressful stimuli. This continuous reassessment of one's environment could be an unhelpful coping strategy (Krohne, 2002).

The stress-vulnerability model for coping takes a biopsychosocial approach (Brown, et al., 1995). Several factors comprise how an individual will handle stressful events. A person may have genetic dispositions regarding how they handle stress. For example, both difficulty handling stressful events and mental illness often run in families (Mental Illness Fellowship, 2013). Personal factors, such as coping skills, social skills, and communication skills, also may play a

role. These person-specific factors in combination with environmental factors (e.g., social support, general home life) also influences how a person approaches stressful events (Brown et al., 1995). For example, a person who has a supportive social network may find comfort in communicating with family members or others closest to them.

In general, theories of coping focus on how individuals first perceive stressful situations and how they then react to them. Understandably, many people differ in their perceptions of stress. What is considered stressful for one person may not be stressful at all to another. These individual differences could vary due to life experiences and learned behavior from family members or close friends. Additionally, coping behaviors also differ between people. Some may prefer to avoid stressful situations and any potential stressors while others may attempt to create unique strategies to change the event or their reaction to the event. Issues arise when people have difficulty enacting their positive coping skills. For instance, if one cannot avoid their stressful situation or find ways to cope, they may engage in problematic behaviors, such as attempting to avoid everything by refusing to leave their house or engaging in substance use in an attempt to forget about what is troubling them. When one continues in this avoidant behavior, they may fail to identify more adaptive coping strategies which in turn exacerbates avoidance. Further, continually seeking to identify situations that require avoidance could cause hypervigilance and increase distress as described by Krohne (2002). If substance use is a person's avoidance strategy, it could lead to a pervasive ongoing issue that only causes more distress rather than alleviating it.

A Biopsychosocial Review of Caffeine and Substance Use Literature

The relevant literature on stimulant use will be reviewed generally, followed by a specific focus on the relevant literature on caffeine. A discussion of the biological and psychological

effects elicited by caffeine and stimulants will be discussed. A review of risk factors linked to stimulant use and research of individuals' coping and other motivations to use stimulants, including caffeine, will follow. Finally, a discussion of literature on the relationship between Caffeine Use Disorders and coping styles will be explored.

Biological Effects of Caffeine and Other Stimulants

Like other drugs, the brain is affected by stimulants, including caffeine. Caffeine has been found to elicit the same dopaminergic reward system as cocaine (Daly & Fredholm, 1998). Caffeine inhibits adenosine receptors, which are responsible for balancing dopamine levels. Due to adenosine receptors being made ineffective, dopamine levels rise. Also, the metabolite of caffeine, paraxanthine, increases dopamine levels. This elevated level of dopamine is present in other stimulant drugs, such as methamphetamine and cocaine. Specifically, the increase of dopamine occurs in the nucleus accumbens which is believed to be the area of the brain associated with addiction (Meredith et al., 2013). This neurological connection between caffeine and "harder" stimulants is significant. Interestingly, a study on caffeine and cocaine found that people who used cocaine as well as caffeine used less cocaine than non-caffeine users (Daly & Fredholm, 1998).

Psychological Effects of Caffeine and Other Stimulants

Caffeine is associated with several beneficial effects including increased alertness, improving concentration, and decreasing feelings of fatigue. Caffeine has also been found to improve functioning on tasks and improve mood and has been correlated with decreased suicide risk (Lara, 2010; Penolazzi et al., 2012). Because of these positive effects, caffeine use is highly common and is considered a helpful, enjoyable beverage or snack versus a drug.

Generally, caffeine is considered to be a safe substance. However, it produces some negative consequences when consumed in excess of 300-400 mg, including disruption in sleeping patterns, higher levels of anxiety, and potential physical dependence (Juliano et al., 2012; Lara, 2010). Hughes et al. (1998) also found that 17% of their sample reported tolerance symptoms to caffeine and 18% endorsed enough symptoms to achieve a diagnosis of caffeine withdrawal. It should be noted that Hughes et al.'s (1998) sample reported a mean daily intake of 222 mg which is under the national average of 280 mg per day (Juliano et al., 2012). Over 95% of Juliano et al.'s (2012) sample endorsed two or more withdrawal symptoms after ceasing their caffeine use. On average, participants experienced six symptoms with headaches, cravings, difficulty concentrating, and fatigue being the most endorsed.

Individual Differences in Caffeine Users

Individual characteristics, such as age, gender, and personality traits, have been linked to differences in caffeine use. Research regarding gender differences in caffeine intake is mixed. Men have been found to use caffeine in higher amounts than women in some studies (e.g., Penolazzi et al., 2012); whereas, others have found the opposite or no gender differences at all (e.g., Brice & Smith, 2002). Penolazzi et al. (2012) speculate caffeine consumption differs based on gender because of potential work differences (e.g., occupation type, schedules), though these claims have yet to be substantiated.

In addition to gender as a potential risk factor for excessive caffeine consumption, age has also been linked to rate of caffeine use. Age is positively correlated with caffeine use; older adults reported higher intake of caffeine (Penolazzi et al., 2012). Young adults, ages 20 to 29, have the lowest amount of caffeine consumption when compared to other adult age groups. Those who were students and were not employed consumed even less caffeine, although

upperclassmen consumed more caffeine than younger students, affirming the age effect (Brice & Smith, 2002).

Personality constructs have also been linked to higher caffeine use. Specifically, impulsivity and sensation-seeking traits have been positively correlated with caffeine use. Impulsivity and sensation seeking have also been associated with lower baseline dopamine levels. This may influence people with higher impulsivity and sensation seeking to intake more caffeine so they can maintain a high level of dopamine activation (Penolazzi et al., 2012). However, Adan (1994) found personality differences (higher levels of neuroticism) when caffeine was consumed via cola beverages. Specifically, participants with higher neuroticism scores consumed more caffeine from sodas. Thus, differences of effects and patterns of use may exist in the particular sources of caffeine, in addition to personality factors.

A difference in caffeine consumption has been found between people who prefer morning time (i.e., high “morningness”) and those who prefer evening time (i.e., high “eveningness”) (Brice & Smith, 2002; Penolazzi et al., 2012). People higher in morningness start their day earlier and thus are more likely to drink caffeine in the morning hours while people who are higher in eveningness tend to consume more caffeine so they can stay awake during the evening hours. Eveningness people also tend to consume more caffeine perhaps because they have more time throughout their day to do so (Adan, 1994; Penolazzi et al., 2012). This finding has been replicated several times and in different countries including the U.S., the U.K., Italy, and Japan (Brice & Smith, 2002; Penolazzi et al., 2012). Morningness and eveningness people also differ on their preferred source of caffeine. People who are high morningness tend to consume caffeine from tea, while people who are high in eveningness consumed caffeine more from coffee or soda (Penolazzi et al., 2012).

It is clear many individual differences exist when it comes to caffeine use. Caffeine use tends to increase with age (Penolazzi et al., 2012), may differ among genders, and differences in consumption and beverage type depend on individuals' preferred time of day. However, research has been mixed, and this area of interest remains under investigation. The relationship of gender and caffeine use is largely unknown. Some studies indicate men are more likely to be caffeine users, while other studies have found no difference between men and women. Additionally, a major missing piece of information is the fact that caffeine comes in many different forms. It is possible people will differ depending on their choice of caffeine source. Coffee drinkers may have different personality constructs or patterns of use when compared to tea drinkers or energy drink consumers, for instance. Variations in caffeine sources are likely given that a person's chosen caffeine sources can differ depending upon their preferred time of day (morning versus evening), (Penolazzi et al., 2012).

Risk Factors Associated with Caffeine and Other Stimulant Use

Studies have also been conducted to determine the risk factors related to problematic stimulant and caffeine use. Partridge et al.'s (2013) study identified several risk factors related to prescription stimulant use including being a white male, belonging to a fraternity or sorority, having a low-grade point average (GPA), engaging in other substance abuse, and considering prescription stimulant use acceptable. Interestingly, participants who endorsed more prescription stimulant use by friends were at increased risk for use. Participants who considered stimulants as a helpful study strategy were also at increased risk of use. These findings support tenants of Aker's social learning theory (Ford & Ong, 2014), including that behaviors are learned via close relationships that individuals attempt to maintain by engaging in the same behaviors as friends or significant others engage in. This social normalcy also normalizes the behavior even if it is

negative. Users of non-medical prescription stimulants have been found to be at risk for other problematic issues in the future. For instance, they are more likely to use other drugs including alcohol in higher doses (Partridge et al., 2013).

Walker, Abraham, and Tercyak (2010) found that adolescents with ADHD were twice as likely to use caffeine as compared to adolescents without ADHD. Conversely, Martin, Cook, and Woodring (2008) found that higher caffeine use was associated with more self-reported and parent-reported symptoms of ADHD in adolescents. Low amounts of caffeine have been found to be benefical in ADHD treatment. Barry, Christopher, and Sloman (1981) found that when 10mg of caffeine was added to an adolscents‘ methylphenidate, it improved their sypmtom management. Further, they found no difference in symptom management between only 10mg of caffeine treatment versus only 10mg methylphenidate treatment. This idea of caffeine as a treatment option has been rejected over the years though it has been speculated that individuals with ADHD may consume more caffeine as a self-medication strategy in order to receive added benefits on their cognition such as attention and focus (Ioannidis, Chamberlain, & Müller, 2014; Walker et al., 2010).

Nicotine, another legal stimulant similar tot hat of caffeine, has been found to be used more among rural populations (Roberts et al., 2016), perhaps due to ease in accessibility but also cultural acceptance. Rural areas tend to have less laws restricting smoking. Further, lack of resources including less opportunity for educational and financial advancement are positively correlated with increased risk of smoking (Roberts et al., 2016). Nicotine has also been found to have similar psychological effects to that of caffeine, such as, decreasing stress and anxiety, improving people’s perception of their functioning, and avoiding withdrawal symptoms (Benowitz, 2010). Though research on caffeine use in rural areas has not yet been explored, in

thinking of individuals living in rural areas and their caffeine use specifically, these individuals typically have longer commutes to and from work, and therefore have longer work days. These logistical factors may increase the likelihood of caffiene consumption in order to stay awake and alert. Due to the lack of research on caffiene use in rural areas, it is currently unknown if caffiene is consumed more in rural populations than in urban populations, as has been found in nicotine use.

Coping and Other Motivations behind Caffeine and Other Stimulant Use

Research supports the idea of people using substances in order to cope with stress. Specifically, the need for coping increases the frequency of the drug use (Gregg, Haddock, Emsley, & Barrowclough, 2014). However, research regarding caffeine use specifically as a coping strategy is significantly limited; although, research has shown people consume more caffeine use during periods of stress (Ratliff-Crain & Baum, 1990). The literature has more findings on general stimulant use.

Stewart, Karp, Pihl, and Peterson (1997) surveyed college students about their alcohol and illicit drug use (marijuana, cocaine, and heroin) and the reasons for using the substances. Additionally, students' anxiety sensitivity levels, or how students perceive anxiety symptoms, were assessed. The researchers explored whether participants' use in substances was a means to cope with anxiety or depression. Around 70% of participants reported using alcohol and/or drugs within the previous month. A significant positive correlation was found among women and using substances to cope with anxiety and depression. A similar finding was also found in a study conducted by Jacobsen and Hansen (1988) that included caffiene. The researchers found women consumed more amounts of caffeine if they experienced depression or if they endorsed having trouble finding alternative coping strategies. In Stewart et al.'s (1997) study, men's illicit

substance and alcohol use, in contrast, was not significantly correlated with coping with anxiety or depression. No significant gender difference was found between the anxiety sensitivity levels of students who reported substance use and those who did not. Coping with anxiety or depression was not found to be a common reason for substance use, though 22% of substance users reported using for tension reduction. In accordance with the tension reduction model, participants viewed consuming substances decreased feelings of stress (Stewart et al., 1997).

In a study investigating substance use motivation conducted by Stewart et al. (1997), college students responded to surveys regarding class of drugs they used, including both licit and illicit substances, (i.e., alcohol, marijuana, tranquilizers, caffeine, stimulants, heroin, cigarettes, cocaine, psychedelics, and analgesics) within the last year. Students were instructed to choose one reason for their drug use out of seven choices for each class of drug they endorsed. The response options were the following: "when I was feeling nervous, excited, tense, restless, or afraid; to avoid feeling nervous, excited, tense, restless, or afraid; when I was feeling depressed, lonely, sad, frustrated, or angry; to avoid feeling depressed, lonely, sad, frustrated, or angry; for social-recreational purposes; to perk me up or get me going; to keep me going" (Stewart et al., 1997, p. 231). Caffeine was used by 94% of the participants, second only to alcohol use which was endorsed by 96% of the sample. While coping was found to be the primary reason for alcohol use, cognitive enhancement was the primary reason for caffeine use. Neither caffeine use in general, nor specifically for enhancement, was found to be correlated with anxiety sensitivity levels (Stewart et al, 1997). However, another study found significant effects of stimulant use for purposes other than enhancement. In a college student sample, Partridge, Bell, Lucke, and Hall (2013) found students use prescription stimulants both to cope with their academic obligations and as a way to "get high."

A body of research has implicated the predominant reason for stimulant use to be the improvement of concentration as a study aid (e.g., Ford & Ong, 2014; Jensen, Forlini, Partridge, & Hall, 2016; Partridge et al., 2013). College students' non-medical use of prescription stimulants to improve their cognitive abilities has been termed "pharmaceutical cognitive enhancement" (Jensen et al., 2016; Partridge et al., 2013). Though substance use is usually conceptualized as an emotion-focused coping strategy, Ratliff-Crain and Baum (1990) speculated that stimulant and caffeine use as a means of coping is problem-focused rather than emotion-focused. In other words, people used caffeine to stay awake to complete a task rather than as a way to actively alleviate the stress with the caffeine itself. Jensen and colleagues (2016) found that problem-focused coping was a common theme for students who engaged in pharmaceutical cognitive enhancement. Additionally, substance use accounted for most of the problem-focused category. It should be noted that in addition to pharmaceutical stimulants, Jensen et al. (2016) also measured caffeinated beverages, such as coffee, tea, and energy drinks. Further, most students endorsed using caffeinated beverages and snacks over non-prescription stimulants.

Caffeine, a drug included under the umbrella of stimulants, has consistently been found to be used as a means for cognitive enhancement. Research has begun to separate caffeine from other stimulants; however, the inconsistency among studies and what is defined as a stimulant and if it is different from caffeine complicates research findings. While caffeine is considered a stimulant due to its pharmacological properties, it is often considered to not be dangerous due to significantly fewer perceived issues than other stimulants, such as cocaine. The inconsistency also makes it difficult to decipher if motivations for general stimulant use are the same as caffeine use. For instance, it is known stimulants are used to "get high" (Partridge et al., 2013),

but can we say the same about caffeinated beverages or snacks? Research has found both stimulants and caffeine specifically can be used for coping purposes, but future research is needed to differentiate between different types of stimulants to get a clearer picture of what drives caffeine use specifically, or if motivations are the same for all stimulants. These findings can have significant impact in what could become problematic and how to manage motivations for stimulant use.

Excessive Caffeine Use as a Substance Use Disorder

Researchers' views on whether Caffeine Use Disorder is a valid Substance Use Disorder are mixed. Dews, O'Brien, and Bergman (2002) do not endorse the idea of caffeine disorders and argue that withdrawal symptoms from caffeine are essentially manageable and the drug cannot be abused. Dews et al. (2002) also state that, because dependence on a drug is defined by the appearance of withdrawal symptoms, caffeine disorders are not real issues. However, withdrawal symptoms, however manageable they may appear to be, have been found among caffeine users. Symptoms can include headaches, trouble with concentration, low mood, irritability, and drowsiness (Juliano et al., 2012; Meredith et al., 2013). Additionally, Juliano et al. (2012) disagree based on results of their study surveying 275 participants wherein almost 90% indicated they experienced failed attempts to reduce or eliminate their use of caffeine, which is a common factor of other Substance Use Disorders that warrant more intensive treatment (Juliano et al., 2012). Over 40% of participants were recommended by a health provider to limit their caffeine use due to health concerns such as cardiovascular problems, anxiety, sleep problems, low blood sugar, and headaches.

Due to the fact excessive caffeine use has been linked to negative consequences similar to that of other substance use disorders, value exists in the relevancy of having diagnostic criteria

for caffeine-related disorders. Caffeine-related disorders are also unique compared to the other Substance Use Disorders in that caffeine is not typically considered a problematic substance with significantly impairing effects. However, not all researchers support the inclusion of caffeine-related disorders in the DSM because of skepticism in the clinical significance of symptoms and problems caused by caffeine use. While research has explored the existence of negative effects from excessive caffeine use, the severity of these effects has not convinced the discipline as a whole that it is a major issue warranting its own diagnoses.

Purpose of Study

For years, caffeine related disorders were included in the DSM as a topic for further study. With the DSM-5, caffeine-related disorders, Caffeine Intoxication and Caffeine Withdrawal, were officially included as a set of formal diagnoses with Caffeine Use Disorder as a condition for further study. Due to its recent addition, not much is known about the prevalence of caffeine-related disorders; therefore, information regarding its presentation, as well as its treatment options, is limited. In general, caffeine is seen as a potentially problematic substance; however, health professionals do not often question caffeine use because it is not seen as a "hard" drug or an addictive drug (Pohler, 2010). This perception could also be due to the easy accessibility of caffeine. Along with traditional coffee, tea, and soda, caffeine is also included in chocolate and other snacks created specifically to give the energy boost associated with the drug (Caffeine Content, 2014; Penolazzi, Natale, Leone, & Russo, 2012). Because the symptoms associated with excessive caffeine use tend to fall into categories of nervousness, irritability, and fatigue (American Psychiatric Association, 2013), many professionals may automatically associate them with a different mental disorder. For example, all of the above-mentioned symptoms also fall into several depressive and anxiety disorders. Thus, because it is much more

typical to see anxiety or depression in a clinical office, the practitioner is more likely to write a mood disorder on a diagnostic profile versus caffeine dependence.

The models of coping and theories of substance abuse have not been applied to caffeine. Though caffeine is not considered a "hard drug," it is a highly common psychoactive substance that can cause negative physical and psychological effects (Pohler, 2010). Further, with the inclusion of caffeine intoxication and withdrawal in the DSM-5, more research regarding the use and misuse of caffeine will be important to determine implications for treatment. The objective of this current study was to address the gaps related to problematic caffeine use.

This study aimed to first validate measures of caffeine use using a modified version of a well-known substance abuse measure. Secondly, this study sought to determine if caffeine is used as a means of coping with stress as other substances have been found to be (Colder, 2001; Cooper et al., 1992, Gregg et al., 2014; Niaura, 2000). It was hypothesized that caffeine would be used to cope with stress considering its social acceptance and accessibility. The third aim of this study was to determine the particular facets of impulsivity associated with caffeine use. It was hypothesized that in particular, higher scores of Negative Urgency, Sensation Seeking, and Lack of Perseverance facets of impulsivity would be associated with higher consumption of caffeine. Finally, the fourth aim of this study was to describe individual differences that are not adequately represented in the literature, specifically individuals living in rural areas. It was hypothesized that caffeine use would be higher in individuals from rural areas due to the accessibility and lack of other resources related to coping.

CHAPTER THREE

METHODS

Participants

To achieve adequate power, according to Tabachnick and Fidell's (2013) equation for multivariate analyses sample sizes, 180 undergraduate student participants were solicited from the Georgia Southern University SONA system. Students are encouraged to participate in research as a potential manner for credit in psychology classes. Students have the ability to choose the studies or experiments in which they participate; those who choose alternative activities write brief reviews of scientific publications in peer-reviewed journals. Students received one unit of credit for their participation in this study. All students over the age of 18 were eligible for participation. Additionally, all ethnicities and genders were included. Students who did not endorse caffeine use were allowed to participate and received credit for the study and their data was removed from the final analyses.

A total of 371 students participated in the survey. As the result of an administrative error (i.e., incomplete administration of measures), 191 participants' responses (51.5%) were removed from final analyses due to substantial missing data. Of the 180 remaining participants, participants who answered less than 90% of survey items were removed (N = 9), resulting in a final participant number of 171. The sample was predominantly female (80.7%, N =138). The mean age was 19.35 (SD = 2.69). Regarding sexual orientation, 85.4% of the sample identified as heterosexual, 2.9 % identified as lesbian, 5.8% as bisexual, 2.9% as "other," and 2.3% preferred not to say. The sample was primarily Caucasian/white (61.4%), followed by African American/Black (25.1%), Hispanic (6.4%), Asian/Asian-American (3.5%), Pacific Islander

(1.2%), and "other" (2.3%). In regard to childhood geographical status, 31.3% reported growing up in a rural town/city.

Measures

Demographics. Each participant completed a questionnaire regarding demographics (e.g., age, gender, sexual orientation, race). Additionally, geographical location of childhood residence determined rural versus suburban/urban status.

Self-reported caffeine consumption. Participants reported daily sources of caffeine and number of servings of each source consumed. The Caffeine Audit, adapted from Hale and Davis (1986), calculated participants' daily caffeine intake in milligrams (mg). Participants indicated the specific caffeinated beverages (e.g., tall Starbucks coffee, chai tea) or snacks (e.g., milk chocolate) that they consume on a daily basis. A list outlining common caffeinated beverages and snacks along with the serving size was included with a text box for participants to type in the number of servings they consume.

Coping strategies. Participants completed the COPE Inventory, a questionnaire assessing individual coping strategies used when experiencing stress (Carver, Scheier, & Weintraub, 1989). Traditionally the measure consists of 15 subscales, including: Positive Reinterpretation and Growth, Mental Disengagement, Focus on and Venting of Emotions, Use of Instrumental Social Support, Active Coping, Denial, Religious Coping, Humor, Behavioral Disengagement, Restraint, Use of Emotional Social Support, Substance Use, Acceptance, Suppression of Competing Activities, and Planning (University of Miami, 2007). Participants rated their responses to 60 statements on a four-point Likert scale from '1' (*I usually don't do this at all*) to '4' (*I usually do this a lot*). For the purpose of this study, only the Active Coping and Substance Use subscales were analyzed, for a total of eight items. The Active Coping subscale has been

found to have adequate internal consistency with a α = .70, and the Substance Use subscale has demonstrated high internal consistency with α = .93 (Cook & Heppner, 1997) and yielded similar reliability in the current study for the Adaptive Coping (α = .72) and Substance Use (α = .95) subscales.

Effect of caffeine. The Effect of Caffeine Use Scale (ECUS; Ralph, 2015), created to be a screening measure for problematic caffeine use, measured participants' experiences of their caffeine use. Participants rated their responses to 19 statements on a six-point Likert scale from '1' (*Strongly disagree*) to '6' (*Strongly agree*). Items focus on individuals' specific physiological experiences (e.g., "I consume caffeine to avoid unpleasant effects such as headaches, fatigue, anxiety, difficulty concentrating, depression or flu-like symptoms") and psychological experiences (e.g., "I have consumed enough caffeine even though I haven't wanted to"). Three of the 19 items were reverse scored, and participant's endorsed rating of each item is totaled to elicit a total ECUS scale. Higher scores on the ECUS indicate a higher possibility of Caffeine Use Disorder. The ECUS has demonstrated high internal reliability in previous research, with α = .94 (Ralph, 2015). In the current study, the ECUS yielded an α of .90.

Psychological functioning. The Depression Anxiety Stress Scales-short version (DASS21) measured participants' depression, anxiety, and stress levels (Lovibond & Lovibond, 1995). The DASS21 contains seven items per scale for Depression, Anxiety, and Stress. Participants rated their responses to statements regarding their mood on a four-point Likert scale with 0 (*Did not apply to me at all*) to 3 (*Applied to me very much, or most of the time*). When used for young adults, the DASS21 has yielded adequate internal consistency on all three scales with Depression α = .90, Anxiety α = .83, and Stress α = .86 (Mahmoud, Hall, & Staten, 2010)

and yielded comparable psychometric properties in this study: Depression, α = .91; Anxiety, α = .80; and Stress, α = .86.

Impulsivity. The UPPS-P Impulsive Behavior Scale measured different aspects of impulsivity across five different subscales: Negative Urgency, Positive Urgency, (Lack of) Premeditation, (Lack of) Perseverance, and Sensation Seeking (Cyders et al., 2007; Whiteside & Lynam, 2001). Participants rated their agreeableness to 59 statements on a 4-point Likert scale from '1' (*Agree strongly*) to '4' (*Disagree strongly*). Negative Urgency measures impulsivity when experiencing negative emotions, while Positive Urgency measures impulsivity when experiencing positive emotions. Lack of Premeditation assesses impulsive reactions made without thought or reflection, Lack of Perseverance focuses on difficulty focusing on tasks without being distracted, and Sensation Seeking measures the likelihood of experiencing pleasure from and being open to new and exciting activities. The five subscales have demonstrated adequate internal consistency in previous research: Negative Urgency α = .88, Positive Urgency α = .95, Lack of Premeditation α = .87, Lack of Perseverance α = .82, and Sensation Seeking α = .86 (Amlung et al., 2013). The UPPS-P yielded similar psychometric properties in this study: Negative Urgency, α = .88; Positive Urgency, α = .93; Lack of Premedication, α = .85; Lack of Perseverance, α = .83; and Sensation Seeking, α = .85.

Negative Consequences of Caffeine Use. The Inventory of Drug Use Consequences, Lifetime (InDUC 2-L) measures lifetime consequences of alcohol and drug use. The InDUC 2-L is a self-report measure with 50 items to assess the negative consequences of drug use. Five types of consequences are tested with the InDUC 2-L: Physical, Interpersonal, Intrapersonal, Impulse Control, and Social Responsibility (Tonigan & Miller, 2002). Participants answered "yes" or "no" to statements with "yes" responses scoring as 1 point while "no" responses are

scored as 0 points. Three out of the five scales have demonstrated adequate reliability: Interpersonal α = .73, Impulse control α = .92, and Social Responsibility α = .88. The Physical scale yielded inadequate reliability α = .68 and the Intrapersonal scale yielded low reliability α = .33 (Tonigan & Miller, 2002). The InDUC 2-L was adapted from its original item focus on alcohol and drug use to caffeine use. Some items were reworded, and others were excluded due to a lack of relevance to caffeine (i.e., "I have been arrested for offenses related to my drug use.). In the current study, the adapted InDUC 2-L demonstrated strong reliability overall (α = .75).

Attention Deficit Hyperactive Disorder (ADHD) Symptoms. The Barkley Adult ADHD Rating Scale-IV (BAARS-IV) is a self-report measure of reporting current ADHD symptoms. Participants rated their responses to statements regarding their experience of ADHD symptoms on a four-point Likert scale with 1 meaning (*Never or rarely*), 2 (*Sometimes*), 3 (*Often*), and 4 (*Very often).* The subscales have demonstrated good reliability: Current Inattention α = .90, Current Hyperactivity α = .78, Current Impulsivity α = .81, Current ADHD Total α = .91 (Barkley, 2011) and, Sluggish Cognitive Tempo α = .79 (Lunsford-Avery, Kollins, & Mitchell, 2018). In this study, Current Inattention (α = .88), Current Hyperactivity (α = .73), Current Impulsivity (α = .81), Sluggish Cognitive Tempo (α = .88), and Current ADHD Total (α = .93) all fell in the acceptable range in terms of reliability.

Design

This study proposed a cross-sectional, non-experimental design online using the Qualtrics platform. Participants were required to participate in one 60-minute session where they completed a battery of self-report questionnaires. Participants' demographic information (age, gender, sexual orientation, race, and geographical location of childhood residence) were collected. Impulsivity, depression, anxiety and stress were the predictor variables tested for their

relationship to the amount of caffeine consumption, negative effects, and consequences of caffeine consumptions which were the outcome variables.

This design posed a number of strengths. Specifically, because of the study's cross-sectional nature, sample attrition was not an issue and maturation effects were of less concern. Additionally, a greater number of participants were able to participate in a short amount of time, which in turn decreased the possibility of history effects.

Procedures

The study was based online using Qualtrics software. At the beginning of the study, participants read an informed consent form and indicated consent by clicking the "Consent" feature before moving forward. Those who did not provide consent to participate in the study were immediately re-directed to an exit page without penalty. Following indication of consent, participants entered their demographic information before completing the six questionnaires. The questionnaire order was randomized for each participant as to minimize ordering effects. Participants' responses were anonymous. Their responses were coded with a random computer-generated number assigned by the researcher. Following completion of the questionnaires, participants were debriefed and automatically received one hour of research credit for their participation in the study.

Statistical Analysis

A series of descriptive and inferential statistics were conducted. A preliminary analysis for all measures, including demographic information, consisted of frequency distributions, reliability analyses, and bivariate correlational analyses.

The first aim was to determine the psychometric properties of a modified measure of problematic caffeine use using reliability analyses.

The second aim of this study was to determine the extent to which caffeine use is used as a coping mechanism for distress. This was addressed by using a multiple regression to determine whether the experience of psychological distress and coping mechanisms act as predictors for problematic caffeine use.

To address the third aim of this study, a second multiple regression was used to determine the extent to which the five impulsivity traits are predictive of excessive use of caffeine.

Individual differences in relation to excessive caffeine use are largely underrepresented in the research, as well as the extent to which they may be associated with geographical location. Thus, the fourth (exploratory) aim of this study sought to determine differences in regular and problematic caffeine use based on geographical status using an odds-ratio analysis.

CHAPTER 4

RESULTS

Preliminary Analyses

Descriptive statistics of the sample revealed the amount of caffeine intake varied greatly among participants. Generally, reports ranged from 0 mg daily intake to 38,948 mg (*SD* = 3,092.44). Upon viewing the frequency distribution of total caffeine consumption, two outliers (38,948 mg and 10,808 mg) were removed as they were deemed to be extreme amounts improbable to be consumed in a 24-hour period. The maximum amount without the above-mentioned outliers was 2,483 mg averaging 399 mg per day (*SD* = 463.85). Men reported an average caffeine intake of 224.3 mg per day (*SD* = 270.46), while women reported an average of 444.84 mg per day (*SD* = 492.01).

Bivariate correlational analyses assessed linear relationships among caffeine use and key variables related to motivation, psychological distress, expectations, coping behaviors, and motivations. Pearson's bivariate correlations revealed non-significant relationships among caffeine use and all subscales of ADHD (as measured by the BAARS). Pearson's correlation values are reported in Table 1.

Table 1

Correlations of Total Caffeine Consumption and ADHD Symptoms.

	1	2	3	4	5	6
1. Caffeine AUDIT-total	-	-	-	-	-	-
2. BAARS-Inattention	.03	-	-	-	-	-
3. BAARS-Hyperactivity	.03	.62**	-	-	-	-
4. BAARS-Impulsivity	-.02	.52**	.54**	-	-	-
5. BAARS-Cognitive Tempo	.08	.70**	.54**	.49**	-	-
6. BAARS-Total Symptom Count	.13	.61**	.45**	.41**	.59**	-

**. Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)

The InDUC-2L was adapted from a measure of negative consequences for alcohol use to a focus on negative consequences of caffeine use. For the purposes of identifying the psychometric properties of the InDUC-2L as related to caffeine use (Aim 1), reliability analyses were conducted. Overall, the subscales demonstrated low reliability: Physical $\alpha = .35$, Interpersonal $\alpha = .49$, Intrapersonal $\alpha = .62$ Impulse control $\alpha = .56$, and Social Responsibility $\alpha = .28$. However, the overall InDUC-2L score yielded acceptable reliability, $\alpha = .75$.

Overall caffeine use was significantly and positively associated with the total amount of negative consequences (i.e., InDUC 2-L total score) as it yielded a small, positive relationship with caffeine use ($r = .18$, $p < .05$). The individual subscales of the InDUC 2-L—Physical Problems, Interpersonal Problems, Intrapersonal Problems, Social Responsibility, and Impulse Control—were not statistically correlated with caffeine use. Pearson's correlation values are reported in Table 2. However, a bivariate correlation between the InDUC 2-L and the ECUS

yielded a significant positive correlation, $r = .63$, $p < .01$, indicating that the InDUC 2-L is a good measure given its convergent reliability with an empirically proven measure.

Table 2

Correlations of Total Caffeine Consumption and Negative Consequences of Use.

	1	2	3	4	5	6	7
1. Caffeine AUDIT-total	-	-	-	-	-	-	-
2. InDUC-Physical	.15	-	-	-	-	-	-
3. InDUC - Interpersonal	.01	.31**	-	-	-	-	-
4. InDUC - Intrapersonal	-.01	.36**	.35**	-	-	-	-
5. InDUC - Impulse Control	-.01	.28**	.59**	.33**	-	-	-
6. InDUC - Soc. Responsibility	.07	.33**	.45**	.43**	.31**	-	-
7. InDUC – Total	.18*	.44**	.54**	.37**	.55**	.12	-

**. Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)

Reports of negative physiological and psychological effects of caffeine were positively associated with higher caffeine use, $r = .17$, $p < .05$, as measured by the ECUS. However, no significant relationships were found between caffeine use and the DASS21. Pearson's correlation values are reported in Table 3. No significant bivariate correlations were found among measures of impulsivity as measured by the UPPS-P and caffeine use. Pearson's correlation values are reported in Table 4.

Table 3

Correlations of Total Caffeine Consumption, Psychological Symptoms, and Coping Mechanisms.

	1	2	3	4	5	6	7
1. Caffeine AUDIT-total	-						
2. ECUS Total	.17*	-					
3. DASS- Stress	.04	.21**	-				
4. DASS- Anxiety	-.03	.20*	.80**	-			
5. DASS-Depression	-.00	.18*	.75**	.66**	-		
6. COPE-Adaptive	-.01	.19*	.10	.10	.14	-	
7. COPE-Substance Use	-.04	.11	-.06	-.16*	-.04	.02	-

**. Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)

Table 4

Correlations of Total Caffeine Consumption and Impulsivity.

	1	2	3	4	5	6
1. Caffeine AUDIT-total	-					
2. UPPS-Neg Urgency	.10	-				
3. UPPS-Pos Urgency	.10	.63*	-			
4. UPPS-Premeditation	.05	.26**	.39**	-		
5. UPPS-Perseverance	.02	.28**	.34**	.56**	-	
6. UPPS-Sensation Seeking	-.04	.16*	.38**	.10	-.14	-

**. Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)

Predicting Caffeine Use

A series of hierarchical multiple regression analyses (MRA) were conducted to test the extent to which coping methods and facets of impulsivity predict overall caffeine use, respectively.

Caffeine use and coping. The first MRA examined reports of psychological distress, specifically stress, anxiety, and depression, to determine if psychological distress and coping mechanisms used would predict overall caffeine use. The combination of psychological distress and adaptive and substance use coping on caffeine consumption was nonsignificant, accounting for about 1% of the variance in overall caffeine use, R^2 = .12, adjusted R^2 = .01, F (5, 152) = .15, p = .82. Unstandardized (B) and standardized (ß) regression coefficients and squared semi-partial correlations (sr^2) for reach predictor in the regression model are reported in Table 5.

Table 5

Multivariate Regression of Total Caffeine Consumption and Coping Mechanisms with Psychological Distress.

	Unstandardized *B*	Standardized ß	sr^2
Caffeine AUDIT-total	862.64	-	-
COPE-Adaptive	-.26	.00	.00
COPE-Substance Use	-57.02	-.05	-.05
DASS- Stress	142.36	.20	.10
DASS- Anxiety	-136.30	-.17	-.10
DASS- Depression	-27.10	-.04	-.03

Caffeine use and impulsivity. In the second MRA, facets of impulsivity were examined as predictors of overall caffeine consumption. Impulsivity, as measured with the UPPS-P, predicted less than 2% of caffeine use R^2 = .02, adjusted R^2 = -.01, F (5, 145) = .69, p = .63. Unstandardized (B) and standardized (ß) regression coefficients and squared semi-partial correlations (sr^2) for each predictor in the regression model are reported in Table 6.

Table 6

Multivariate Regression of Total Caffeine Consumption and Impulsivity.

	Unstandardized *B*	Standardized ß	sr^2
Caffeine AUDIT-total	1152.18	-	-
UPPS-Neg Urgency	14.17	.03	.03
UPPS-Pos Urgency	45.15	.13	.08
UPPS-Premeditation	31.57	.05	.04
UPPS-Perseverance	-51.99	-.08	-.06
UPPS-Sensation Seeking	-52.62	-.12	-.10

Caffeine Use and Rurality

A nonparametric odds-ratio (risk) analysis was conducted to test the final, exploratory aim of this study regarding the likelihood of engaging in problematic caffeine use based on childhood geographic location (i.e., rural vs. nonrural). The increased odds of higher caffeine use in those from a rural area was non-significant, OR = 1.37, 95% Confidence Interval = .67, - 2.77.

CHAPTER 5

DISCUSSION

The current study sought to explore problematic caffeine use and predictors of high caffeine consumption. Specifically, the study explored psychological experiences, coping mechanisms, and impulsivity traits to determine the extent to which caffeine use was associated with or predicted by the abovementioned factors. The current study's research design was guided by social learning theory and the stress-vulnerability theory of coping. Though caffeine intoxication and caffeine withdrawal diagnoses have been included in the DSM-5 with Caffeine Use Disorder labeled as a topic for further study; little is known about problematic caffeine use, its predictors, and its effects on mental health. In order to explore the answers to these questions, a cross-sectional, non-experimental design using surveys was used to assess caffeine consumption and its associations and potential predictors of increased use.

Measuring the Negative Consequences of Caffeine Use

Research is significantly limited in identifying negative consequences of caffeine use. The current findings yielded some areas in which problematic caffeine use affected participants' lives. This study attempted to determine participants' experiences of negative consequences of caffeine use by modifying an existing measure of negative alcohol-related consequences, the InDUC-2L. Though items believed to be irrelevant to caffeine use were excluded at the onset of the study (e.g., "I have spent time in jail or prison because of my caffeine use), other low-probability items were still included (e.g., I have gotten into a physical fight because of my caffeine use). A reliability analysis of the modified InDUC-2L revealed poor reliability of all subscales related to caffeine use; however, the reliability of the total modified InDUC-2L was

acceptable and can thus be interpreted. Overall, participants who reported more caffeine use also reported greater negative consequences of their caffeine use.

The disconnect between the illicit/licit labels between alcohol and caffeine may have impeded some of the attempts to measure true negative consequences of caffeine use considering participants did report negative effects of caffeine use. Given the difference of alcohol and caffeine, it may be that the problems caused by alcohol are not the same as any problems that could be caused by caffeine. For instance, negative consequences of caffeine use may not be seen as severe or problematic. An adapted measure focusing on the consequences of other stimulant use such as cocaine may have yielded higher reliability. Consequences of caffeine intake could be more related to issues regarding attention, craving, psychological dependency, or withdrawal which have been established in the literature (Juliano et al., 2012; Meredith et al., 2013).

This study found significance in reports of negative/problematic experiences related to caffeine use as measured by the ECUS. The ECUS was developed as a potential screening tool for Caffeine Use Disorder and included items related to the proposed criteria in the DSM-5 (i.e., difficulty cutting down use, tolerance, withdrawal symptoms, needing caffeine to function). This finding is also important in the consideration for Caffeine Use Disorder as a diagnosable condition. Recently, Ágoston, Urbán, Richman, and Demetrovics (2018) also developed a measure to assess Caffeine Use Disorder and found the highest issues reported by participants endorsing the most criterion (higher severity of the disorder) were “failure to fulfill obligations/interpersonal problems” while reports of “consumption of more caffeine or longer than intended and craving” were associated with a lower severity. In accordance with Ralph

(2015) and Ágoston et al. (2018), participants in this study indicate true impairment in individuals' functioning related to caffeine use, supporting its inclusion in the DSM-5.

Caffeine, Psychological Distress, and Coping

Little is known about the extent to which caffeine consumption is used as a coping mechanism, particularly in contrast to other substances. The current study found that while increased caffeine consumption was significantly and positively correlated with problematic use, no statistically significant relationships were revealed among caffeine use and self-reports of stress, depressive symptoms, or anxiety symptoms.

Interestingly, though statistically insignificant, increased caffeine use was positively associated with stress while it was negatively associated with anxiety and depression reports. Research has shown conflicting evidence between caffeine and anxiety and depression. Some studies have found associations between increased anxiety and increased depression with higher caffeine use (Irons et al., 2014; Lara, 2010; Veleber & Templer, 1984), while others have found decreased anxiety with caffeine use (Smith, 2008). Some findings suggest the specific amount of caffeine consumed may delineate the place where anxiety and depression symptoms shift from a positive to a negative trend (Lara, 2010). A more recent study found that people were less susceptible to negative feelings after consuming 400mg of caffeine (Giles, Spring, Urry, Moran, Mahoney, & Kanark, 2017). However, Giles et al.'s (2017) study was an experimental study that provided participants with caffeine to observe potential effects on their perceptions of negative images rather than observing if participants would seek caffeine on their own.

The current study found a slight positive trend in the association between stress and caffeine use, in support of previous studies (Gregg et al., 2014; Ratliff-Crain & Baum, 1990) though this study's findings were non-significant. Currently, the question of caffeine

consumption and its relation to problematic psychological symptoms remains unclear. It is possible that caffeine is less associated with negative symptoms but has strong associations to positive symptoms. Additionally, as previously discussed, caffeine use is a normalized, socially condoned and somewhat encouraged behavior and lends itself to fall into a social learning construct. As stated in Akers' social learning theory, one's "if-then" framework for caffeine may be "If I use caffeine, I will feel good" rather than "If I use caffeine, I will not feel bad." Per the social learning theory, caffeine tends to be associated with its positive benefits as well as a potentially comforting substance. Cafes and coffeehouses are increasingly popular, especially on college campuses and are seen as a place to relax or a comforting place to sit while working. Considering that caffeine is traditionally seen as a non-problematic substance with benefits, it would be informative to explore the positive emotions related to its use.

The current study failed to find any prediction of caffeine use from measuring one's use of adaptive coping methods or use of substances as a coping mechanism. According to social learning theory, caffeine traditionally is associated with positive effects rather than as a means to avoid negative ones. For instance, when someone has a project to complete and they reach for caffeine, it could be argued that they do so because of the belief that caffeine will help them focus or concentrate rather than reaching for caffeine because they are stressed.

This study found that women generally use more caffeine than men. Though the reason for this finding is unknown, it can be speculated that women may find physical health benefits from using more caffeine. For instance, research has shown that caffeine can help relieve headache symptoms and enhance the effects of painkillers (Lipton, Diener, Robbins, Garas, & Patel, 2017). Women typically have more headaches than men due to hormonal changes (Silberstein, 2000). Caffeine has also been helpful in the treatment of menstrual cramps (Ali et

al., 2007), which is why some common menstrual pain relief medications include caffeine in its ingredients (Anderson, Juliano, & Schulkin, 2009). Thus, women's increased vulnerability to specific types of physical pain and caffeine's established benefit to treating pain may explain why women consume more caffeine than men.

Caffeine and Impulsivity

Identifying specific facets of impulsivity related to caffeine consumption was unsuccessful. None of the specific types of impulsivity as measured by the UPPS-P yielded statistically significant correlations. Further, impulsivity was not found to be a predictor of caffeine use in the present study as the UPPS-P accounted for less than 2% of caffeine consumption.

Findings regarding the relationship among facets of impulsivity and caffeine have been mixed (Lara, 2010). For instance, Penolazzi et al. (2012) found a positive association between impulsivity and sensation seeking and caffeine consumption, and even found that higher impulsivity was predictive of caffeine use. On the contrary, Jones' and Lejuez's (2005) and Heaton (2012) found that though caffeine consumption was associated with higher reports of impulsivity, impulsivity was not predictive of caffeine use. Thus, the findings concerning impulsivity as a predictor of caffeine use remains inconsistent. It is possible that the particular measure of impulsivity may account for the inconsistent findings across studies. Moreover, rather than pure impulsivity leading to increased caffeine use, it may be that increased caffeine use provides some positive consequences (e.g., alertness, increased productivity). Therefore, consuming more caffeine is a known plan or a habit to experience the positive effects.

Given caffeine's regular use among most people, it is a substance often used as part of a routine rather than as a substance sought impulsively. If one is feeling impulsive, caffeine may

not be the first substance to come to mind because effects are less intense as compared to another substance. Additionally, caffeine is easily accessible and does not require an impulsive decision to obtain. Some caffeine sources may take a more prolonged process as well. For example, brewing and making a cup of coffee or tea takes steps and thus does not feel like an impulsive decision.

In thinking of drug use as a learned behavior, caffeine use may be more of a learned response rather than an impulsive action to get a certain physical/psychological outcome. Many people use caffeine for its perceived benefits, such as improved concentration, increased productivity. In order to maintain these effects, people keep consuming caffeine. Additionally, people continue their caffeine use to avoid any negative effects or withdrawal symptoms (e.g., headaches, irritability). This same learning response has been found with other drug abuse and even from the neural level, ongoing drug use shifts from a chosen action to a learned response leading to addiction at least in part (Everitt & Robbins, 2005, Robbins & Everitt,1999). This theory of "habit-based learning" may help explain how caffeine is a drug that is heavily based in social learning given its general acceptance in society. Thus, ongoing and increased caffeine consumption may lend itself more to learned behavior and developing habits rather than impulsivity resulting in addiction.

Caffeine and ADHD Symptoms

Caffeine use has been found to be positively associated with ADHD symptoms (Chamberlain, Derbyshire, Leppink, & Grant, 2015; Martin et al., 2008). However, no significant relationships were found between caffeine consumption and reported inattention, hyperactivity, impulsivity, sluggish cognitive tempo, or total ADHD symptoms as measured by the BAARS. While it is unclear what led to the lack of this finding in this study, it may be that participants

were less reliable in their self-reports. Further, participants are currently in college courses and those who may have ADHD symptoms may have identified compensatory strategies to combat problematic symptoms. Research has shown that caffeine has benefits to attention and it has been shown that caffeine has been helpful in treatment of ADHD in combination with methylphenidate (Lara, 2010). This study's null finding could be due to the fact that caffeine consumption was within an "appropriate" range for many, if not most, of the participants. Therefore, it may be that college students have identified the amount of caffeine that is the most beneficial for them in managing any ADHD symptoms they may experience, in other words, finding an appropriate way to self-medicate. This idea of individuals with ADHD using caffeine as a means to self-medicate to help with their symptoms has been speculated (Ioannidis et al., 2014). The self-medication concept also fits well with social learning in substance use in that substance use increases when the substance is believed to provide positive effects (Colder, 2001; Niaura, 2000).

Caffeine and Rurality

Research has not addressed differences in quantity of caffeine use based on geographical area. The current findings yielded no significant differences between the caffeine use of participants who grew up in rural locations versus non-rural locations. This indicates that caffeine consumption is not dependent upon location. Though it cannot be said why exactly caffeine use did not differ between rural and non-rural populations, it can be speculated that due to the easy accessibility of caffeine, the location of one's residence is insignificant because it is likely caffeine is accessible somewhere. Caffeine also comes in many different forms and is contained in different beverages and snacks at varying degrees. It can be found not only in coffee shops but also in gas stations and dollar stores. Furthermore, in the current age of online

shopping and delivery, it is a common practice for people to order items to be delivered that they may not find conveniently in their immediate location.

Limitations

Though this study is believed to have provided useful information regarding caffeine use disorders, it has several limitations. First, the study is strictly self-report. Thus, estimations of caffeine consumption rely on both participants' awareness of and accuracy in reports of daily caffeine intake. Secondly, the present study also examined caffeine consumption from a purely numerical standpoint of daily milligram intake. Given the variety in caffeine consumption, differences of type of caffeine source may impact one's experience of effects and consequences of caffeine use. Third, this study only explored negative consequences of caffeine consumption. It is possible that the positive effects of caffeine use could overpower negative perceptions related to caffeine.

Clinical Implications

This study found an association between problematic experiences and caffeine use that is consistent with other substance use disorder issues (i.e., difficulty cutting down use, needing caffeine to function). Therefore, though this study was unsuccessful in discovering specific coping motivations of using caffeine, it appears caffeine use has some overlap with other substance use disorders. Many caffeine consumers have been found to experience unsuccessful attempts at cutting down use, dependence, withdrawal, and intoxication on caffeine (Hughes et al., 1998; Jones & Lejuez, 2005; Juliano et al., 2012; Meredith et al., 2013). Though caffeine use does not produce negative effects for all caffeine users, it has been found to be associated with clinical impairment in some as was found in the current study, which may justify addition of Caffeine Use Disorder to the DSM. Furthermore, in following the results from this study,

increased use could be associated with high amounts of stress. Stress in high enough amounts may lead to clinical impairment or exacerbate pre-existing symptoms to the point of clinical impairment. Clinically, it would be beneficial for health providers to inquire about caffeine use when discussing other substance use. Given the possibility that increased stress may be leading to increased caffeine use or vice versa, it may impact diagnoses or treatment. For instance, a person who comes to a psychological evaluation reports difficulty managing stress and is noted to be highly nervous, exhibiting rambling speech, and is having difficulty with sleep may at first glance appear to have a diagnosis of an anxiety disorder. However, all of the abovementioned symptoms also fit with a diagnosis of Caffeine Intoxication and a pattern of high caffeine use may point to a diagnosis of Caffeine Use Disorder. Having knowledge of an individual's caffeine intake can help solidify their diagnostic profile to most accurately encapsulate their difficulties. Moreover, a cognitive-behavioral treatment for anxiety could greatly differ from a caffeine-related disorder that would require a more substance use treatment approach. Due to the differences in caffeine and other substances, such as its general acceptance and perceived positive effects, treatment of excessive caffeine use may look different than treatment of another substance.

Future Directions

The current study only explored caffeine consumption in the context of coping with negative emotions. Given the fact that caffeine use may be more of a routine in peoples' lives, it may be a substance regularly used for the positive benefits such as being more alert. Caffeine may also be associated with positive emotions which was not explored within this study. Moreover, it may be helpful in identifying if a certain amount of caffeine differentiates between positive consequences and negative consequences.

People consume caffeine in a multitude of ways, from coffee and tea to energy drinks and gum. Future research should focus on the different impact of caffeine depending on the source. Some studies have found differences in motivations for use depending on the type of caffeine (e.g., Richards & Smith, 2015). Additionally, the various sources could have different consequences related to their consumption. Therefore, though this study did not explore the differences between caffeinated beverages and snacks, differences in consequences of use may exist depending on the source of caffeine. A potential future direction of study may include more thorough research on the differences in consequences of use as it pertains to caffeine source, taste of the caffeine, or even different impulsivity/personality traits of the consumer, and their preferred source.

Conclusion

Justification of a Caffeine Use Disorder is highly debatable in the literature. Lara (2010) explained that because caffeine is generally easily accessible, and people are therefore able to choose their own "doses" of caffeine intake, they naturally have the ability to stop their use when it becomes problematic. However, if unwanted effects occur after ingesting caffeine, it may reinforce continued use to avoid withdrawal symptoms. The lack of replicability between studies on caffeine use and negative consequences leading to clinical impairment hinders the defense of its inclusion in the DSM, though research has shown individuals can develop dependence and withdrawal symptoms toward caffeine. Though not everyone develops problematic symptoms following caffeine use, the same argument can be made for other licit and illicit substances, such as tobacco or marijuana. Therefore, more exploration and replication are needed to make a confident decision on its clinical significance as a diagnosable condition.

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APPENDIX 1

List of Measures

Caffeine Audit

COPE Inventory

Effect of Caffeine Use Scale (ECUS)

Depression Anxiety Stress Scales-short version (DASS21)

UPPS-P Impulsive Behavior Scale

Inventory of Drug Use Consequences, Lifetime (InDUC 2-L)

Barkley Adult ADHD Rating Scale-IV (BAARS-IV)