The Relationship between Key Personality traits and Type I/II Alcoholism among College Students

by

Rui Ding

A thesis submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of
Master of Science

Auburn, Alabama
August 7, 2021

Key words: alcohol use, alcohol use disorder, college students, personality

Approved by

Dr. Diana R. Samek, Associate Professor, Department of Human Development and Family Science
Dr. Joshua R. Novak, Assistant Professor, Department of Human Development and Family Science
Dr. Scott A. Ketring, Associate Professor, Department of Human Development and Family Science

Abstract

Alcohol use remains common among college students. This study used longitudinal data from a sample of 209 first-year students at a university located in the Southeastern United States to identify support for Cloninger's theory of Type I vs. Type II alcoholism. I hypothesized that Type II alcoholism (defined here as a class of alcoholics scoring lower in the personality trait of constraint) would be more common among males than females and earlier relative to later in college. I also hypothesized Type I (defined here as a class of alcoholics scoring higher in constraint, harm avoidance, and negative emotionality traits) would be more common among females than males and later relative to earlier in college. Results indicated that a class of alcoholics for males that who scored lower in constraint but also higher in negative emotionality across the three time points. There was also limited support for the Type I hypothesis - there was support for a class of female alcoholics that scored higher in harm avoidance, but this was found only at the baseline assessment (i.e., the first year of college) and not the follow up assessments (approximately one and five years after baseline). This class demonstrated lower average constraint and higher average negative emotionality scores, as well. Altogether, lower constraint and greater negative emotionality were associated with the alcoholic class across time for both men and women. Implications for this study include potential screening of personality-based risk and offer personality-based education and offering special intervention for the AUD in the college student population.

Acknowledgments

I would first like to thank my major professor Dr. Diana Samek for her guidance and support over the past two years. I would also wish to thank the other Auburn University marriage and family therapy program faculty, Dr. Scott A. Ketring, Dr. Josh Novak. To my cohort, thank you all for your friendship over the past two years.

I want to thank all the clinical supervisors and my professors. When this paper started to break out in COVID-19, I experienced various difficulties during the progress of the paper, which allowed me to be much more stronger than the old ME. The process of studying and researching during the global pandemic has greatly exercised my willpower and patience.

Sigmar, thank you for all the protection you have given me and people who I love over the past two years. Thank you for sheltering me and my friends in the Great Plague, and helping us fight against Nurgle.

Table of Contents

List of Tables

Chapter 1. Introduction

Alcohol use remains common among college students (National Institutes on Alcohol Abuse and Alcoholism [NIAAA], 2016; Substance Use and Mental Health Administration [SAMSHA], 2020). Recent data from the 2019 National Survey on Drug Use and Health showed that almost 33% of full-time college students ages 18 to 22 engaged in binge-drinking during the past month, and 8.2% engaged in heavy drinking in that same time frame (SAMSHA, 2020). Binge-drinking is generally defined as having 4-5 drinks on one occasion and heavy drinking is defined as binge-drinking at least 5 out of the last 30 days (SAMSHA, 2020). Further, ~9% of college students meet the criteria for alcohol use disorder (AUD), which as defined as not how much one drinks, but how alcohol use impacts a person psychologically, physically, or socially. Heavy or frequent alcohol use is associated with several negative outcomes such as school dropout, car crashes, drunk-driving arrests, sexual assaults, and injuries, even death (Hingson, et al., 2017).

For example, Piazza-Gardner and colleagues (2016) found the number of drinks consumed was the strongest predictor of academic performance in a longitudinal sample of college students. One potential mechanism that may explain this link is supported by studies showing a link between greater alcohol use and deviations in brain development (Cservenka & Brumback (2017). Greater alcohol use is also reported as a strong predictor of students' mental health in which, it was attributable for increased depressive symptoms accompanied with drinking to cope, attempted suicide and self-harm behaviors, and aggressive behaviors (Ali, et al., 2013; Gonzales, et al., 2011; Peltzer, et al., 2016; Toprak, et al., 2011).

It remains important for research to address precursors of problematic drinking in order to improve overall health for college students. The purpose of this thesis is to evaluate the

prevalence and predictors of theorized types of AUD symptoms in the college student population based on Cloninger et al's. theory (1981, 1996) and recently replicated by Gierski et al. (2017). Using a longitudinal sample of college students in the Southeastern United States, I hypothesized there would be support for two types of AUD.

- Type II AUD will be characterized by lower constraint. Type II alcoholism will be more common for males than females as well as earlier relative to later in college.
- Type I AUD will be characterized by higher constraint, especially higher harm avoidance, and higher negative emotionality. This subtype will be more common for females than males as well as later relative to earlier in college and females will be more likely to classify as Type I than males**.**

If hypotheses support the two subtypes of alcoholism in the population of college students, then results support efforts to screen and target students at high risk for AUD based on personality and gender. Mental health professionals and schools can offer prevention and intervention programs to help potential group of students learning about protective behavioral strategies, like offering personality tests for freshman and giving continues group therapy for the students who are suffering from seeking group belongingness. On the other hand, students of the low novelty-seeking and high harm-avoidant subtype may be more receptive to special psychological treatment orientation, like Cognitive behavioral therapy (CBT) or DBT orientation, which will help them to change the negative emotion reaction pattern and related coping styles.

Chapter 2. Literature Review

The Developmental Context of College

College represents a unique time in which adolescents gain more freedom and have dedicated time to explore identity and career development. Following this Arnett, et al. (2014) summarized that people experiencing the ages 18–29 years are classified as "emerging adults" and have instability, in love relationships, work, and habitation. And during these years, the entry into marriage, parenthood, and stable employment has been postponed for most young people, sometimes through their own desire to increase education and self-development. Following this dedicated time spent on career and identity development, there is evidence that personality stabilizes at this time (Atherton, 2020; Hopwood et al., 2011). Further, Schulenberg and Maggs (2002) demonstrate that transition to college often normalizes and socializes heavy drinking.

The Importance of Personality

One of the most salient predictors of problematic drinking throughout the life-course is personality traits. Many studies have found that binge-drinkers score higher on impulsivity and sensation seeking compared to non-binge drinkers (Adan et al., 2017; Leeman et al., 2007, 2014; Mackie et al., 2011), including in the college student population (Lannoy et al., 2017). When concentrating on the relationship between personality vulnerability with alcohol misuse, researchers (Krank et al., 2011; Castellanos-Ryan & Conrod, 2012) have found a four-factor model of personality traits is relevant. In this model, four personality traits, hopelessness, anxiety sensitivity, impulsivity, and sensation seeking, are related to alcohol misuse. Out of these four traits, impulsivity and sensation seeking seem to be most relevant to alcohol use problems (LaBrie et al., 2014; Quinn et al., 2011; Stautz, & Cooper, 2013). Whereas impulsivity refers to a multidimensional construct that is related to poor organization skills, difficulty in concentration,

and risk-taking behavior. Sensation seeking refers to the general need for adventure and excitement, exploring unforeseen circumstances and friends, and being willing to take risks just for the experience in new life (Adan et al., 2017).

In addition to this four-factor model highlighting different vulnerability pathways to substance use, there are other personality models that have been well-validated and studied in relation to a large set of health outcomes. Probably the most studied model to date is the Big Five model, which includes the traits of extraversion, neuroticism, openness to experiences, agreeableness, and conscientiousness (Costa & McCrae, 1992; 2008; Goldberg, 1993). The Big Five also corresponds well to the Hierarchical Taxonomy of Psychopathology (HiTOP, Kotov et al., 2017) conceptualization of five-factor structure of personality and the new dimensional approach to measuring personality disorder vs. reliance on disorder diagnoses in the DSM-5 (Krueger et al., 2021). One key Big Five trait is conscientiousness, which is characterized as the extent to which individuals score high in self-discipline and order versus being more disorganized and impulsive. Conscientiousness acts as a protective factor in that it is positively related to prosocial and health-promoting behaviors in general (Lunn et al., 2014), as well as less alcohol and substance use (Conroy, & de Visser, 2014; Clark et al., 2012; Anderson et al., 2007). Neuroticism is characterized by often feeling anxious or depressed, behaving more impulsively vs. feeling calm and stable. Several studies have shown greater neuroticism, particularly the impulsivity facet, is associated with greater substance use and related psychopathology (Carver, & Johnson, 2018; Moraleda-Barren et al., 2018; Rogers t al., 2018; Aluja t al., 2019).).

A third well-validated measurement of personality is the Big Three Model (Patrick et al., 2002; Tellegen & Waller, 2008), which evaluates the higher-order traits of positive emotionality, negative emotionality, and constraint. Positive emotionality is not consistently associated with

substance use problems (Acton, 2003), but negative emotionality and constraint are (McGue et al., 1997; Oliva et al., 2012; Nichols et al., 2019; Samek et al., 2018). Negative emotionality refers to the extent to which individuals experience strong negative emotions, particularly under conditions of stress, whereas constraint refers to the extent to which individuals are organized and inhibited (Tellegen & Waller, 2008). For example, McGue et al. (1997) found that alcoholics have a significantly higher scores on the negative emotionality dimension and consistently lower scores on constraint dimensions. In a longitudinal study on adolescents that classified them as problem users, experimenters, or abstainers at age 18, Olivia et al. (2012) found that problem users had significant constraints constraint than experimenters, and experimenters had significant constraints and higher negative emotionality than abstainers. Also, Samek et al. (2018) indicated the subsequent rank-order increases in AUD symptoms of young adulthood are predicted by lower constraint in adolescence. Nichols et al. (2019) found that greater AUD symptoms in the first-year college were predictive of decreases in constraint in the second year, but only for males. In this thesis, I use the big three measure of personality, as this was the data that was available.

Guiding Frameworks

Although the prior literature is consistently in linking personality traits related to impulsivity to alcohol and substance use problems in adolescence, there is some evidence that there may be more than one type of alcoholism that is related to a differential personality risk profile. One of the most researched typologies is Cloninger et al. 's (1981, 1996) identification of two subtypes of alcoholics. Cloninger et al. (1981) conducted a large study of Swedish adopted males and evaluated a myriad of risk factors, including data on their biological and adopted parents drinking, and data from national registries on crime, alcohol use infractions, medical

diagnoses, as well as measures of personality. Results showed that one subtype of alcoholism was characterized by an earlier onset of drinking, a stronger pattern of having biological parents that were alcoholics, and scoring high in personality traits related to novelty seeking with a motivation to induce euphoria. This was referred to as Type II alcoholism, and such alcoholics were predominately male.

On the other hand, there was a group of individuals that also developed alcohol problems but were more likely to later in life, where social occasions promoted drinking. Cloninger et al. (1981, 1996) noted this group of individuals were less likely to have biological parents that abused alcohol and their drinking generally was used to relieving anxiety. This type scored higher on personality traits related to harm avoidance and low on traits related to novelty-seeking. This subtype is referred to as Type 1 alcoholism, and such alcoholism was more common in females relative to Type II.

Such gender differences in subtype align with research showing greater rates of externalizing problems in boys and men and greatest rates of anxiety and depression in girls and women (Kramer et al., 2008). This suggests substance use by girls and women may be a result of coping with stress more so than for boys and men. Following this, Gao et al. (2020) found female drinkers tended to be more anxious compared to females that did not drink and the associations between substance use behaviors and mental health problems were stronger for females than males. Other work has demonstrated that women are more likely to use alcohol to relieve stress and cope with negative affect (Peltier et al., 2019).

The two subtypes Cloninger et al. (1981, 1996) theorized has been empirically supported in several populations (Babor et al., 1992, 2002) although not in others (Wennberg et al., 2014). There is less research on how these typologies might be relevant to college students, as this

development context promotes drinking and problematic use like binge drinking is often perceived as normal. One recent cross-sectional study (Gierski et al., 2017) attempted to fill this gap by evaluating 200 French college students; 100 of those who regularly binge-drank (50 men, 50 women) whereas the other 100 did not. They analyzed multiple personality traits related to Cloninger et al.'s theory (1981, 1996), including harm avoidance, novelty-seeking, and persistence ("perseverance despite frustration or fatigue," p. 1971). Cluster analysis also showed support for two groups of binge-drinkers that aligned with Cloninger's theory. One group, consisting of mostly men, had greater novelty-seeking but lower persistence and self-directedness scores, supporting the type II classification. The other binge-drinking group had greater harm avoidance scores, but only for females, supporting the type I classification.

I aimed to extend knowledge on these findings by attempting to replicate them in a sample of college students in the Southeastern United States. Using longitudinal data, I also will study whether the support for these subtypes change over time. I test this using the big three models of personality, which has been well-validated. I test whether two subtypes can be found in the population of first year students and track how these changes through data collection approximately one and four years later. Given the increase of alcohol use in social situations in college, and the nature of the type II alcoholic being more likely to drink to evoke euphoria, I expect that in first of college, type II alcoholics will be more common than type I, and will be made up of mostly men. By the transition out of college, I expect to find Type I alcoholics would be more common than type II, at least for females, based on research demonstrating women are more likely to use substances to cope with stress compared to men (e.g., Peltier, 2019).

Study Overview

The purpose of this study is to replicate and extend Gierski et al. (2017) and test for support for Cloninger's Type I vs. II alcoholism subtypes. Using a three-wave longitudinal study of college students, and the Big Three personality framework (Tellegen & Waller, 2008), I aim to evaluate whether there is support for the subtypes in a sample of university freshman and how these subtypes change over time.

H1: There will be support for two subtypes of alcoholism in the population of college students that align with Cloninger's theory and that they will change over time.

H1a. One subtype will be characterized by lower constraint (Cloninger's Type II). This subtype will be more common earlier relative to later in college and males will be more likely to classify than females.

H1b. The other subtype will be characterized by higher constraint, higher harm avoidance, and higher negative emotionality (Cloninger's Type I). This subtype will be more common later relative to earlier in college and females will be more likely to classify than males.

Chapter 3. Methods

Participants

All participants were randomly selected from the population of first-year students at a university located in the Southeastern United States. There were three waves of data collected via a wide-ranging online survey that took about one to two hours to complete, on average. The purpose of the original study was to evaluate risk and protective factors for substance use problems and related psychopathology (depression, anxiety). Therefore, an extensive list of questions was asked (e.g., personality, parent and peer support, romantic relationship experiences, etc.). The first assessment was completed in the fall and spring semesters of the 2015-2016 academic year. Seven hundred students were randomly selected from the approximately 5,000 students and were invited to participate. Of the 700 eligible students, 73% (N = 511) was successfully located, and 209 of those agreed to participate (41% participation rate). Written consent was required by the university IRB for all participants before receiving survey instructions. In general, the sample was representative of the population it was sampled from but was slightly more likely to be female (~60% vs. 50%) and white (~90% vs. 80%). In Wave 2, 178 individuals participated (84.3% retention rate). The average time between the two assessments was about 11 months (range from ~8 to 16 months), and the vast majority were enrolled in school full- or part-time (96%). At Wave 3, 80% (N = 167) of the original participants had taken the Wave 3 survey. The average time between the first and last assessment is four years (range from 3.10 to 4.35), and about half of the sample reported recently graduating from college. Please see **Table 1** for demographic information on the study sample.

Measures

Alcohol use disorder symptoms. DSM-5 symptoms of alcohol use disorder will be used to assess problematic alcohol use. Items were adapted from the Substance Abuse Module (Robins et al., 1987) of the Composite International Diagnostic Interview (Robins et al., 1988) for DSM-5 criteria (APA, 2013). A detailed overview of this measurement and the corresponding 10 DSM-5 symptoms have been described previously (Nichols & Samek, 2019; in their supplemental materials). From DSM-5, Alcohol use disorder can be mild, moderate or severe, based on the number of symptoms you experience. Some signs and symptoms may include:

- Being unable to limit the amount of alcohol you drink
- Wanting to cut down on how much you drink or making unsuccessful attempts to do so
- Spending a lot of time drinking, getting alcohol or recovering from alcohol use
- Feeling a strong craving or urge to drink alcohol
- Failing to fulfill major obligations at work, school or home due to repeated alcohol use
- Continuing to drink alcohol even though you know it's causing physical, social or interpersonal problems

The DSM 5 allows clinicians to specify how severe or how much of a problem the substance use disorder is, depending on how many symptoms are identified. Two or three symptoms indicate a mild substance use disorder;1 four or five symptoms indicate a moderate substance use disorder, and six or more symptoms indicate a severe substance use disorder.

Personality traits

Personality traits were assessed at Wave 1, 2, and 3 during this study, using the 198-item version of the Multidimensional Personality Questionnaire (MPQ, Tellegen & Waller, 2008, also

see University of Minnesota Press. (n.d.). MPQ Standard). Most items were made by using a 4-point Likert scale (from 1= Definitely True to 4 = Definitely False), but some were answered on a slightly different scale (1 = Definitely A to 4 = Definitely B). The MPQ uses 11 primary scales to portray three high order dimensions: constraint, negative emotionality, and positive emotionality. The primary scales that load on to constraint are control, harm avoidance, and traditionalism (αs ranged from .80 to .86 across scales and waves). The primary scales that load onto negative emotionality are stress reaction, alienation, and aggression (αs ranged from .86 to .91 across scales and waves). Although not evaluated here, the primary scales that load onto positive emotionality are well-being, social potency, achievement, and social closeness (αs ranged from .84 to .92 across scales and waves).

Covariates. Fraternity/Sorority membership was assessed by answering "I belong to a Fraternity" or "I belong to a Sorority" to the question "Do you belong to a Sorority or Fraternity. By using this covariate, we want to explore the peer social interaction's effect on binge drinking. A clinical level of depression was assessed by CES-D. Items in this scale assess for depression (e.g., "I was bothered by things that usually don't bother me" or "I felt depressed"), rated on a four-point scale ranging from rarely or none of the time (less than one day) to most or all of the time (5-7 days). If they score ≥ 16, they are coded to meet a clinical threshold for depression based on Lewinsohn and colleagues' research (1997).

Analysis plan

In order to evaluate whether there were two valid types of alcoholism (type I and II), Using Mplus 8.4 (Muthén & Muthén, 1998-2020), I compared 1- and 2-class solutions for females vs. males based on the indicators of alcohol use disorder symptoms, the personality scores of constraint, harm avoidance, and negative emotionality and the covariates of

fraternity/sorority membership and clinical-level depressive symptoms (CES-D ≥ 16). Full information maximum likelihood will be used to handle missing data. Statistical and theoretical criteria were used to determine the best model fit. Statistical criteria include comparing Akaike Information Criterion (AIC) and the adjusted Bayesian Information Criterion (BIC) score and evaluating the significance of the Lo-Mendell-Rubin adjusted LRT. The lower the AIC and BIC, the better the fit. The null hypothesis for the LRT test is that a model with one less class is a better fitting model. Theoretical criteria include making sense of the mean loadings on each of the observed classes (in line with study hypotheses). I tested class solutions at each Wave and evaluated how support for 1- vs. 2-class solutions change over time.

Chapter 4. Result

Gender differences in mean scores of AUD and personality faces

Table 2 presents the mean scores, standard deviations, and range of the AUD symptoms, and personality traits by gender. In general, overall average AUD symptoms did not change much over time. For males, the mean of AUD symptoms at Wave 1 = 1.19 (*SD* = 2.04). At Wave 2, this average dropped to .92 (*SD* = 1.27) and rose again at Wave 3 to 1.20 (*SD* = 1.62). For females, AUD symptoms linearly increased from Wave 1 (*M* = .80, *SD* = 1.49), to Wave 2 (*M* = .96, *SD* = 1.78), to Wave 3 (*M* = .65, *SD* = 1.25). The only significant gender difference found for AUD symptoms was at Wave 3, in which males reported greater average AUD than females (Cohen's *d* = .38). In general, males had significantly lower constraint than females (*ds* ranged .72 to .56). Negative emotionality scores were generally similar across males and females at Waves 1 and 2 (*d*s = .04 and .05); however, males had significantly greater negative emotionality at Wave 3 (*d* = .35). Finally, harm avoidance scores were significantly greater for females than males (*ds* ranged from .98 to .85).

Correlation between AUD symptoms and personality faces

Correlations between AUD symptoms, constraint, negative emotion, and harm avoidance are shown in **Table 3**. For both males and females, AUD symptoms were inversely and generally significantly correlated with constraint within and across time (ranged from -.15 to -.40). On the other hand, negative emotionality was generally positively correlated with AUD symptoms. Further, the correlations between negative emotionality and AUD symptoms did not reach significance for males except for the correlation between negative emotionality at Wave 1 and AUD symptoms at Wave 3 ($r = .32$, $p < .05$). For females, correlations between negative emotionality and AUD symptoms were generally significant at Waves 2 and 3 (rs ranged

from .20 to .31, *p*s < .05) but not at Wave 1 (*r*s ranged from .12 to .16, *p*s > .05). For males, harm avoidance was generally not significantly associated with AUD symptoms. For females, harm avoidance at Waves 2 and 3 were significantly and inversely correlated with AUD symptoms at Wave 3 (rs range from -.25 and -.26, *p*s < .05). In general, these correlations somewhat support hypotheses. It does not appear constraint is more correlated with AUD symptoms for males than females, as I hypothesized. Negative emotionality does appear to be more correlated with AUD symptoms for females than males, as I hypothesized. On the other hand, harm avoidance seems less relevant to AUD symptoms than constraint or negative emotionality, at least in the first two years of college. By the transition out of college, harm avoidance is relevant and only for females and not in the direction as hypothesized (see **Table 3** for details).

Latent Profile Analyses: Results for females

Table 4 describes results for females in comparing model fit in 1- and 2-class models using data from at Wave 1. The 1-class solution shows averages in variables for females and 100% in the class. For females at Wave 1, the 2-class model showed a drop in AIC and adjusted BIC values in comparison to the 1-class model (ΔAIC= 440.18, ΔBIC = 441.33); however, the LRT indicated the 2-class model did not fit significantly better than the 1-class model ($p = .21$). Thus, there is some statistical evidence for a 2-class solution and some for a 1-class solution. Theoretically, the 2-class solution aligned with the hypothesis, somewhat. That is, females in class 2 had greater average AUD symptoms, as well as greater average negative emotionality, greater harm avoidance scores, and lower constraint compared to females in class 1 (the non-alcoholic class). The majority of females (91.3%) made up class 1, whereas a minority made up class 2 (8.7%). Females in class 2 had 3.13 times the odds of being in a sorority and 2.63 times the odds of meeting a clinical threshold for depression.

Table 5 describes results for females in comparing model fit in 1- and 2-class models using data from at Wave 2. For female students, compared to the 1-class model, the 2-class model showed a drop in AIC and adjusted BIC values (ΔAIC = 403.688, ΔBIC = 405.08); however, the LRT indicated the 2-class model did not fit significantly better than the 1-class model (p = .17). The 1-class solution shows averages in variables for females and 100% in the class. In this 2-class model, most females (90.3%) were in class 1, which showed generally lower than average AUD symptoms, slightly higher constraint scores, slightly lower negative emotionality scores, and slightly higher harm avoidance scores compared to the sample average. As was found at Wave 1, at Wave 2, class 2 was made up of individuals with greater average AUD symptoms, negative emotionality, as well as lower constraint and harm avoidance scores. Thus, unlike results at Wave 1, results at Wave 2 did not support expectations that females with AUD would demonstrate greater than average harm avoidance. They did show elevated risk in negative emotionality and low constraint, however. Females in the high-risk group had 2.70 times the odds of being in a sorority and 1.67 times the odds of meeting a clinical threshold for depression.

Table 6 describes results for females in comparing model fit in 1- and 2-class models using data from at Wave 3. For female students, compared to the 1-class model, the 2-class model showed a drop in AIC and adjusted BIC values (ΔAIC = 1,565.77, ΔBIC =1,579.11); however, the LRT indicated the 2-class model did not fit significantly better than the 1-class model (p = .06). The 1-class solution shows averages in variables for females and 100% in the class. In this 2-class model, most females (80.9%) were in class 1, which showed generally lower than average AUD symptoms, higher constraint scores, slightly lower negative emotionality scores, and higher harm avoidance scores. Following results for Wave 2, results at Wave 3

showed that class 2 comprised individuals with greater average AUD symptoms, negative emotionality scores, as well as lower constraint and harm avoidance scores. Females in the lower risk group had 1.64 times the odds of being in a sorority compared to the high-risk group, and the high-risk group had 3.70 times the odds of meeting a clinical threshold for depression.

Latent Profile Analyses: Results for males

Table 7 shows results for males using Wave 1 variables. Model fit improved for the 2- relative to 1-class solution as indicated by the change in AIC and adjusted BIC (ΔAIC = 262.08, ΔBIC =265.73) but the LRT test did not reach statistical significance (p = .07). Class 2 represented the higher risk class, representing 4.1% of the sample, with greater than average AUD symptoms, lower constraint, greater negative emotionality, and lower harm avoidance scores. This aligned with expectations as the main difference in comparing results across males and females was that the class with greater AUD symptoms differed in harm avoidance scores. However, men in the alcoholic class also scored relatively higher in negative emotionality. Males in the high-risk group had 2.63 times the odds of meeting a clinical threshold for depression.

Table 8 shows results for males using Wave 2 variables. Model fit improved for the 2- relative to 1-class solution as indicated by the change in AIC and adjusted BIC (ΔAIC = 198.68, ΔBIC =202.34), but not the LRT test ((p = .10). Class 2 represented the higher risk class, representing 31.1% of the sample, with greater than average AUD symptoms, lower constraint, lower negative emotionality, and lower harm avoidance scores. Males in the high-risk group had 1.27 times the odds of being in a fraternity.

Table 9 shows results for males using Wave 3 variables. Model fit improved for the 2- relative to 1-class solution as indicated by the change in AIC and adjusted BIC (ΔAIC = 696.29, ΔBIC =706.22), with LRT test (p = .20). Class 1 represented the higher risk class, representing

21.1% of the sample, with greater than average AUD symptoms, higher negative emotionality, and lower constraint and harm avoidance scores.

Chapter 5. Discussion

The purpose of this study was to evaluate support for Cloninger et al.'s (1981, 1996) theory on the existence of two subtypes of alcoholics in a community sample of first year college students and evaluate whether support for this theory changed from the transition into to the transition out of college. Results partially supported hypotheses in that there was support for a class that constituted lower constraint and greater AUD symptoms for males at each assessment; however, members of this class also showed elevated negative emotionality. There was only some support for a class of alcoholics with greater harm avoidance symptoms, but this was found only at the baseline assessment for females, and not the follow up assessments. What was consistent was that lower constraint and greater negative emotionality were associated with greater AUD symptoms across time for both men and women. This supports the idea of having a personality liable to greater externalizing and internalizing problems for alcoholics across the board.

Based on previous research, it is supported that AUD symptoms align with an externalizing model of development (Krueger et al., 2021). The characteristic of externalizing model is a tendency for behavioral under-control, poor response inhibition (Dick et al., 2010), and increasing sensation to reward (Gatzke-Kopp et al., 2009; Krueger et al., 2007; Zucker et al., 2011; Zuckerman & Kuhlman, 2000). A number of documents record the role of externalization characteristics in the development of substance use issues (Farmer et al., 2016; Meque et al., 2019; Steele et al., 1995; Zucker et al., 2011). This model proposes that disinhibited externalizing has been linked to multiple maladaptive traits, including disorganization, lack of impulse control, and a lack of concern about the consequences of behaviors (Crego, C., & Widiger, 2016; Kotov et al., 2017; Somma et al., 2019).

On the other hand, results show that as negative emotionality was consistently linked to the alcoholic class across time and genders, results potentially support an internalizing pathway of AUD. Several studies indicated that internalizing symptoms in childhood and adolescence predict subsequent substance use (Hussong et al., 2011; Kushner et al., 2012; Steele et al., 1995). Hussong et al. (2011) described that internalizing pathway includes an ongoing set of interactions between risk, protective, and vulnerability factors that lead to substance use disorders. Hussong and colleagues expect that negative affect pathway leading to greater substance use disorders starts in late childhood and it related to three facets: positive expectations for substance's effects, interpersonal skills deficits which lead to social withdraw, and self-medication as coping technique. Some studies also notice that there is a subgroup in the drinkers who are using alcohol to reduce negative affect (Carpenter & Hasin, 1999; Tarter et al., 1994), which may consider alcohol using as a self-medication to deal with anxiety, depression (Swendsen et al., 2020; Tomlinson & Brown, 2012). This internalizing pathway or potentially self-medicating hypothesis is further supported by this study's results showing those in the alcoholic class tended to have greater odds of having a clinical threshold of depression across waves and gender.

One reason for the low consistency of alcoholics with more significant harm avoidance symptoms at the follow-up assessments may be due to the longitudinal nature and design of the study. I expected to replicate Gierski et al. (2017) and find support for a class of female alcoholics with greater harm avoidance scores. Gierski et al. used a cross-sectional sample of 200 French university students that were not necessarily in their first year. These authors also used the French version of a temperament measure designed to measure Cloninger's theory to assess harm avoidance, while this study used the harm avoidance scale from the multidimensional

personality questionnaire (Tellegen & Waller, 2007), although I would expect the harm avoidance scales from both instruments would be highly correlated. This study also evaluated AUD symptoms instead of binge-drinking to measure alcoholic tendencies. Considering this, it may be that Cloninger's theory is more specific to binge-drinking than impairment in physical, psychological, or social health in the population of college students. Further research is needed to unpack this. We also need to notice that Cloninger's theory (1981) was based on a sample from a large study of Swedish adopted males who ranged in age from 23 to 43 years at the time of last information, while this study was of emerging adults in a more recent generation.

Study results have implications for AUD prevention and intervention in the college student population. In selective prevention, the reorganization of dysfunctional metacognition (for example, drinking to avoid negative judgments of others) may help control drinking, and the establishment of adaptive emotion regulation strategies may be helpful. In addition, education on drinking patterns could reduce the frequency of AUD symptoms among impulsive and sensory-seeking people. Prevention should start at the beginning of school age, and not limited to specific actions, because the overall goal should be to promote the empowerment and overall health of young people. Containing various elements that promote protective factors seems to be the best strategy for restoring healthy habits and improving the quality of life in the short and long term. From this perspective, to make these methods more successful, it is necessary to consider the personality characteristics that represent the vulnerability factors of the occurrence and maintenance of AUD. Dick et al. (2021) mention that it is difficult get large numbers of college students to willingly engage with prevention education materials designed to provide helpful information for enhance their health outcomes. Thus, they propose that by making educational materials more personal and engaging, teachers/clinicians may make students want to participate,

and in addition, by using sharing and social media, students can actively recruit other students to participate in prevention programs. Based on this study, I suggest that schools could process the personality questionnaire survey for first-year students and give personalized feedback about the risk factors for AUD. It may encourage students to engage in psychological intervention by integrating alcoholism with adult social and personality development psychoeducation. At the same time, the group therapy regularly helps troubled students, especially new students and graduates.

The limitations of the research should be considered when interpreting these findings. First, the burden lies in the sample size, resulting in limited ability to detect the significant gender differences in drinking found in the previous literature. Second, this study was based on retrospective self-reports of drinking, raising the possibility of errors in recall or evaluation. Finally, our sample was 90% White, limiting the applicability of generalization. Given the comorbidities of alcoholism with personality disorders (Creswell et al., 2016), clinical samples should also be used, such as those with personality disorders outpatients/inpatients. Strengths of this study include the longitudinal design and evaluation of potential gender differences in the predictors of AUD symptoms.

In conclusion, results from this study only partially support for Cloninger et al's (1981, 1996) theory on the existence of two subtypes of alcoholics in a community sample of first year college students. There was support for a class of alcoholics for males that constituted lower constraint, higher negative emotionality, and greater AUD symptoms at each assessment. On the other hand, there was only some support for a class of alcoholics with greater harm avoidance scores, but this was found only at the baseline assessment for females. The most consistent set of findings was that lower constraint and greater negative emotionality were associated with the

alcoholic class for men and women across all three time points. Although this study has limitations and future work is warranted, results supporting a growing body of research supporting the use of personality-screening and targeted intervention in the college student population (e.g., Dick et al., 2021).

References

Acton, G. S. (2003). Measurement of impulsivity in a hierarchical model of personality traits: Implications for substance use. *Substance use & misuse, 38*(1), 67-83. doi: 10.1081/JA-120016566

Adan, A., Forero, D. A., & Navarro, J. F. (2017). Personality traits related to binge drinking: a systematic review. *Frontiers in psychiatry, 8*, 134. doi: 10.3389/fpsyt.2017.00134

Ali, B., Ryan, J. S., Beck, K. H., & Daughters, S. B. (2013). Trait aggression and problematic alcohol use among college students: the moderating effect of distress tolerance. *Alcoholism: clinical and experimental research*, *37*(12), 2138-2144. doi: 10.1111/acer.12198

Aluja, A., Lucas, I., Blanch, A., & Blanco, E. (2019). Personality and disinhibitory psychopathology in alcohol consumption: A study from the biological-factorial personality models of Eysenck, Gray, and Zuckerman. *Personality and Individual Differences, 142*, 159-165. doi: 10.1016/j.paid.2019.01.030

American Psychiatric Association [APA]. (2013). *Diagnostic and statistical manual of mental disorders (5th ed).* Washington, DC: Author.

Anderson, K. G., Tapert, S. F., Moadab, I., Crowley, T. J., & Brown, S. A. (2007). Personality risk profile for conduct disorder and substance use disorders in youth. *Addictive Behaviors, 32*(10), 2377-2382. doi: 10.1016/j.addbeh.2007.02.006

Arnett, J. J., Žukauskienė, R., & Sugimura, K. (2014). The new life stage of emerging adulthood at ages 18–29 years: Implications for mental health. *The Lancet Psychiatry*, *1*(7), 569-576.

Atherton, O. E., Grijalva, E., Roberts, B. W., & Robins, R. W. (2021). Stability and change in personality traits and major life goals from college to midlife. *Personality and Social Psychology Bulletin*, *47*(5), 841-858. doi.org: 10.1177/0146167220949362

Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001). The alcohol use disorders identification test: Guidelines for use in primary care, 2nd edition. World Health Organization (WHO). http://apps.who.int/iris/bitstream/handle/10665/67205/WHO_MSD_MSB_01.6a.pdf;jsessionid=5DA3ADE3AF97D5D2875FA9BD9D06EE7C?sequence=1

Babor, T. F., Hofmann, M., DelBoca, F. K., Hesselbrock, V., Meyer, R. E., Dolinsky, Z. S., & Rounsaville, B. (1992). Types of alcoholics, I: Evidence for an empirically derived typology based on indicators of vulnerability and severity. *Archives of general psychiatry*, *49*(8), 599-608. doi: 10.1001/archpsyc.1992.01820080007002

Carpenter, K. M., & Hasin, D. S. (1999). Drinking to cope with negative affect and DSM-IV alcohol use disorders: A test of three alternative explanations. *Journal of Studies on Alcohol, 60*(5), 694–704. doi: 10.15288/jsa.1999.60.694

Carver, C. S., & Johnson, S. L. (2018). Impulsive reactivity to emotion and vulnerability to psychopathology. *American psychologist, 73*(9), 1067. doi: 10.1037/amp0000387

Castellanos-Ryan, N., & Conrod, P. (2012). Personality and substance misuse: Evidence for a four-factor model of vulnerability. In J. C. Verster, K. Brady, M. Galanter, & P. Conrod (Eds.), *Drug abuse and addiction in medical illness: Causes, consequences and treatment* (pp. 47–62). Springer Science + Business Media. doi: 10.1007/978-1-4614-3375-0_4

Clark, A., Tran, C., Weiss, A., Caselli, G., Nikčević, A. V., & Spada, M. M. (2012). Personality and alcohol metacognitions as predictors of weekly levels of alcohol use in binge drinking university students. *Addictive Behaviors, 37*(4), 537–540. doi: 10.1016/j.addbeh.2011.11.035

Cloninger, C. R., Bohman, M., & Sigvardsson, S. (1981). Inheritance of alcohol abuse: Cross-fostering analysis of adopted men. *Archives of general psychiatry, 38*(8), 861-868. doi: 10.1001/archpsyc.1981.01780330019001.

Cloninger, C. R., Sigvardsson, S., & Bohman, M. (1996). Type I and type II alcoholism: An update. *Alcohol Health and Research World, 20*(1), 18.

Conroy, D., & de Visser, R. (2014). Being a non-drinking student: An interpretative phenomenological analysis. *Psychology & Health, 29*(5), 536-551. doi: 10.1080/08870446.2013.866673.

Costa, P., & McCrae, R. (2008). The revised neo personality inventory (neo-pi-r). In G. J. BoyleG. Matthews, & D. H. Saklofske *The SAGE handbook of personality theory and assessment: Volume 2 — Personality measurement and testing* (pp. 179-198). SAGE Publications Ltd, doi: 10.4135/9781849200479.n9

Crego, C., & Widiger, T. A. (2016). Convergent and discriminant validity of alternative measures of maladaptive personality traits. *Psychological Assessment, 28*, 1561–1575. doi: 10.1037/pas0000282

Cservenka, A., & Brumback, T. (2017). The burden of binge and heavy drinking on the brain: Effects on adolescent and young adult neural structure and function. *Frontiers in psychology*, *8*, 1111. doi: 10.3389/fpsyg.2017.01111

Dick, D. M., Saunders, T., Balcke, E., Driver, M. N., Neale, Z., Vassileva, J., & Langberg, J. M. (2021). Genetically influenced externalizing and internalizing risk pathways as novel prevention targets. *Psychology of Addictive Behaviors.* Advance online publication. doi: 10.1037/adb0000759

Dick, D. M., Smith, G., Olausson, P., Mitchell, S. H., Leeman, R. F., O'Malley, S. S., & Sher, K. (2010). Understanding the construct of impulsivity and its relationship to alcohol use disorders. *Addiction Biology, 15*(2), 217–226. doi: 10.1111/j.1369-1600.2009.00190.x.

Farmer, R. F., Gau, J. M., Seeley, J. R., Kosty, D. B., Sher, K. J., & Lewinsohn, P. M. (2016). Internalizing and externalizing disorders as predictors of alcohol use disorder onset during three developmental periods. *Drug and Alcohol Dependence, 164,* 38–46. doi: 10.1016/j.drugalcdep.2016.04.021

Gao, W., Ping, S., & Liu, X. (2020). Gender differences in depression, anxiety, and stress among college students: a longitudinal study from China. *Journal of Affective Disorders*, *263*, 292-300. doi: 10.1016/j.jad.2019.11.121

Gatzke-Kopp, L. M., Beauchaine, T. P., Shannon, K. E., Chipman, J., Fleming, A. P., Crowell, S. E., Liang, O., Johnson, L. C., & Aylward, E. (2009). Neurological correlates of reward responding in adolescents with and without externalizing behavior disorders. *Journal of Abnormal Psychology, 118*(1), 203–213. doi: 10.1037/a0014378

Gierski, F., Benzerouk, F., De Wever, E., Duka, T., Kaladjian, A., Quaglino, V., & Naassila, M. (2017). Cloninger's temperament and character dimensions of personality and binge drinking among college students. *Alcoholism: Clinical and Experimental Research, 41*(11), 1970-1979. doi: 10.1111/acer.13497

Goldberg, L. R. (1993). The structure of phenotypic personality traits. *American Psychologist, 48*, 26-34. doi: 10.1037/0003-066X.48.1.26.

Gonzalez, V. M., Reynolds, B., & Skewes, M. C. (2011). Role of impulsivity in the relationship between depression and alcohol problems among emerging adult college drinkers. *Experimental and Clinical Psychopharmacology*, *19*(4), 303. doi: 10.1037/a0022720

Hingson, R., Zha, W., & Smyth, D. (2017). Magnitude and trends in heavy episodic drinking, alcohol-impaired driving, and alcohol-related mortality and overdose hospitalizations among emerging adults of college ages 18–24 in the United States, 1998–2014. *Journal of studies on alcohol and drugs*, *78*(4), 540-548. doi: 10.15288/jsad.2017.78.540.

Hopwood, C. J., Donnellan, M. B., Blonigen, D. M., Krueger, R. F., McGue, M., Iacono, W. G., & Burt, S. A. (2011). Genetic and environmental influences on personality trait stability and growth during the transition to adulthood: a three-wave longitudinal study. *Journal of personality and social psychology*, *100*(3), 545. doi: 10.1037/a0022409

Hussong, A. M., Jones, D. J., Stein, G. L., Baucom, D. H., & Boeding, S. (2011). An internalizing pathway to alcohol use and disorder. *Psychology of Addictive Behaviors, 25*(3), 390–404. doi: 10.1037/a0024519

Kotov, R., Krueger, R. F., Watson, D., Achenbach, T. M., Althoff, R. R., Bagby, R. M., ... & Zimmerman, M. (2017). The Hierarchical Taxonomy of Psychopathology (HiTOP): A dimensional alternative to traditional nosologies. *Journal of abnormal psychology, 126*(4), 454. doi: 10.1037/abn0000258

Kramer, M. D., Krueger, R. F., & Hicks, B. M. (2008). The role of internalizing and externalizing liability factors in accounting for gender differences in the prevalence of

common psychopathological syndromes. *Psychological Medicine, 38*(1), 51. doi: 10.1017/S0033291707001572

Krank, M., Stewart, S. H., O'Connor, R., Woicik, P. B., Wall, A. M., & Conrod, P. J. (2011). Structural, concurrent, and predictive validity of the Substance Use Risk Profile Scale in early adolescence. Addictive behaviors, 36(1-2), 37-46. doi: 10.1016/j.addbeh.2010.08.010

Krueger, R. F., Markon, K. E., Patrick, C. J., Benning, S. D., & Kramer, M. D. (2007). Linking antisocial behavior, substance use, and personality: An integrative quantitative model of the adult externalizing spectrum. *Journal of Abnormal Psychology, 116*(4), 645–666. doi: 10 .1037/0021-843X.116.4.645

Krueger, R. F., Hobbs, K. A., Conway, C. C., Dick, D. M., Dretsch, M. N., Eaton, N. R., ... & HiTOP Utility Workgroup. (2021). Validity and utility of Hierarchical Taxonomy of Psychopathology (HiTOP): II. Externalizing superspectrum. *World Psychiatry*, *20*(2), 171-193. doi: 10.1002/wps.20844

Kushner, M. G., Wall, M. M., Krueger, R. F., Sher, K. J., Maurer, E., Thuras, P., & Lee, S. (2012). Alcohol dependence is related to overall internalizing psychopathology load rather than to particular internalizing disorders: Evidence from a national sample. *Alcoholism, Clinical and Experimental Research, 36*(2), 325–331. doi: 10.1111/j.1530-0277.2011.01604.x

LaBrie, J. W., Kenney, S. R., Napper, L. E., & Miller, K. (2014). Impulsivity and alcohol-related risk among college students: Examining urgency, sensation seeking, and the moderating influence of beliefs about alcohol's role in the college experience. *Addictive behaviors, 39*(1), 159-164. doi: 10.1016/j.addbeh.2013.09.018

Lannoy, S., Billieux, J., Poncin, M., & Maurage, P. (2017). Binging at the campus: Motivations and impulsivity influence binge drinking profiles in university students. *Psychiatry Research, 250*, 146-154. doi: 10.1016/j.psychres.2017.01.068

Leeman, R. F., Fenton, M., & Volpicelli, J. R. (2007). Impaired control and undergraduate problem drinking. *Alcohol and Alcoholism, 42*(1), 42-48. doi: 10.1093/alcalc/agl095

Leeman, R. F., Hoff, R. A., Krishnan-Sarin, S., Patock-Peckham, J. A., & Potenza, M. N. (2014). Impulsivity, sensation-seeking, and part-time job status in relation to substance use and gambling in adolescents. *Journal of Adolescent Health, 54*(4), 460-466. doi: 10.1016/j.jadohealth.2013.09.014

Lewinsohn, P. M., Seeley, J. R., Roberts, R. E., & Allen, N. B. (1997). Center for Epidemiologic Studies Depression Scale (CES-D) as a screening instrument for depression among community-residing older adults. *Psychology and Aging, 12*, 277-287. doi:10.1037/0882-7974.12.2.277

Lunn, T. E., Nowson, C. A., Worsley, A., & Torres, S. J. (2014). Does personality affect dietary intake?. *Nutrition, 30*(4), 403-409. http://dx.doi.org/10.1016/j.nut.2013.08.012

Mackie, C. J., Castellanos-Ryan, N., & Conrod, P. J. (2011). Personality moderates the longitudinal relationship between psychological symptoms and alcohol use in adolescents. Alcoholism: *Clinical and Experimental Research, 35*(4), 703-716. doi: 10.1111/j.1530-0277.2010.01388.x

McGue, M., Slutske, W., Taylor, J., & Lacono, W. G. (1997). Personality and substance use disorders: I. Effects of gender and alcoholism subtype. *Alcoholism: Clinical and Experimental Research, 21*(3), 513-520. doi: 10.1111/j.1530-0277.1997.tb03797.x

Meque, I., Dachew, B. A., Maravilla, J. C., Salom, C., & Alati, R. (2019). Externalizing and internalizing symptoms in childhood and adolescence and the risk of alcohol use disorders in young adulthood: A meta-analysis of longitudinal studies. *The Australian and New Zealand Journal of Psychiatry, 53*(10), 965–975. doi: 10.1177/0004867419844308

Moraleda-Barreno, E., Díaz-Batanero, C., Pérez-Moreno, P. J., Gómez-Bujedo, J., & Lozano, O. M. (2018). Relations between facets and personality domains with impulsivity: New evidence using the DSM-5 Section III framework in patients with substance use disorders. *Personality Disorders: Theory, Research, and Treatment, 9*(5), 490. doi: 10.1037/per0000278

Muthén, L. K., & Muthén, B. O. (1998-2020). *Mplus User's Guide, Eighth Edition*. Los Angeles, CA: Muthén & Muthén.

National Institute on Alcohol Abuse and Alcoholism. (2016). Fall semester: A time for parents to discuss the risks of college drinking.

Nichols, L. R., Samek, D. R., & McConnell, L. (2019). Key personality traits and alcohol use disorder symptoms in first and second-year college students: detangling antecedent from consequence. *Addictive Behaviors, 89*, 178-187. doi: 10.1016/j.addbeh.2018.10.004

Oliva, E. M., Keyes, M., Iacono, W. G., & McGue, M. (2012). Adolescent substance use groups: antecedent and concurrent personality differences in a longitudinal study. *Journal of Personality, 80(*3), 769-793. doi: 10.1111/j.1467-6494.2011.00746.x

Patrick, C. J., Curtin, J. J., & Tellegen, A. (2002). Development and validation of a brief form of the Multidimensional Personality Questionnaire. *Psychological Assessment, 14*(2), 150. doi: 10.1037/1040-3590.14.2.150

Peltzer, K., Pengpid, S., & Tepirou, C. (2016). Associations of alcohol use with mental health and alcohol exposure among school-going students in Cambodia. *Nagoya journal of Medical Science*, *78*(4), 415. doi: 10.18999/nagjms.78.4.415

Peltier, M. R., Verplaetse, T. L., Mineur, Y. S., Petrakis, I. L., Cosgrove, K. P., Picciotto, M. R., & McKee, S. A. (2019). Sex differences in stress-related alcohol use. *Neurobiology of stress*, *10*, 100149. doi: 10.1016/j.ynstr.2019.100149

Quinn, P. D., Stappenbeck, C. A., & Fromme, K. (2011). Collegiate heavy drinking prospectively predicts change in sensation seeking and impulsivity. *Journal of Abnormal Psychology, 120*(3), 543. doi: 10.1037/a0023159

Robins, L. N., Babor, T. F., & Cottler, L. B. (1987). Composite international diagnostic interview: expanded substance abuse module. *St. Louis: Authors*.

Robins, L. N., Wing, J., Wittchen, H. U., Helzer, J. E., Babor, T. F., Burke, J., ... & Towle, L. H. (1988). The Composite International Diagnostic Interview: an epidemiologic instrument suitable for use in conjunction with different diagnostic systems and in different cultures. *Archives of general psychiatry*, *45*(12), 1069-1077. doi:10.1001/archpsyc.1988.01800360017003

Rogers, M. M., McKinney, C., & Asberg, K. (2018). Substance use is predicted by parental maltreatment, gender, and five-factor personality. *Personality and Individual Differences, 128*, 39-43. doi: 10.1016/j.paid.2018.02.030

Samek, D. R., Hicks, B. M., Durbin, E., Hinnant, J. B., Iacono, W. G., & McGue, M. (2018). Co-development between key personality traits and alcohol use disorder from adolescence through young adulthood. *Journal of personality, 86*(2), 261-282. doi: 10.1111/jopy.12311

SAMHSA, Center for Behavioral Statistics and Quality. 2019 National Survey on Drug Use and Health. Table 6.23B—Alcohol Use Disorder in Past Year among Persons Aged 18 to 22, by College Enrollment Status and Demographic Characteristics: Percentages, 2018 and 2019. https://www.samhsa.gov/data/sites/default/files/reports/rpt29394/NSDUHDetailedTabs2019/NSDUHDetTabsSect6pe2019.htm#tab6-23b.

Schulenberg, J. E., & Maggs, J. L. (2002). A developmental perspective on alcohol use and heavy drinking during adolescence and the transition to young adulthood. *Journal of Studies on Alcohol, Supplement, (14),* 54-70. doi: 10.15288/jsas.2002.s14.54

Somma, A., Krueger, R. F., Markon, K. E., & Fossati, A. (2019). The replicability of the personality inventory for DSM–5 domain scale factor structure in US and non-US samples: A quantitative review of the published literature. *Psychological assessment*, *31*(7), 861. doi: 10.1037/pas0000711

Stautz, K., & Cooper, A. (2013). Impulsivity-related personality traits and adolescent alcohol use: A meta-analytic review. *Clinical psychology review, 33*(4), 574-592. doi: 10.1016/j.cpr.2013.03.003

Steele, R. G., Forehand, R., Armistead, L., & Brody, G. (1995). Predicting alcohol and drug use in early adulthood: The role of internalizing and externalizing behavior problems in early adolescence. *American Journal of Orthopsychiatry, 65*(3), 380–388. doi: 10.1037/h0079694

Substance Abuse and Mental Health Services Administration. (2020). Key substance use and mental health indicators in the United States: Results from the 2019 National Survey on Drug Use and Health (HHS Publication No. PEP20-07-01-001, NSDUH Series H-55).

Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/data

Swendsen, J. D., Tennen, H., Carney, M. A., Affleck, G., Willard, A., & Hromi, A. (2000). Mood and alcohol consumption: an experience sampling test of the self-medication hypothesis. *Journal of abnormal psychology*, *109*(2), 198. doi: 10.1037/0021-843X.109.2.198

Tarter, R., Kirisci, L., Hegedus, A., Mezzich, A., & Vanyukov, M. (1994). Heterogeneity of adolescent alcoholism. *Annals of the New York Academy of Sciences-Paper Edition, 708*, 172-180. doi: 10.1111/j.1749-6632.1994.tb24710.x.

Tellegen, A., & Waller, N. G. (2008). Exploring personality through test construction: Development of the Multidimensional Personality Questionnaire. *The SAGE handbook of personality theory and assessment*, *2*, 261-292. doi: 10.4135/9781849200479.n13

Tomlinson, K. L., & Brown, S. A. (2012). Self-medication or social learning? A comparison of models to predict early adolescent drinking. *Addictive behaviors*, *37*(2), 179-186. doi: 10.1016/j.addbeh.2011.09.016

Toprak, S., Cetin, I., Guven, T., Can, G., & Demircan, C. (2011). Self-harm, suicidal ideation and suicide attempts among college students. *Psychiatry research*, *187*(1-2), 140-144. doi: 10.1016/j.psychres.2010.09.009

University of Minnesota Press. (n.d.). *MPQ Standard*. MPQ Standard. https://www.upress.umn.edu/test-division/mpq/copy_of_mpq_BF-overview

Wennberg, P., Berglund, K., Berggren, U., Balldin, J., & Fahlke, C. (2014). The cloninger Type I/Type II typology: Configurations and personality profiles in socially stable alcohol dependent patients. *Advances in Psychiatry*, *2014*. doi: 10.1155/2014/346157

Zucker, R. A., Heitzeg, M. M., & Nigg, J. T. (2011). Parsing the undercontrol–disinhibition UUpathway to substance use disorders: A multilevel developmental problem. *Child Development Perspectives, 5(4*), 248–255. doi: 10.1111/j.1750-8606.2011.00172.x

Zuckerman, M., & Kuhlman, D. M. (2000). Personality and risk-taking: Common biosocial factors. *Journal of Personality, 68*(6), 999–1029. doi: 10.1111/1467-6494.0012

Tables

Table 1

Study Demographics

	Wave 1 (*N* = 209)	**Wave 2 (*N* = 178)**	**Wave 3 (*N* = 167)**
% male	38.3%	36.0%	36.5%
% White	90.9%	89.8%	89.8%
% Black or African American	5.8%	6.2%	6.0%
% Hispanic or Latino	1.9%	4.4%	3.0%
% Enrolled in school full-time	96.6%	90.5%	40.0%
% Fathers earned a BA/BS or higher	70.2%	68.5%	--
% Mothers earned a BA/BS or higher	69.4%	66.5%	--
M age (*SD*)	19.1 (.40)	19.9 (.39)	22.7 (.38)

Notes. This table shows demographics and descriptive statistics for study participants across assessments

Table 2

Descriptive Statistics for Males (N = 80) and Females (N = 129)

	Males				Females				*t*-test	Cohen's *d*
	M	***SD***	***Range***	***n***	***M***	***SD***	***Range***	***n***		
1. AUD Sx (w1)	1.19	2.04	0-11	80	.80	1.49	0-8	129	1.48	.22
2. AUD Sx (w2)	.92	1.27	4	64	.96	1.78	0-8	114	-.15	.03
3. AUD Sx (w3)	1.20	1.62	7	59	.65	1.25	0-7	104	2.26*	.38
4. Constraint (w1)	45.67	9.71	59.66	72	52.55	9.28	42.87	125	-4.94***	.72
5. Constraint (w2)	46.63	9.81	53.47	60	52.79	9.41	56.87	113	-3.99***	.64
6. Constraint (w3)	46.55	9.30	40.09	58	51.96	9.93	45.27	99	-3.43**	.56
7. Neg emot (w1)	49.76	10.76	52.56	72	50.14	9.58	47.53	125	-.25	.04
8. Neg emot (w2)	50.07	10.50	39.61	60	49.56	10.17	47.72	113	.31	.05
9. Neg emot (w3)	52.18	9.67	56.79	58	48.73	10.07	40.20	99	2.12*	.35
10. Harm avd (w1)	44.86	10.30	44.83	72	52.91	8.59	42.84	127	-5.62***	.85
11. Harm avd (w2)	44.23	10.32	41.54	60	53.39	8.37	50.04	113	-5.92***	.97
12. Harm avd (w3)	44.30	9.80	43.04	58	53.32	8.60	41.21	99	-5.82***	.98

Notes. AUD Sx = alcohol use disorder symptoms, Neg emot = negative emotionality, harm avd = harm avoidance, w1 = Wave 1, w2 = Wave 2, w3 = Wave 3. Significant differences in means by gender were tested using *t*-tests. Significance is denoted by *** $p < .001$, ** $p < .01$, * $p < .05$. Cohen's *d* provides a measure of effect size in mean differences, *d* = .20-.30 indicates a small effect, .5 a medium effect, and .80+ a large effect.

Table 3

Study Correlations for Males (N = 80) and Females (N = 129)

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1. AUD Sx (w1)	--	.65***	.47***	-.23*	-.23*	-.18	.12	.16	.16	.03	-.00	-.05
2. AUD Sx (w2)	.61**	--	.43***	-.26**	-.18	-.23*	.16	.20*	.24*	-.04	-.01	-.08
3. AUD Sx (w3)	.57**	.61***	--	-.33**	-.40***	-.31**	.22*	.23*	.31**	-.13	-.25*	-.26*
4. Constraint (w1)	-.15	-.20	-.02	--	.79***	.71***	-.06	-.07	-.24*	.56***	.49***	.49***
5. Constraint (w2)	-.31*	-.34***	-.17	.87**	--	.73***	-.17	-.08	-.20	.49***	.66***	.51***
6. Constraint (w3)	-.34**	-.29*	-.24	.72***	.75***	--	-.16	-.24*	-.18	.42***	.55***	.75***
7. Neg emot (w1)	.18	-.09	.32*	-.14	-.01	-.25	--	.73***	.64***	-.10	-.13	-.17
8. Neg emot (w2)	-.02	-.14	.03	.07	.18	-.00	.72***	--	.60***	-.10	-.11	-.20
9. Neg emot (w3)	-.16	-.06	.12	.01	.12	-.02	.61***	.62***	--	-.20	-.09	-.18
10. Harm avd (w1)	.02	-.12	.02	.59***	.57***	.47***	-.31**	-.09	-.17	--	.74***	.60***
11. Harm avd (w2)	-.16	-.18	-.14	.60***	.62***	.58***	-.10	.02	.04	.81***	--	.69***
12. Harm avd (w3)	-.15	-.10	-.13	.54***	.56***	.58***	-.31*	-.12	-.07	.79***	.84***	--

Notes. AUD Sx = alcohol use disorder symptoms, Neg emot = negative emotionality, harm avd = harm avoidance, w1 = Wave 1, w2 = Wave 2, w3 = Wave 3. This table shows zero-order correlations between all study variables. Correlations for males are shown below the diagonal and females above the diagonal. Significance is denoted by *** $p < .001$, ** $p < .01$, * $p < .05$.

Table 4

Comparison of 1- and 2-class Solutions for Female Students at Wave 1

	1-class	**2-class**	
		1	2
	(*N* = 129)	(*n* = 116)	(*n* = 11)
AUD symptoms	.80	.44	4.80
Constraint	52.55	52.94	48.40
Negative emotionality	50.14	49.50	57.08
Harm avoidance	52.91	52.84	54.57
% of class	100.0	91.3	8.7
Sorority membership	.54		OR = 3.13**
Depression threshold	.33		OR = 2.63*
AIC	3,582.65	3,142.47	
Adjusted BIC	3,579.02	3,137.69	
LRT *p*	--	.21	

Notes. AUD = alcohol use disorder, OR = odds ratio, AIC = Akaike Information Criterion, BIC =Bayesian Information Criterion, LRT *p* = *p*-value associated with the Lo-Mendell-Rubin adjusted LRT (significance indicates model fits significantly better than the one with one less class). Significance of sorority membership and depression threshold covariate is denoted by *** $p < .001$, ** $p < .01$, * $p < .05$.

Table 5.

Comparison of 1- and 2-class Solutions for Female Students at Wave 2

	1-class	**2-class**	
		1	2
	(*N*=114)	(*n* = 102)	(*n* = 11)
AUD symptoms	.96	.44	5.27
Constraint	52.79	53.54	46.70
Negative emotionality	49.56	48.84	55.46
Harm avoidance	53.39	53.55	52.14
% of class	100	90.3	9.7
Sorority membership	.55		OR = 2.70*
Depression threshold	.37		OR = 1.67
AIC	3,268.05	2,864.37	
Adjusted BIC	3,262.96	2,857.88	
LRT *p*	--	.17	

Notes. AUD = alcohol use disorder, AIC = Akaike Information Criterion, BIC =Bayesian Information Criterion, LRT p = p-value associated with the Lo-Mendell-Rubin adjusted LRT (significance indicates model fits significantly better than the one with one less class). Significance of sorority membership and depression threshold covariate is denoted by *** $p < .001$, ** $p < .01$, * $p < .05$.

Table 6

Comparison of 1- and 2-class Solutions for Female Students at Wave 3

	1-class	**2-class**	
		1	2
	(*N*=106)	(*n* = 38)	(*n* = 9)
AUD symptoms	.65	.28	3.47
Constraint	51.96	52.90	41.43
Negative emotionality	48.73	47.22	56.01
Harm avoidance	53.32	54.02	45.32
% of class	100	80.9	19.1
Sorority membership	.38		OR = .61
Depression threshold	.34		OR = 3.70**
AIC	2,745.69	1,179.92	
Adjusted BIC	2,739.74	1,160.63	
LRT *p*	--	.06	

Notes. AUD = alcohol use disorder, AIC = Akaike Information Criterion, BIC =Bayesian Information Criterion, LRT p = p-value associated with the Lo-Mendell-Rubin adjusted LRT (significance indicates model fits significantly better than the one with one less class). Significance of sorority membership and depression threshold covariate is denoted by *** $p < .001$, ** $p < .01$, * $p < .05$

Table 7

Comparison of 1- and 2-class Solutions for Male Students at Wave 1

	1-class	**2-class**	
		1	2
	(*N* = 80)	(*N* = 70)	(*N* = 3)
AUD symptoms	1.19	.80	7.91
Constraint	45.57	45.66	46.74
Negative emotionality	49.76	49.22	59.97
Harm avoidance	44.86	44.73	43.68
% of class	100	95.9	4.1
Fraternity membership	.21		--
Depression threshold	.21		OR = 2.63
AIC	2,138.46	1,876.38	
Adjusted BIC	2,129.20	1,863.47	
LRT *p*	--	.07	

Notes. AUD = alcohol use disorder, AIC = Akaike Information Criterion, BIC =Bayesian Information Criterion, LRT p = p-value associated with the Lo-Mendell-Rubin adjusted LRT (significance indicates model fits significantly better than the one with one less class). Note, the OR calculation did not converge for fraternity membership-class 2 association due to small sub-sample size ($n = 3$) but this association was significant (estimate = 10.75, S.E. = 2.36, $p < .001$). Significance of fraternity membership and depression threshold covariate is denoted by *** $p < .001$, ** $p < .01$, * $p < .05$.

Table 8

Comparison of 1- and 2-class Solutions for Male Students at Wave 2

	1-class	2-class	
		1	2
	(N = 64)	(n = 42)	(n = 19)
AUD symptoms	.92	.18	2.56
Constraint	46.63	49.10	41.31
Negative emotionality	50.07	51.43	47.15
Harm avoidance	44.23	45.56	41.37
% of class	100	68.9	31.1
Fraternity membership	.28		OR = 1.27
Depression threshold	.23		--
AIC	1,726.65	1,527.97	
Adjusted BIC	1,714.79	1,512.45	
LRT p	--	.10	

Notes. AUD = alcohol use disorder, AIC = Akaike Information Criterion, BIC =Bayesian Information Criterion, LRT p = p-value associated with the Lo-Mendell-Rubin adjusted LRT (significance indicates model fits significantly better than the one with one less class). Note, the OR calculation did not converge for depressive threshold -class 2 association, most likely due to small sub-sample size (n = 19) but this association was significant (estimate = 12.13, S.E. = .44, $p < .001$). Significance of fraternity membership and depression threshold covariate is denoted by *** $p < .001$, ** $p < .01$, * $p < .05$.

Table 9

Comparison of 1- and 2-class Solutions for Male Students at Wave 3

	1-class	**2-class**	
		1	2
	(*N* = 61)	(*n* = 8)	(*n* = 30)
AUD symptoms	1.20	2.38	.42
Constraint	46.55	40.17	49.38
Negative emotionality	52.18	54.85	50.86
Harm avoidance	44.30	38.87	45.62
% of class	100	21.1	78.9
Fraternity membership	.33		--
Depression threshold	.29		--
AIC	1,650.57	954.28	
Adjusted BIC	1,638.16	931.94	
LRT *p*	--	.20	

Notes. AUD = alcohol use disorder, AIC = Akaike Information Criterion, BIC =Bayesian Information Criterion, LRT p = p-value associated with the Lo-Mendell-Rubin adjusted LRT (significance indicates model fits significantly better than the one with one less class). Note, the OR calculation did not converge for fraternity membership-class 2 association, most likely due to small sub-sample size ($n = 8$) but this association was significant (estimate = 11.57, S.E. = .99, $p < .001$). Note, the OR calculation did not converge for depression threshold -class 2 association, most likely due to small sub-sample size ($n = 19$) but this association was significant (estimate = 11.13, S.E. = .87, $p < .001$).