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**That's Why We Drink: Effects of Undergraduate Stress During the COVID-19 Pandemic  
on Alcohol Behaviors**

by

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A master's thesis submitted to the Department of Psychology  
in partial fulfillment of the requirements for the degree of  
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### **Abstract**

Previous literature has shown that undergraduates' alcohol use is often affected by their perceived stress, especially when there is a significant disruption to their typical college lifestyle. The primary goal of the study was to demonstrate that there is a relationship between perceived undergraduate stress and alcohol behaviors mediated by anxiety during the COVID-19 pandemic. The secondary goal was to determine if there were any significant moderating variables on the aforementioned mediation, specifically characteristics of personality. A self-report Qualtrics survey was conducted to assess perceived stress, anxiety, alcohol use, and personality domains along the Big Five Inventory for 244 students. The simple mediation model analyzed through Hayes' Macro Process Model 4 yielded significant indirect results through anxiety but the following moderated mediation analysis using Model 58 did not. While there were significant effects of neuroticism on the relationship between perceived stress and alcohol use through anxiety, no significant index of moderated mediation was found. Although the mediation model was significant, future studies should focus on larger sample sizes and different sample populations for longitudinal designs, as well as other possible confounding variables that can account for the relationship between stress and alcohol use.

***Key words: Perceived Stress, Undergraduates, Alcohol Use, Anxiety, Personality, COVID-19***

### **That's Why We Drink: Effects of Perceived Stress During the COVID-19 Pandemic on Alcohol Behaviors**

During the monumental COVID-19 pandemic, many adjustments were made to social and educational routines to adhere to guidelines presented by the Center for Disease Control and Prevention (CDC, 2020). As such, stay-at-home orders were mandated in hopes that the spread of the virus could be contained (Moreland et al., 2020) leading universities to close and transition students from face-to-face courses to remote learning experiences. Following this change, young adult students reported increased negative mental or behavioral consequences (Czeisler et al., 2020). As college students, these increased symptoms may have risen due to reduced social connectivity or lack of access to common coping mechanisms (Torales et al., 2020). Reports of anxiety were found to be increased among individuals who experienced more or worsened symptoms of anxiety and reported that these symptoms made work, home, and social procedures harder to endure (Coakley et al., 2021).

In response to the increasing anxiety among college students at that time, some students disclosed that there were reductions in drinking with groups of friends (social drinking) and increases in drinking with family (Jackson et al., 2021). Moreover, those who indicated they drank more with their families, justified their changed behavior via greater opportunity, boredom, and to cope with distress (Jackson et al., 2021). Another study, however, asserted that loneliness and listening to pandemic-related news were associated with increased coping motives that in turn related to increased alcohol consumption (Mohr et al., 2021). Additionally, there was an increase in isolated binge drinking among adults while the lockdown procedures and stay-at-home orders were in effect (Weerakoon et al., 2021). These results indicate a possible connection between perceptions of increasing stress relating to secondary increase in alcohol consumption in

response. One mechanism for this relation could be due to the increased anxiety of students. Other mechanisms could include an inability to control the impulsive choice of alcohol as a coping mechanism or lack of other normative coping mechanisms.

Furthermore, alcohol-related deaths jumped more than 25% between 2019 and 2020, after the onset of the pandemic. There was also a recorded upward trend in alcohol sales from March to September of 2020, indicating higher quantities of drinking (Castaldelli-Maia et al., 2021). Higher rates of consumption identify a problem wherein the possibility of substance dependency or reliance on alcohol as a coping technique grows with the duration and amount of alcohol use (Mosel, 2022). Similarly, as the pandemic continued, reports of loneliness and subsequent mental health problems were reported amongst young adults (Lee, Cadigan, & Rhew, 2020). In turn, loneliness and psychopathology were also associated with increased frequencies of drinking among the same population (Graupensperger et al., 2021). As more individuals drank alcohol, for various reasons, during the COVID-19 pandemic, concerns about negative consequences for such behaviors also grew.

Due to the relatedness of alcohol and stress, the investigation of the mediational role of anxiety is necessary in order to sort out the underlying mechanisms contributing to increased alcohol use among college students during the COVID-19 pandemic. Mediational analyses help to demonstrate why relationships may occur, such that alcohol use caused by increasing stress is contingent upon increasing anxiety. The reasoning behind this mechanism, however, is based upon the context, expectancies, and personality of the individual.

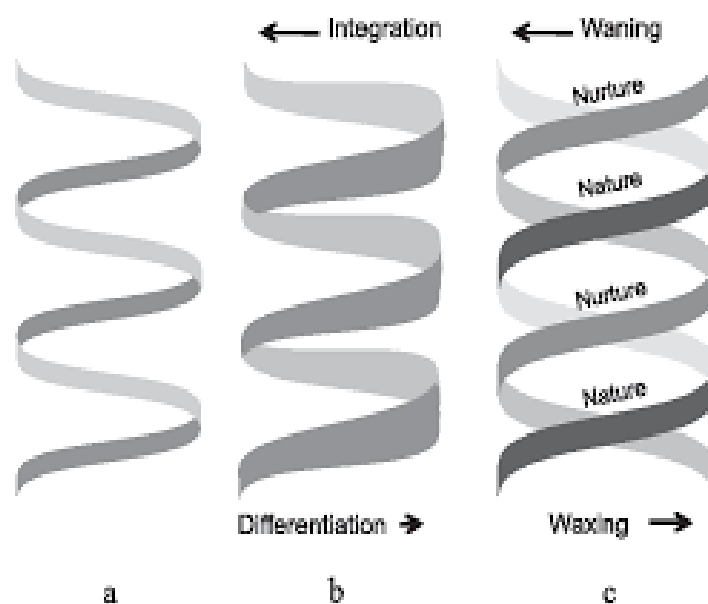
### **Context Theory**

Proposed inclusion of context within development is pivotal in understanding the development of alcohol-related behaviors, especially for individuals in university settings.

Sameroff's Unified Theory (2010) incorporates individuality and context to generate a well-rounded encompassing model for development and application to behavioral outcomes. Focusing on a variant of the nature versus nurture considerations, Sameroff (2010) put forth a model that emphasizes an interaction among prior experiences, environmental stimuli, and personal change through a “double helix” representation (Figure 1).

**Figure 1**

*Double Helix Model (Sameroff, 2010)*



For example, rather than genetic inheritance being responsible entirely for predisposition to alcohol abuse, there often are also nurture characteristics, as in parental influence and peer influence, that can be responsible for behavioral outcomes (Enoch, 2012). Additionally, the roles of personal change, context, regulation, and representation were integrated in his dialectical model to attribute development to a unification of theory, instead of a divergence of theory. The multi-factorial implications of this model blend nicely within the complex nature of alcohol behaviors, wherein socio-ecological, developmental, and behavioral aspects emerge to reflect a model like the broader biopsychosocial model of psychology.

Personal change, defined as the changing of the individual from infancy, focuses on the development of an individual through periods of stability and transition into other stages (Sameroff, 2010). Development of certain relationships with caregivers, and the effects of these relationships on one's perception of alcohol use can be an example of how personal change applies within this topic. While not the focus in this study, personal change is important in shaping an individual's cognitive and behavioral expectancies which play a significant role in college students coping with stress and utilization of alcohol.

Context in this model refers to the inability to separate personal experiences and social aspects of behavior and development (Sameroff, 2010). The social-ecological model has similarities to Bronfenbrenner's Bioecological model (2006). Sameroff's Unified Theory distributes social experiences throughout overlapping layers of influence, such that inner circles affect the individual the most (i.e., peers, parents) and outer circles exert smaller, more outward reaching influence (i.e., community, geopolitical). Influences placed at inner levels are the surrounding environments in which a person finds themselves in on a regular, common occurrence. More distal circles represent extending influences, such that there is usually an unknown or infrequent impact on the individual directly. Evolution of alcohol use can be swayed dependent upon one's experiences within any one or multiple experiences in these realms of experience. As such, it is imperative that investigation of alcohol use include analysis of context to understand influences on behavioral outcomes and reasoning behind varied behavioral outcomes.

Similarly, the regulation model within this perspective highlights the dependencies on extrinsic regulation as an individual grows and adopts more self-regulative capacities through time (Sameroff, 2010). The ice-cream-cone-in-a-can portrayal of this idea demonstrates the idea

that an infant, by definition, will rely more on others' regulation of them, whereas an adult will have increased ability to regulate themselves. This idea is relevant to the age group we are studying as undergraduate students are yet to fully develop but have increased amounts of independence, justifying their need to establish their own self-regulation while simultaneously still relying on other adults at times (Arnett, 2006). Overall, regulation is necessary to understand behavior as we look at how social interaction and individual expectations can impact alcohol behavior.

The Unified Theory model generates an adapted version of the components into a representation of the experiences someone encounters through various areas of development (Sameroff, 2010). The experiences affecting an individual become expectations and behaviors by means of personal change, context, and regulation. These variations of the model's proponents create a template for the biopsychosocial model, the overarching consolidation of dynamic features of development. Placing emphasis on the levels of development creates a compound method for investigating behavior because of context – something that can be useful in delineating the relationship between stress, anxiety, and alcohol use among undergraduate students.

Context provides useful information for understanding the underlying mechanisms for certain behaviors, especially behaviors with multi-faceted foundations. Primarily contexts, such as the environment and the individuals around us, help to explain why we engage in certain behaviors reinforcing the idea of anxiety mediating the relationship between perceived stress and alcohol use on the premise that the context provides opportunity and normality for alcohol use in university settings during the pandemic.

### **Expectancy Theory**



Expectancy theory aims to define human behavior through the learning mechanisms by which we create expectancies and utilize these to drive our later choices (Smith & Goldman, 1994). Based on Tolman (1932) this comprehensive theory posits that human behavior is resultant from a combination of learning experiences and the influences they have throughout our cognitive evaluations in different scenarios. Within this theory, memories are utilized to enhance our learning via experiences, thus forming behavioral patterns associated with our expectancies dependent upon situation and context (Smith, 1988). Due to the foundation of this theory being learning from situations and acquiring new behaviors consequently, the application of this theory lends itself nicely to the investigation of alcohol-related behaviors among college students where the facilitation of drinking is often influenced by cognitive mediators such as expectancy (Stacy, Widaman, & Marlatt, 1990).

Expectancy theory has both cognitive (e.g., memory) and behavioral (e.g., reinforcement and conditioning) foundation, combining the two major theoretical contributions to explain the reasoning behind certain behaviors (Bolles, 1972). Alike that of learning theories reliant on conditioning, the repeated associations between stimuli and certain outcomes produces a cognitive-based expectancy that is stored in memory (Oei & Baldwin, 1994). Furthermore, these associations can then affect the decisions being made when posed with the same stimuli or similar stimuli, also dependent upon the history of allocated rewards (Smith & Goldman, 1994). In this manner, along with other possible contributors such as developmental characteristics, thoughts and behaviors can help explain the reasons behind problematic drinking among undergraduate students.

Several risk factors that have been identified in the evolution of drinking habits for emerging adults, including as gender, family history, and psychopathology (Lundahl et al., 1997;

MacDonald, Fleming, & Barry, 1991). These factors rely on an underlying causal mechanism that can demonstrate the motivations for such behavior while also connecting it to context (Smith & Goldman, 1994). Incorporating the expectancies that individuals may have can shed new light on their perceptions surrounding alcohol, in turn demonstrating an important proximal influence on their behaviors related to alcohol (Smith & Goldman, 1994).

### ***Aspects that Affect Perceptions***

Within the formulation of said expectancies that drive behaviors, there are a multitude of aspects that can affect perceptions of a behavioral outcome. Attitude is defined as feelings and evaluations regarding alcohol use that leads to intentional components for drinking behaviors. Fazio (1986) considered attitude to be a contributing factor to the learning processes, wherein someone's attitude can lead them to gain more profit from certain behaviors contingent upon how they perceive the situation (Reid & Carrey, 2018). Furthermore, college students typically learn in social environments and can create schemas for drinking behaviors as they interact with new individuals and continually update their expectancies, especially during the first two years of their college experience (Capone et al., 2007). While individual peer influence appears to provide little impact on one's perceptions about drinking, more intimate relationships, such as with close friends and family, display more robust shaping of expectancies (Yanovitzky, Stewart, & Lederman, 2006). Certain types of peer influence can still affect individual's perceptions, such as Greek fraternity and sorority involvement where the social milieu in which a person functions is more frequently present and in which there are higher rates of alcohol-related behaviors (Capone et al., 2007). However, there is greater impact on perceptions about alcohol emanating from the more proximal and frequently engaged associations with which one chooses to partake,

where the most meaningful relationships will affect the person's expectancies the most (Rulison et al., 2016).

Interpretation of perceived outcomes may help to explain interindividual differences that lead some individuals to evaluate situations distinctively (Patrick & Maggs, 2011). Some students may perceive consequences of alcohol-related behavior variously compared to others within their groups, demonstrating the importance of subjectivity in this topic (Brooks-Russell et al., 2013); some students face extended legal consequences or threat of addiction compared to other students who do not have such extensive consequences to alcohol use. In contrast, injunctive norms concerning alcohol use can regulate perceptions as individuals typically behave in way that conform to their group's norms. Participation in a group with higher rates of alcohol-related behaviors may be associated with different perceptions about drinking alcohol than the drinking perception one might hold while still living at home with one's titular family, even if it is in contrast to the general societal norm for drinking (Graupensperger et al., 2020). This idea becomes paramount as we evaluate the drinking behaviors of individuals who frequently consume alcohol and explore their perceptual contrasts to others of the same context and environment.

Alike context, the perceptions that individuals may have regarding alcohol use can provide reinforcement for those behaviors. Having the perception that alcohol use is a sufficient coping method will influence the individual to participate in those behaviors due to the familiarity and idea that those behaviors are appropriate in that situation. Perception, therefore, can provide knowledge as to why individuals begin to drink alcohol in response to stress.

### **Personality**

Personality traits and characteristics can be defined as the stable, consistent ways in which a person thinks, feels, or behaves. Since the early considerations of Cattell (1945) and Allport (1960), research mainly in the United States found that tens of thousands of descriptors of human traits could be summarized accurately among five dimensions – leading to the contemporary personality theory called the Big Five (Goldberg, 1993). Literature demonstrates that personality characteristics, while mostly stable throughout the lifespan, can have innate influence on a person's behavior (Paunonen, 2003). The current investigation will explore the roles of certain dimensions of the Big Five of Personality on the relationship between the experience of stress and alcohol-related behavior, particularly for those experiencing anxiety and during increased amounts of perceived stress.

Neuroticism is represented by anxiousness, anger, depression, and other emotional factors which often appear unstable (Goldberg, 1993). Typically, those with high levels of neuroticism tend to respond to environmental stressors poorly, where the individual often feels overwhelmed easily and vulnerable (Widiger & Oltmanns, 2017).

Extraversion is based on one's energy, including facets of adventurousness, enthusiasm, and sociability (Goldberg, 1993). Higher levels of extraversion represent more curiosity to the environment in comparison to higher levels of introversion where someone is more apt to avoid socialization, be less energetic, and be less willing to explore new areas (Afshan, Askari, & Manickam, 2015).

Conscientiousness is recognized by being organized, dutiful, competent, and self-disciplined (Goldberg, 1993). As such, this factor is often cited in health and longevity research due to its relationship with making good decisions and instigating good coping strategies when under distress (Bogg & Robert, 2014). Those with high amounts of conscientiousness are often

logical and responsible, demonstrating a protective factor against developing problematic alcohol-related behaviors (Hakulinen et al., 2015).

Levels of agreeableness depend on trust, straightforwardness, altruism, and compliance according to Goldberg (1993). In other words, this factor relates to the ability to empathize and receive pleasure by helping others and doing what they are told to do (Ode & Robinson, 2007). Furthermore, this trait is linked to abilities of self-control and effortful control, two important implications in the protection against development of addictive disorders (Sohrabi et al., 2019).

Lastly, openness is demonstrated by curiosity, imagination, and excitability according to Goldberg (1993). This factor is found in those who exercise a lot of binge drinking, especially related to one's social drinking (Adan, Forero, & Navarro, 2017) wherein someone's willingness to try new things may facilitate greater risk for problematic behaviors.

According to Brebner (2001), predications can often be made regarding the utilization of stress coping among the Big Five domains. Vollrath (2001) confirms that stress coping is greatly affected by personality traits, so much so that "coping ought to be redefined as a personality process" (pg. 341). The research revolving around the relationship of stress and personality involves depth and transactional implication, indicating that there are more factors also involved in these processes due to individual differences and a combination of nature and nurture (Cooper & Payne, 1991).

Along with predictions among stress coping, personality also plays an important role in predicting the motivations behind alcohol-related behaviors (Theakston et al., 2004). High impulsivity and high sensation seeking traits were significant in predicting binge drinking behaviors, in addition to higher weightings of neuroticism, extraversion, and lower levels of conscientiousness (Adan, Forero, & Navarro, 2017). Impulsivity, linked to higher amounts of

neuroticism and extraversion as well, has been positively related to alcohol use frequency, alcohol-related problems, binge drinking, and alcohol use disorders (Shin, Hong, & Jeon, 2012). In turn, higher levels of neuroticism and extraversion were correlated, along with lower levels of agreeableness and conscientiousness, with developing any type of addictive disorder, according to Dash et al. (2019), highlighting the comorbidity among addictive disorders, including alcohol use. All in all, personality has an important role in the development of alcohol-related behaviors based on its relationship with stress coping, indicating the need for inclusion within this study as a pivotal intrapersonal factor.

### **Emerging Adulthood**

Emerging adulthood is noted as a characteristically distinct period of the developmental lifespan. For adults approximately aged 18 to 25 years, there are marked differences in the responsibilities that shape these individuals' lives as they transition from prior childhood and adolescence to maturity. However, due to societal changes in norms for industrialized countries there is less emphasis placed on procreation and establishment of long-term life routines, such as work or marriage (Arnett, 2000). Such cohort change has allowed more time and freedom to form identities and behavioral patterns (Nelson & Barry, 2005). At this point in the lifespan, individuals are relatively unrestrained by norms and typical expectations as they are legally of-age and yet are just beginning their own independent living in most circumstances (Arnett, 2000).

Without the same time- and energy-consumptive roles of a typical adult, these individuals have extensive ability to explore – including the adoption of risky behaviors (Arnett, 2006). Emerging adults typically participate in more risky behaviors than their adolescent or established adult counterparts, such as the use of substances, drinking while driving, or having unprotected

sex (Nelson & Barry, 2005). However, these behaviors are exhibited differently based on age, gender, and individual differences in psychosocial contexts (Bradley & Wildman, 2002). As a result of the sensation seeking and identity exploration characteristics of emerging adults, the evaluation of alcohol-related behaviors may be inconsistent with that of other age groups (Quigley & Marlatt, 1996). It is important to recognize the contributable factors that emerging adults possess, such as lack of extensive responsibility, to truly understand their alcohol-related behaviors.

### **Covid-19 Stress for University Students**

Previous research has identified that finances, health, and interpersonal relationships are the main contributors to stress for undergraduate students, especially for those who are upperclassmen and female (Beiter et al., 2014; Darling et al., 2007; Stallman, 2010). There is a balance needed to equate work, study, and leisure, which adds to college stress overall, despite class level or gender (Sprung & Rogers, 2019; Lehto et al., 2014). Emerging adults in college often find themselves worrying about various factors of basic human necessity, such as meals and housing (Mukigi et al., 2018; Broton & Goldrick-Rab, 2017), combined with more advanced preferential necessities, such as positive human interaction and positive social appraisal (Lee, Keough, & Sexton, 2011). Consequently, there is a great deal of stress during the typical college experiences leading to possible negative mental health outcomes among students (Hubbard et al., 2018).

As the pandemic grew, colleges were forced to close; many of the college students had to adapt to completely online learning, a format they may not have been familiar with or not of preference, as college courses were transitioned from in-person instruction (Chandra, 2020). A rough transition into an informal college experience added personal stress and uncertainty into

the typical college stressors (Halliburton et al., 2021). Students at this time had additional stress as many of the foundations of their stress relief had been eradicated; gyms, schools, churches, etc. were all placed on temporary hold to stop contact among individuals effectively removing or altering many individuals' stress relief techniques (Keyserlingk et al., 2020). Without proper stress relief, and the onset of more generalized stress, college students found themselves struggling to minimize their stress, especially for those who were at the top of the academic levels when they began planning for graduation and life after undergraduate studies (Clabaugh, Duque, & Fields, 2021). Overall, the effects of the pandemic due to the nationwide lockdown led to psychological distress for students in many ways, where there was an increase in mood disorders and depressive or anxious symptoms (Son et al., 2020; Batra et al., 2021).

As the pandemic continued the typical college experience was formatted differently due to the transfer of classes to online formats as schools nationwide closed their doors (Moreland et al., 2020). As such, there was more stress for those in college during the pandemic as opposed to those that were not, though there is no instance where college is not stressful at all. The requirement for immense change and the impending health crises during the pandemic compromised ones' abilities to adequately adjust to stress (Fruehwirth, Gorman, and Perreira, 2021). New inventive methods of stress relief, among the lack of access to common resources, were needed to reestablish ability to cope with vast stressors leading to a surge in alcohol consumption and sales (Castaldelli-Maia, Segura, & Martins, 2021).

### **Alcohol and Stress among College Students**

Usually for college students, their time is spent in various social interactions causing stress from the lack of social ability when the pandemic led to stay-at-home mandates (Coccia & Darling, 2013). Additionally, most of the stressors that undergraduate students, especially



freshman, reported were intrapersonal or environmental, indicating that their stress mostly comes from the transition into college life with changing sleep or eating habits, increased workload, and more responsibility (Ross, Niebling, & Heckert, 1999). However, it has been noted that some interpersonal relationships during college, such as working with unfamiliar individuals, exacerbate stress for the undergraduate student, most notably for higher level undergraduates and females (Bulo & Sanchez, 2014). Therefore, there are indications of possible differences in stress among level of undergraduate and sex. While alcohol use among the college population is expected, the mechanisms by which they choose to partake in are less obvious. Theoretically, context, expectancy, and personality all play roles in answering why individuals choose to drink alcohol, especially during times of more stress.

### **The Current Study**

Throughout an individual's development, there will be certain associations and expectations that arise towards the use of alcohol in response to stress. Despite this, there are added stressors during the COVID-19 pandemic that can affect someone's normative coping styles and constitute new or worsened behavioral outcomes. This study relies on severity of responses for alcohol measures to establish a participant's relationship with alcohol and subsequently a mediational design to explore the indirect effects of stress during the pandemic in relation to alcohol use. There will also be incorporation of perceived norms through the assessment of alcohol use.

First, it was hypothesized that perceived student stress would positively relate to alcohol-related behaviors and the use of alcohol as a coping mechanism due to increases in anxiety, with self-reported alcohol use used as the dependent measure and self-reported anxiety used as the mediating variable.

Second, it was hypothesized that self-reported neuroticism and extraversion estimates would moderate the relationship between perceived student stress on alcohol-related behaviors [effect from neuroticism and extraversion on the mediational model proposed subsequently also affecting the outcome of alcohol behavior].

In contrast, levels of conscientiousness and agreeableness were hypothesized to moderate the relationship between perceived stress and alcohol use through anxiety in a negative direction. Having higher rates of conscientiousness and agreeableness are related to dutifulness and compliance indicating that those higher in these dimensions of personality would be less likely to use alcohol in response to higher perceived stress and anxiety. In other terms, it is hypothesized having higher conscientiousness and agreeableness will decrease the effects of anxiety also leading to lower amounts of alcohol-related behaviors in response to more perceived stress.

## **Method**

### **Procedure and Ethics**

In the beginning of this study the participants were provided a digital informed consent form to read. After the informed consent form was administered, the participants could either agree or disagree to continue with this study. Disagreement to continue resulted in ending the session. With agreement to continue, participants were directed to a questionnaire with various measures and were told to read each question thoroughly and then answer honestly. They were also informed that their information and responses were anonymous and there would be no identifying information collected. Participants took approximately 30 minutes to complete all questions. Collection of data for this study was from January to December of 2022 but this study also included pre-COVID-19 pandemic data.

This study was submitted and approved with IRB oversight from University of North Florida's Institutional Review Board. The APA Ethical Principles of Psychologists and Code of Conduct (APA, 2017) were followed throughout the entire procedure to ensure ethical treatment of all participants. All identifying information from participants was protected and all students remained anonymous. There was no foreseeable harm highlighted during this study.

### **Participants**

Participants ( $N = 1,059$ ) for this study were undergraduate students attending the University of North Florida. Total data collection began several years prior to the pandemic (before 2020), but alcohol-related questions were only used after January of 2022 ( $N = 244$ ). Therefore, the number of participants related to perceived stress before and during the pandemic will amount to more than the number of participants related to the alcohol measures.

Participants were recruited using the university's SONA systems a system maintained by the psychology department for the purpose of sampling undergraduate students for research conducted within the department in which the participants can sometimes earn credit for their courses.

Cleaning the data consisted of removing individuals that spent less than one minute completing the survey and removing anyone that did not pass one of the two attention checks, in addition to removing anyone who did not give consent to being in the study. Those who did not provide answers for any of the variables used in the analyses, such as the perceived stress, anxiety, alcohol use, or personality inventories, were consequently removed. Removal criteria left a sample of 244 participants for alcohol-related measures. Of these participants, 84.0 % ( $N = 205$ ) identified as female, 14.8 % ( $N = 36$ ) as male, and 1.2 % ( $N = 3$ ) as "other". The age range was found to be 18 to 49 years, with the average being 21.34 years. The sample included students who identified

as Black or African American (11.9%), Hispanic, Latino/Latina, or of Spanish origin (9.0%), Asian or Pacific islander (6.1%), White (65.2%), Multiethnic (5.3%), or Other (2.5%). Refer to Table 1 for list of descriptive data.

Using R Statistical Package *pwr2ppl* (2021) we found that the achieved power was 0.996 for our sample size of 244 participants when detecting simple mediation. The names of the participants who completed this questionnaire were made known for the sole purpose of providing course credit for those individuals. The participant's names were deleted once credit was given and their answers to the questions remained anonymous the entire time.

## **Materials**

### ***Demographic Questionnaire***

Several demographic questions, including year in school, gender, and race, were utilized to collect background information, as well as to investigate the role of the COVID-19 pandemic within these individuals' school and personal lives. The demographics inquiries were administered via self-report where students were told to completely read the question and respond to an open-ended, multiple choice, or Likert scale based on 1 (*Disagree*) to 5 (*Agree*).

### ***Perceived Stress Scale***

We measured stress perceptions using the Perceived Stress Scale (Cohen, 1994). This scale includes 14 5-point Likert Scale items. The Likert Scales were assessed based on "1 = *Never*" to "5 = *Very Often*". The participants were instructed to reflect on their experiences over the past month and answer the questions. Questions 4, 5, 6, 7, 9, 10, and 13 were reverse scored and totaled with the non-reverse scored items to create a grand total score on the scale. The higher the score, the greater indication of perceived stress and vice versa.

Furthermore, the PSS-14 splits scoring into ranges formulated on low, medium, and high scores. With a score of 0-14 the participant could be in the low perceived stress group, a score of 15-27 the participant would be in the medium perceived stress group, and a score of greater than 28 would portray high perceived stress. Internal reliability of this scale was reported as .84-.86 and test-retest reliability was reported as  $r = .85$  (Cohen, Kamarck, & Mermelstein, 1983). For our study, Cronbach's alpha was 0.769 suggesting that items included were closely related and that there should not be removal of any items.

### ***Alcohol Use Disorders Identification Test***

We measured drinking habits' severity using the Alcohol Use Disorders Identification Test (AUDIT; WHO, 1982). This scale consists of ten questions asking about the frequency of drinking and frequency of other indicators of reliance on alcohol, such as feelings about drinking and inability to go without drinking, based on a "0 = lowest frequency" to "4 = highest frequency" format based on of different ranges of time periods. The first question, for example, was "0 = never" to "4 = 4 or more times a week" in response to a question about frequency of drinking. Similarly, the next question was rated such that 0 (1 or 2) to 4 (10 or more) in response to a question regarding how many drinks are consumed in a sitting. The next six questions were similar in the format and structure. The last two questions were based on no/yes, not recently/yes, recently format to inquire about consequences that have occurred from drinking.

The scores from each question are totaled to give the participant a grand total score, indicating that the higher the score the more demonstration of an alcohol use disorder. Intrascale reliability was reported at coefficients of 0.93-0.81 (WHO, 1993). Additionally, criterion validity assessed 99% of those who were alcoholics as well as 98% of those who were abstinent from

alcohol use (WHO, 1993). For this study, the Cronbach's alpha was 0.849, suggesting that the items included were closely related and that there should not be removal of any items.

### ***Substance Abuse Subtle Screening Inventory***

We measured drinking habits' severity over the prior year using the Substance Abuse Subtle Screening Inventory (SASSI; Miller, 1988). This adapted scale consists of two questions asking about the frequency of specific alcohol-dependent behaviors, such as using alcohol to talk about feelings or using alcohol to provide energy, based on a 4-point Likert Scale: 0 (*never*) to 3 (*repeatedly*) format.

The scores from these questions were totaled to give the participant a total score, indicating that the higher the score the more demonstration of an alcohol use disorder. Test-retest reliability coefficients were stated to be from 0.92-1.00 where the overall alpha coefficient was 0.93 (Miller, 1988). For this study, the Cronbach's alpha was 0.744. It should be noted, however, that this inventory also assesses for other substance use disorders and is not alcohol-specific, though some questions, like the ones used in this study, are engineered to assess alcohol dependence.

### ***Total Alcohol Use Variable***

After scoring the AUDIT and SASSI questions, a total alcohol use variable was computed by adding up each score for the alcohol scales. Scores for the AUDIT ranged from *one* to *five*, with five indicating the most use on alcohol. Scores for the SASSI ranged from *one* to *four*, with four indicating the most use on alcohol. Both scales were continuous and the total numerical score for both were added together to create one variable for use in the analyses representing overall alcohol use.

### ***Generalized Anxiety Disorder Scale***

We assessed participants' levels of anxiety using the Generalized Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006) during the prior two weeks. The participants were asked several questions on a 4-point Likert Scale from 0 (*not at all*) to 3 (*nearly every day*). The scores were added in the end to create a total score where higher scores demonstrated higher amounts of generalized anxiety. Internal consistency of the GAD-7 has been established by Lowe et al. (2008) at 0.89. For this study, the Cronbach's alpha was 0.934, suggesting that the items included were closely related and that there should not be removal of any items.

### ***Big Five Personality Inventory***

This inventory identifies the levels of five characteristics related to personality: openness, extraversion, agreeableness, conscientiousness, and neuroticism. Participants were directed to read a list of statements that may or may not relate to themselves and then indicate the level of which they believed those statements applied to themselves using a five-point Likert scale: 1 (*strongly disagree*) to 5 (*strongly agree*), and the middle choice was "*neither agree nor disagree*". The score was a totaling of the responses to all 44 items on this measure and the items were categorized into smaller scales based on which personality factor they relate to. Reliability of the Big Five Personality Inventory has been established to be 0.84 for the English version and the cross-language convergent validity was found to be 0.84 (John et al., 1991). For each of the subscales mentioned to assess individual factors, openness, neuroticism, extraversion, conscientiousness, and agreeableness, the Cronbach's alpha was found to be 0.744, 0.838, 0.883, 0.762, and 0.727 respectively.

Correlations between all variables is demonstrated in Table 2.

## **Results**

### ***Mean Differences***

Primarily, the impact of the COVID-19 pandemic on the perceived stress of undergraduate students was explored by comparison of means from different timepoints of data collection before and during the pandemic. (For a more in-depth description, please refer to the *participants* section.) There was not a significant difference in the means of participants' perceived stress before ( $M=43.1$ ,  $SD=7.29$ ) or during ( $M=44.0$ ,  $SD=6.75$ ) COVID-19,  $F(1, 870) = 3.198$ ,  $p = 0.074$  (Figure 3).

### ***Mediation Analyses***

Mediational analyses are used to investigate predicting variables on the outcome variable through a mechanism or an “intervening variable. This process allows for determination of whether or not a variable impacts the relationship between two variables in a meaningful way and provides an explanation of the relationship. In this study, the mediator variable is anxiety, and it is analyzed as an intervening variable between perceived stress and alcohol use.

Hayes' Macro Process (2018) Model 4 was used to explore for possible mediation via an indirect effect of perceived stress on alcohol use through anxiety. To state that the mediator has a mediational effect, the indirect effect of perceived stress on alcohol use via anxiety (i.e., indirect effect = path a x path b; a = perceived stress on the mediator of anxiety, b = anxiety on alcohol use) and the 95% confidence interval around the indirect effect must exclude zero.

The results showed a significant indirect effect of perceived stress on alcohol use through anxiety [CI = 0.1124, 0.3247], supporting the second hypothesis. The direct effect of perceived stress on alcohol use with the mediator anxiety was not significant ( $b = -0.0804$ ,  $p = 0.229$ ). Anxiety fully mediates the relationship between perceived stress and alcohol use (Table 3, Figure 4).

### ***Conditional Process Analyses***



Conditional process analysis is utilized when there is a complex model where a mediator and a moderator may account for the anticipated relationship between two variables along the indirect path(s). In moderated mediation models, the goal is to determine if there is a significant mediating variable, in addition to a significant moderating variable, that may produce interactions that account for the relationship between the independent and dependent variables.

Hayes Process Macro (2018) Model 58 was used to investigate the indirect moderating effects of personality along both the *a* and *b* paths of the mediation of perceived stress on alcohol use through anxiety. For those low in levels of neuroticism, there is an insignificant effect of 0.0819 [-0.0085, 0.1757] from perceived stress to alcohol use through anxiety. For those high in levels of neuroticism, there is a significant effect of 0.1386 [0.0627, 0.2347] from perceived stress to alcohol use through anxiety (Figure 5). No other dimensions of personality were significant.

Further exploratory analyses were computed to analyze the effects of neuroticism along each indirect pathway (Models 7 and 14). Model 7 was used to investigate neuroticism along the *a* pathway as a moderating factor on the mediator variable, anxiety (Figure 5). Results revealed for participants low in neuroticism, there was a conditional indirect effect of 0.1271 [0.0617, 0.2099] and for participants high in neuroticism, there was a conditional indirect effect of 0.1067 [0.0486, 0.1824]. The index of moderated mediation, however, was insignificant, -0.0017 [-0.0050, 0.0011]. Model 14 was used to investigate neuroticism along the *b* pathway as a moderating factor on the outcome variable, alcohol use (Figure 5). Results revealed for participants low in neuroticism, there was a conditional indirect effect of 0.1372 [-0.0118, 0.2783] and for participants high in neuroticism, there was a conditional indirect effect of 0.2767

[0.1428, 0.4429]. The index of moderated mediation, however, was insignificant, 0.0116 [-0.0013, 0.0259].

### **Discussion**

The goal of the current study was to determine if anxiety produced a mediating effect on the relationship between perceived stress and alcohol use. Additionally, there was a secondary goal to determine if there was also a moderating effect of personality on the mediation model proposed. As hypothesized, there was an association between perceived stress and alcohol use through anxiety.

The indication of mediation from anxiety on the relationship between perceived stress and alcohol use demonstrated a strength of the current study as it reinforces the literature that, generally, undergraduate students tend to drink more alcohol in connection with greater amounts of stress as a result of context and environment. Furthermore, the current study further identifies that the relationship between perceived stress and alcohol use is also affected by anxiety, providing one possible mechanism for answering why students in college decide to drink alcohol when experiencing more duress, such as during a pandemic. Not only do the results portray reasoning behind alcohol-related behaviors for undergraduates, but the results also highlight importance of the topic as well as how context, expectancy, and personality can impact our behaviors. Understanding the motivations behind alcohol use will impact the perspective and plausible prevention or remedial treatment of behaviors that may be problematic. In order to confidently assess and treat any mental health disorders, the motivations behind the disorder need to be explored, including qualities such as personality.

The current investigation did not find a significant moderating effect from personality among any of the five dimensions (Openness, Conscientiousness, Extraversions, Agreeableness,

and Neuroticism). However, there was indication of simple moderation from higher levels of neuroticism. Therefore, there is evidence of mediation and possibly other factors involved as moderators, but no evidence of moderated mediation.

Moreover, the results did not indicate a significant difference in perceived stress among undergraduate students before or during the COVID-19 pandemic. In part, this may have been due to the rating system used to assess perceived stress, which did not include measures specifically related to the COVID-19 pandemic. As well, the scale utilized to assess stress was not directed towards undergraduate students but was assessing broader perceptions of stress relatable to extensive populations. While there was no instance of significant mean differences between before and during COVID-19 groups, the perceived stress of undergraduate students still may have been exacerbated by the onset of the pandemic along with reduction in perceived stress regarding other factors, such as stress from social interactions or stress from employment. Once again, the importance of specific context and expectancies can impact the perception of stress as related to the theoretical bases.

Furthermore, engaging in new coping mechanisms, such as alcohol use, during the onset of the pandemic can offset some of the acquired stress. Focusing on the population at hand could also play a role in an insignificant finding; undergraduate students have comparatively different stressors than their older adult counterparts possibly contributing to the lack of indication of increasing perceived stress in relation to the pandemic. Lack of evidence regarding a significant difference in before and during COVID-19 impacting perceived stress, nonetheless, does not reinforce the idea that those in college were not significantly stressed. Further research should tease out distinctive stressors for both undergraduate students and older individuals to properly assess the increases in stress in relation.

Similarly, after extended periods of time interacting with the same stressor there becomes a time where the individual acclimates to the stressor as explained in the idea of state versus trait anxiety (Endler & Kocovski, 2001). This can account for some of the undistinguished difference between before and during the COVID-19 where assessment of the anxiety levels and stress levels only showed a difference during the onset of the pandemic. Meaning, even though the perceived stress and anxiety during the pandemic was present, due to the state-like existence of stress at that time, the results of measuring the stress and anxiety may not have demonstrated a large difference. Instead, the difference between before and during the pandemic perhaps occurred over many months or years because of how long the pandemic lasted and how large the effects to daily lives were. As such, rather than focusing on trait anxiety, as it was in this study using the GAD-7 which looked at only the previous two weeks' anxiety and the PSS which looked at perceived stress one month at a time, further research should focus on state anxiety (stress).

One possibility as to why the results indicated mediation but not moderated mediation is that the emerging adults used for the current sample continue to be actively developing their personality traits and characteristics, leading to less distinct patterns along the Big 5 personality dimension and creating varied influence. While personality traits are typically distinctive and stable throughout the lifespan, individuals' personality traits may evolve, though the process by which is unknown (Bleidorn et al., 2019). However, the use of emerging adults represents a particular strength of this study where young adults are identified in a cohort separate from their older adult counterparts, especially adults over the age of thirty who can demonstrate different responses to stress and different norms of alcohol use.

Another strength of the present study regarding either analysis is that it occurred over two different semesters and included a diverse sample of college students from various levels.

Another strength of the current study is the reliance on a department-wide program to recruit participants. Without the department's use of the SONA program, it would be likely that the study would have been underpowered for simple mediation and moderated mediation.

Additionally, this investigation provides insight into a unique context during the global COVID-19 pandemic, which was a rare once-in-a-lifetime experience. The COVID-19 pandemic asserted an interesting overall stressful period in most peoples' lives for various reasons demonstrating a pinnacle time to investigate how increased stress, from means beyond our control, can affect the stress and alcohol relationship.

Despite no evidence of moderating factors of personality, the results are consistent with literature in the sense that alcohol use did increase along with increases in perceived stress through the mechanism of greater anxiety. The results are also somewhat consistent in determining how personality affects the relationship between perceived stress and alcohol use in the sense that those higher in neuroticism demonstrated greater effects on the mediation model, yet it was not due to moderated mediation likely caused by other confounding variables.

Despite these strengths, the study also had limitations. One limitation was simply that confounding variables may account for the significant relationships due to lack of random assignment and control used, however it is necessary to recognize that it is impossible to control, manipulate, or apply pandemic-like circumstances and stressors. Variables, such as age, could affect the relationship of perceived stress on alcohol use as we see different cohorts of ages behave with alcohol differently. Likewise, other factors, may also instigate moderated mediation where personality did not and therefore better explain the relationship between perceived stress

and alcohol use through anxiety. Other factors should be investigated such as race and types of coping mechanisms.

A second limitation of the current study is the reliance on a convenient sample. The current sample is predominantly young, Caucasian, female, and within the psychology department. Generalization is restricted to only the mentioned population of undergraduate students and there should be replication of this study among other populations to further investigate the relationship between perceived stress and alcohol use. Similarly, in order to study moderated mediation within the relationship between perceived stress and alcohol use through anxiety, it is recommended to broaden the population to include older individuals who may have more stable senses of their own personality versus younger populations that may waiver in their opinions of themselves.

Thirdly, the measures utilized within this study were adaptations of the full-scale inventories or scales. As well, these measures were no standardized prior to the study's use of them nor were they all established as completely valid measures, especially those regarding alcohol use. Consequently, the results may lack substantial validity in determining accurate use of alcohol, especially for undergraduate students where alcohol use has different perceptions and norms. Studies focusing on alcohol use should attempt to incorporate reliable and valid measures aimed at their current population.

Longitudinal methodology would also benefit this type of investigation as mediational results are hard to determine using cross-sectional data. The development of problematic use of alcohol and state anxiety occur over a long period of time, causing difficulty when utilizing only cross-sectional data. Trends in data are easier to identify when the participants are studied over large windows of time, whereas cross-sectional methods typically only view shorter durations of

time and thus have less power to detect causal mechanisms behind behaviors. Future research should attempt to focus on longitudinal methods in order to scrutinize the relationship of both mediating and moderating variables in the relationship between perceived stress and alcohol use.

As a final limitation, the dependence on self-report data, principally with private and sensitive information such as alcohol use and feelings stress or anxiety, can be falsified or skewed. Individuals tend to portray themselves how they view the norm would be or better than what they truly are. Anonymity was used in the current study to attempt to sway participants from being influenced in any way. Future studies should promote the benefits on studies regarding sensitive information and ensure the participants that the information is safe, anonymous, and solely used for the intended purposes.

With all of that being said, it is paramount to recognize the importance of alcohol research in relation to perceived stress. Alcohol use, alongside any drug use, is complicated due to the incorporation of many factors, biologically, socially, environmentally, etc. Therefore, investigations into possible mechanisms, even if they do not generalize towards larger groups of people, will provide insight into how to diagnose and treat problematic alcohol use. Generally, this study introduces some context to an already established relationship between perceived stress and alcohol use, however it is unique in the sense that it focuses on a rather neglected area of population in regard to alcohol use as it is expected that undergraduate students utilize alcohol, either problematically or not. Even so, understanding alcohol use in college-age populations can further our knowledge about *why* alcohol behaviors are enacted, especially in times of great stress, can possibly guide perspectives on alcohol use towards prevention and intervention rather than treatment.

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**Table 1***Participant Demographics Summary (N = 244)*

| Variable                                       | <i>n</i> (%) | <i>M</i> ( <i>SD</i> ) |
|--|--------------|------------------------|
| Age (years)                                    |              | 21.34 (4.84)           |
| Biological Sex                                 |              |                        |
| Male   | 36 (14.8%)   |                        |
| Female   | 205 (84.0%)  |                        |
| Intersex                                       | 3 (1.2%)     |                        |
| Race/Ethnicity                                 |              |                        |
| Asian or Pacific Islander                      | 15 (6.1%)    |                        |
| White  | 159 (65.2%)  |                        |
| Black or African American                      | 29 (11.9%)   |                        |
| Hispanic, Latino/a, or of other Spanish origin | 22 (9.0%)    |                        |
| Multiethnic                                    | 13 (5.3%)    |                        |
| Other  | 6 (2.5%)     |                        |
| Year in College                                |              |                        |
| Freshman                                       | 69 (28.3%)   |                        |
| Sophomore                                      | 50 (20.5%)   |                        |
| Junior   | 88 (36.1%)   |                        |
| Senior   | 37 (15.2%)   |                        |
| Cohort   |              |                        |
| Spring 2022                                    | 111 (45.5%)  |                        |
| Fall 2022                                      | 133 (54.5%)  |                        |

**Table 2***Correlations Between All Variables*

|                |                     | Alcohol_Update | E       | O      | C       | N       | A       | PSSTotal | GADTotal |
|----------------|---------------------|----------------|---------|--------|---------|---------|---------|----------|----------|
| Alcohol_Update | Pearson Correlation | 1              | .053    | .093   | -.106   | .189**  | -.138*  | .158*    | .310**   |
|                | Sig. (2-tailed)     |                | .395    | .131   | .088    | .002    | .026    | .012     | <.001    |
|                | N                   | 262            | 262     | 262    | 262     | 262     | 262     | 252      | 253      |
| E              | Pearson Correlation | .053           | 1       | .209** | .197**  | -.308** | .216**  | -.236**  | -.192**  |
|                | Sig. (2-tailed)     | .395           |         | <.001  | <.001   | <.001   | <.001   | <.001    | <.001    |
|                | N                   | 262            | 919     | 919    | 919     | 919     | 919     | 872      | 559      |
| O              | Pearson Correlation | .093           | .209**  | 1      | .116**  | .016    | .212**  | .021     | .082     |
|                | Sig. (2-tailed)     | .131           | <.001   |        | <.001   | .635    | <.001   | .526     | .053     |
|                | N                   | 262            | 919     | 919    | 919     | 919     | 919     | 872      | 559      |
| C              | Pearson Correlation | -.106          | .197**  | .116** | 1       | -.273** | .441**  | -.334**  | -.176**  |
|                | Sig. (2-tailed)     | .088           | <.001   | <.001  |         | <.001   | <.001   | <.001    | <.001    |
|                | N                   | 262            | 919     | 919    | 919     | 919     | 919     | 872      | 559      |
| N              | Pearson Correlation | .189**         | -.308** | .016   | -.273** | 1       | -.292** | .657**   | .659**   |
|                | Sig. (2-tailed)     | .002           | <.001   | .635   | <.001   |         | <.001   | <.001    | <.001    |
|                | N                   | 262            | 919     | 919    | 919     | 919     | 919     | 872      | 559      |
| A              | Pearson Correlation | -.138*         | .216**  | .212** | .441**  | -.292** | 1       | -.280**  | -.204**  |
|                | Sig. (2-tailed)     | .026           | <.001   | <.001  | <.001   | <.001   |         | <.001    | <.001    |
|                | N                   | 262            | 919     | 919    | 919     | 919     | 919     | 872      | 559      |
| PSSTotal       | Pearson Correlation | .158*          | -.236** | .021   | -.334** | .657**  | -.280** | 1        | .628**   |
|                | Sig. (2-tailed)     | .012           | <.001   | .526   | <.001   | <.001   | <.001   |          | <.001    |
|                | N                   | 252            | 872     | 872    | 872     | 872     | 872     | 872      | 534      |
| GADTotal       | Pearson Correlation | .310**         | -.192** | .082   | -.176** | .659**  | -.204** | .628**   | 1        |
|                | Sig. (2-tailed)     | <.001          | <.001   | .053   | <.001   | <.001   | <.001   | <.001    |          |
|                | N                   | 253            | 559     | 559    | 559     | 559     | 559     | 534      | 559      |

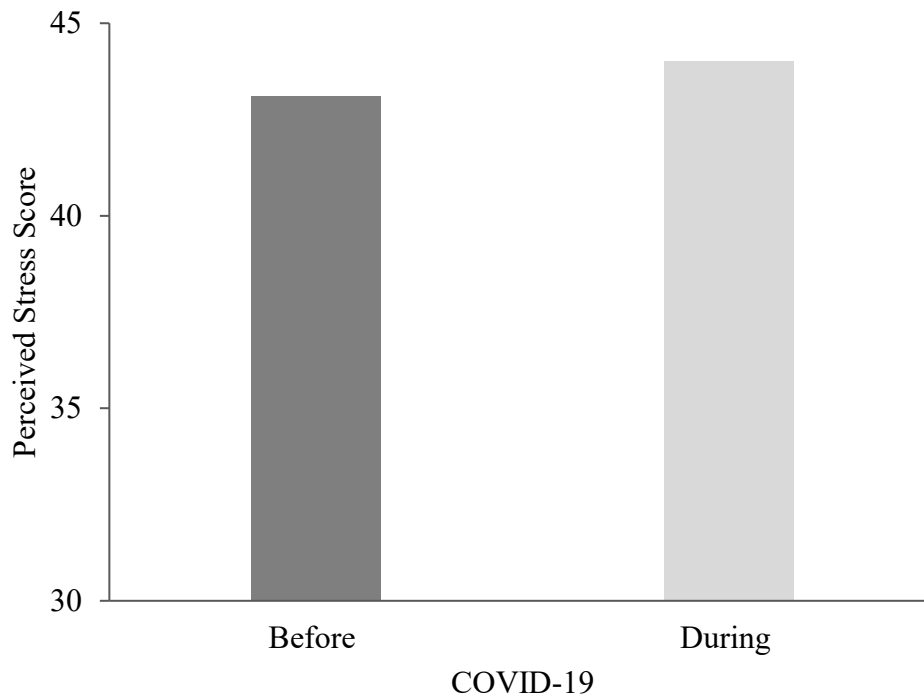
\*\* Correlation is significant at the 0.01 level (2-tailed).

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



**Figure 3**

*Means of Perceived Stress Before and During the Covid-19 Pandemic (N = 1,059)*

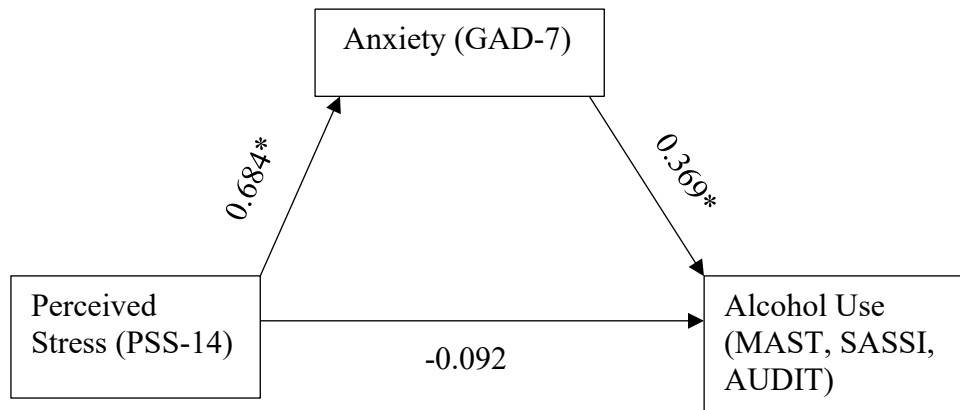


**Table 3***Mediation Analysis Summary*

| Relationship                             | Total   | Direct  | Indirect | Confidence Interval |             | Conclusion     |
|--|---------|---------|----------|---------------------|-------------|----------------|
|  | Effect  | Effect  | Effect   |                     |             |                |
| Perceived Stress > Anxiety > Alcohol Use | 0.1326  | -0.0804 | 0.2131   | Lower Bound         | Upper Bound | Full Mediation |
|  | (0.009) | (0.229) |          | 0.1124              | 0.3247      |                |

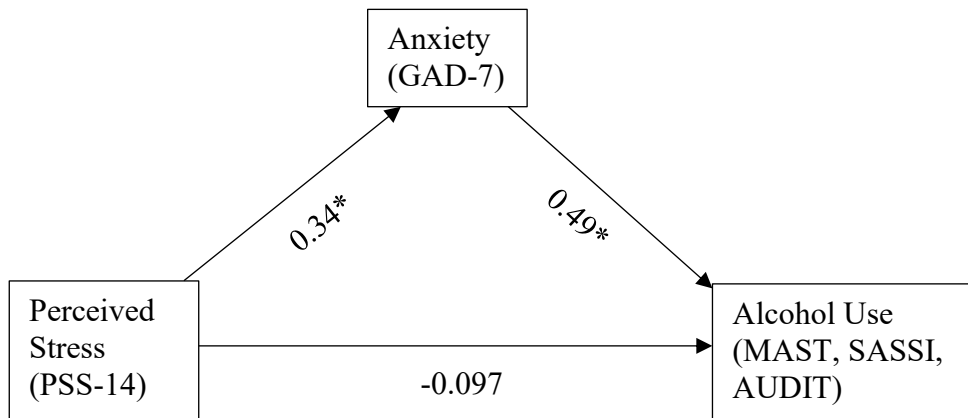
**Figure 4**

*Simple Mediation Model (Hayes' Macro Process Model 4)*

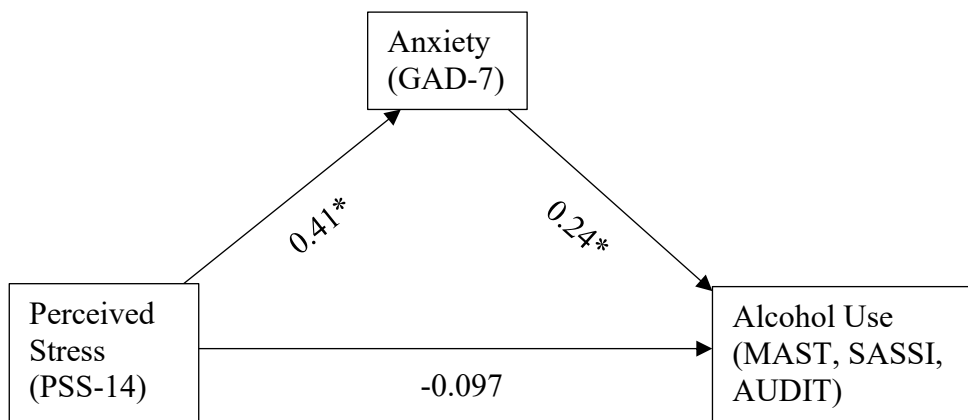


Ind1 (PSS>GAD-7>Alcohol) = 0.2131 [0.1547, 0.3828]

\* indicates significance at .95 confidence interval

**Figure 5***Conditional Process of Moderated Mediation (Model 58)***Higher Neuroticism**

Indirect effect (PSS→GAD-7→Alcohol) = 0.168 [0.076, 0.282]

**Low Neuroticism**

Indirect effect (PSS→GAD-7→Alcohol) = 0.099 [-0.011, 0.209]

*Note.* \* indicates significance at .95 confidence interval.