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CROSS-CUTTING MECHANISMS THAT CONTRIBUTE TO DEVELOPING ANXIETY-RELATED ALCOHOL USE PROBLEMS AMONG COLLEGE STUDENTS

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CROSS-CUTTING MECHANISMS THAT CONTRIBUTE TO DEVELOPING ANXIETY-RELATED ALCOHOL USE PROBLEMS AMONG COLLEGE STUDENTS

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CROSS-CUTTING MECHANISMS THAT CONTRIBUTE TO DEVELOPING ANXIETY-RELATED ALCOHOL USE PROBLEMS AMONG COLLEGE STUDENTS

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Drinking behaviors among college students have become problematic as evidenced by 20% of students who endorse five or more problems associated with alcohol use. Alcohol use problems are associated with numerous anxiety problems and can begin as early as young adolescence. The period for risk of developing emotional problems peaks during the transition to college. Despite the relationship between anxiety and alcohol use problems, little is known about the cross-cutting mechanisms that explain their relationship and comorbidity. Researchers have proposed affective (i.e. anxiety sensitivity and distress tolerance) and alcohol-specific motivations (i.e. expectancies, valuations, peer influence, and drinking motives) as vulnerabilities for alcohol use and anxiety problems. To address the relationship gap,, the current study examined how changes in anxiety sensitivity, alcohol expectancies, valuations, peer resistance, and drinking motives contributed to changes in alcohol and anxiety interference across three waves of time. Key findings from 297 college students revealed expectancies predicted positive changes alcohol use problems across two phases of time. Anxiety sensitivity predicted alcohol use problems, drinking motives, expectancies, and valuations. Moreover, anxiety sensitivity predicted positive changes in anxiety interference and peer resistance. Drinking motives were associated with increased changes in alcohol use

problems. The relationship between anxiety sensitivity and alcohol use problems were serially mediated via expectancies and motives. These results highlight the importance of targeting specific cognitive- affective mechanisms among early college students to reduce the risk of alcohol use and anxiety-related problems.

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CHAPTER 1: INTRODUCTION

About 44% of college students engage in binge drinking behavior, about 12% use alcohol heavily, and 20% of students experience five or more problems related to alcohol use (Wechsler, Lee, Nelson, & Kuo, 2002). Alcohol use problems are associated with numerous anxiety problems and can begin as early as young adolescence (Grant et al., 2005; Zimmerman et al., 2003). Typical onset for emotional problems occurs in the adolescent period (ages 15-24), which indicates that this is a peak period for risk of developing such problems, including alcohol misuse During the transition from high school to the first year of college, significant changes in individual responsibilities and living environment occur that may contribute to increased alcohol use. For instance, the transition from adolescence to emerging adulthood is understood to be associated with increased risk of substance use (Arnett, 2000; White et al., 2005). College students are likely to experience significant levels of stress, which may lead to development of emotional problems and risky substance use if at a higher psychological risk. In particular, individuals with symptoms of panic and social anxiety are 6 and 4 times more likely, respectively, to develop alcohol dependence by age 30 (Buckner, Timpano, Zvolensky, Sachs-Ericsson, & Schmidt, 2008). Despite the relationship between anxiety and alcohol use problems, little is known about the cross-cutting mechanisms that explain their relationship and comorbidity. Identifying the mechanisms that link anxiety and excessive alcohol use could inform be a target for prevention-focused interventions that help reduce the development of alcohol use disorders.

Problems with Categorical Conceptualization of Mental Illness

Given problems associated with the categorical conceptualization of mental

illness (i.e. high overlap in symptoms between emotional disorders), some researchers have moved toward a dimensional system of classification to better understand of psychopathology (Insel et al., 2010). According to Barlow, Allen, and Choate (2004), the multiple forms of anxiety and depression pathology that we have previously separated into separate disorders share in common an amplification of maladaptive emotions, cognitions and dysfunctional avoidance behavior and are better conceptualized as manifestations of an overall Negative Affect Syndrome (NAS). Maladaptive responses aimed at avoiding or reducing anxiety symptoms then lead to overall impairment in functioning. Categorical diagnostic models do not accurately reflect pathology given the substantial rates of comorbidity within anxiety disorders (Brown, Campell, Lehman, Grisham, & Mancill, 2001; Kessler, et al., 2005; Kessler, Chiu, Demler, & Walter, 2005). Disorder-specific treatments may neglect common strategies that influence cross-cutting mechanisms that may be helpful in treating other disorders (Antony & Rowa, 2005). Common cognitive-affective mechanisms such as anxiety sensitivity, distress tolerance, and anxiety control are likely components that contribute to NAS. However, identifying common cognitive-affective mechanisms between disorders could result in developing treatments around those mechanisms (Norton & Paulus, 2015; 2017).

Internalizing Pathway to Alcohol Use

Two developmental pathways to early adulthood have been conceptualized to help explain alcohol use problems. The externalizing pathway is thought to first emerge as difficult temperament in infancy that is followed in childhood by externalizing symptoms (e.g., aggression and conduct problems), early substance use, increases in antisocial behavior, and then the beginning of alcohol use disorders (Hussong, Jones,

Stein, Baucom, & Boeding, 2011; Zucker, 2006). Problems that are central to this pathway typically reflect an inability to inhibit socially undesirable actions (Iacono, Malone, & McGue, 2008). While the externalizing pathway for later onset of alcohol use problems is dominant in the literature, the role of an alternate pathway to developing such problems is less researched as it is more difficult to detect during early developmental periods (Hussong, et all, 2011).

The internalizing pathway is an early emerging developmental pathway to alcohol use problems in which negative affect and internalizing symptoms represent underlying difficulties (Hussong, 2011). Individuals who develop alcohol problems via the internalizing pathway have been labeled as having a subtype of alcohol use problems such as Negative Affect Alcohol Use Disorders (NAAUD; Hussong, 2011). Through an internalizing pathway, adolescent youth appear to hold tension reduction or coping expectations associated with alcohol use as they continue adolescence (Colder, Chassin, Stice, & Curran, 1997) and these beliefs are predictive of greater alcohol use (Reese, Chassin, & Molina, 1994). Individuals may then develop negative affect-related alcohol use problems could very well follow an externalizing pathway, with disinhibition mostly influencing alcohol use and the salience of affect-related risk mechanisms that are dampened in the context of multiple mechanisms that are simultaneously contributing to drinking behavior. According to Hussong et al., (2011), negative affect-related alcohol use problems might be more evident in individuals with "pure" forms of internalizing symptoms because an individuals use is primarily motivated by coping efforts. Some evidence suggests that adolescents who drink alone with a self-medication motive to relieve distress could be at greater risk for developing alcohol-related problems (Cooper,

1994). By late adolescence, social anxiety has predicted greater risk for drinking, especially heavy drinking (Sher, Grekin, & Gross, 2007). Internalizing symptoms or psychological vulnerabilities could become associated with onset of alcohol use problems cognitive, social, and biological risk factors in which alcohol serves as a negative reinforcement strategy for managing distress and associated cues. However, little research has evaluated the progression of these vulnerabilities with alcohol use problems in young adulthood.

Anxiety-Related Risk Factors for Alcohol Use

Despite a number of empirically supported interventions to address alcohol problems, dangerous drinking rates have persisted and a clearer understanding of underlying motivations and risk factors for drinking is warranted (Wechsler et al., 2002). Certain underlying mechanisms likely act as vulnerabilities for later developing problems with comorbid alcohol use and anxiety. According to Barlow, et al. (2004), anxiety states are maintained by reactive vulnerabilities (i.e. cognitive-affective mechanisms) that underlie multiple forms of anxiety pathology through the amplification of maladaptive emotions, cognitions and avoidance behavior. These reactive vulnerabilities may contribute to emotional problems such as the development of negative affect syndrome (NAS; Barlow et al., 2004). The NAS framework appears to parallel the NAAUD (Negative Affect Alcohol Use Disorders) framework where affect-related vulnerabilities are underlying mechanisms (internalized) that contribute toward developing anxiety and alcohol use problems. Certain cross-cutting or transdiagnostic vulnerability factors may influence alcohol use behavior as part of the process of the maladaptive response to

avoiding or reducing anxiety symptoms (Wolitzky-Taylor et al., 2015). Several key cross-cutting vulnerability factors will be reviewed below.

Anxiety sensitivity (AS), a vulnerability that is characterized as a cognitive misappraisal that anxiety symptoms are harmful appears to account for the relationship between alcohol and anxiety problems. AS has been shown to play a role in the maintenance as well as reduction of many types of anxiety psychopathology (Arch et al., 2013; Baker et al., 2017). AS can be conceptualized as a trait-like cognitive vulnerability that may influence the amplitude of existing feelings of anxiety. Individuals with high AS may interpret physical sensations as dangerous and therefore experience an increase in anxiety levels (Olatunji & Wolitzky-Taylor, 2009). For example, an individual with high AS may have a heightened sensitivity to physical sensations such as experiencing chest tightness, which subsequently produces a thought of having a heart attack.

According to researchers, the manifestation of AS is thought to come from a combination of genetic predispositions and learning experiences that result in the development of beliefs about the potential harmful effects of physiological sensations (Stein, Jang, & Livesley, 1999; Stewart, et al., 2001). AS is also a distinct vulnerability from trait anxiety (i.e., fear response to a broad range of stressors) in that it is a more specific fear response to internal anxiety-related sensations. Research supports that AS is unique from trait anxiety. That is, AS has been shown as a predictor of fear responses to inhalation of carbon dioxide enriched air independent of trait anxiety among adults (Zinbarg, Brown, Barlow, & Rapee, 2001; Zvolensky, Feldner, Eifert, & Stewart, 2001) and youth (Leen-Feldner, Feldner, Bernstein, McCormick, & Zvolensky, 2005) in laboratory studies. When examining the relationship between AS and trait anxiety, they appear to be hierarchically organized with AS indicated as a lower order trait as a

dimension nested within trait anxiety (Lilienfeld, Turner, & Jacob, 1993). Some researchers have begun to explore the extent to which AS differs from other psychological vulnerabilities.

AS is a vulnerability that amplifies preexisting anxiety and places individuals at risk for later developing anxiety-related problems, especially panic disorder (Cox, Borger, & Enns, 1999; Reiss, 1991; Gallagher et al., 2013). Researchers have consistently found evidence for a strong relationship between measures of AS and panic disorder symptoms (Deacon & Valentiner, 2001) and has been shown to predict panic attack frequency independent of negative affect (Schmidt, Mitchell, & Richey, 2008). Literature shows that AS precedes the development of panic disorder symptoms and the association between them is not confounded by another variable (Olatunji & Wolitzky-Taylor, 2009). Therefore, AS appears to be a considerable risk factor for panic disorder etiology.

While there is considerable evidence that AS is implicated for the etiology of panic disorder, AS also appears to be a broader vulnerability factor for other emotional problems. In theoretical formulations on the development and maintenance of specific anxiety pathology, AS has been implicated for Posttraumatic Stress Disorder (PTSD; Taylor, 2003), specific phobias (e.g., McNally & Steketee, 1985), Obsessive-Compulsive Disorder (OCD; Calamari, Rector, Woodward, Cohen, & Chick, 2008) and social anxiety (Rapee & Heimberg, 1997; Rodriguez et al., 2004). For instance, higher AS was found in women who developed PTSD in response to intimate partner violence compared to both those experiencing such violence without developing PTSD and women without a trauma history (Lang, Kennedy, & Stein, 2002). Moreover, treatment research has demonstrated that AS predicted changes in PTSD symptoms for victims of motor vehicle accidents

(Federoff, Taylor, Asmudson, & Koch, 2000). Higher levels of AS have also been found in patients with Generalized Anxiety Disorder (GAD) and Obsessive-Compulsive Disorder (OCD; Zinbarg, Barlow, & Brown, 1997; Zinbarg, et al., 2001). Higher levels of AS have also been found for individuals with depression (Rodriguez, et al., 2004; Taylor, Koch, Woody, & McLean, 1996). Although AS has strong specificity toward symptoms of panic disorder, AS also appears to have considerable relationships to broader emotion-related problems.

Similarly, research on AS has shown a relationship to alcohol problems while controlling for anxiety and negative affect (Collins et al., 2018; Howell, Leyro, Hogan, Buckner, & Zvolensky, 2010; Novak, Burgess, Clark, Zvolensky, & Brown, 2003; Schmidt, Buckner, & Keough, 2007). According to Howell, et al. (2010), AS is incrementally related to coping-related drinking motives, alcohol problems, and risk of developing an alcohol use disorder. The relationship between AS and alcohol use problems suggests that AS might be an important underlying mechanism that explains drinking behaviors independent of anxiety symptoms. The research on the relationship between anxiety sensitivity and alcohol use appears to be mixed. Some research supports the self-medication hypothesis such that individuals with high AS are more motivated to drink in order to reduce symptoms (Paulus et al., 2017). For instance, to lessen discomfort associated with physical sensations, individuals who use substances may also be high on AS (Lejuez, Paulson, Daughters, Bornovalova, & Zvolensky, 2006; Paulus et al., 2017). This research suggests that high AS individuals are motivated to drink in order to dampen the physical sensations that are perceived as dangerous. According to a review, AS functions as a risk factor that influences a cycle of negative reinforcement by

alcohol use, but the specificity of alcohol use for coping with AS depends of multiple risk factors (DeMartini & Carey, 2011). Evidence suggests that high AS individuals may consume more alcohol, drink more frequently, and for more risky reasons compared to those with lower AS (DeMartini & Carey, 2011). The reasons for consumption of alcohol are likely negatively reinforced because high AS individuals may experience greater dampening of arousal when drinking alcohol than lower AS individuals. DeMartini and Carey (2011) have proposed that AS contributes to anxiety symptoms and drinking motives that later result in alcohol use. Despite development of this model, little research has tested these relationships while also accounting for other relevant vulnerabilities. Other research on AS and alcohol suggests that there is a negative association between AS and alcohol use. In fact, several researchers have reported that AS and alcohol use are directly negatively related (Ali et al., 2016; Castellanos-Ryan et al., 2013; Krank et al., 2011; Wagner, 2001). Only one recent study using a college sample has supported the negative association between AS and alcohol use (Collins et al., 2018). Therefore, the relationship between AS and alcohol use problems appears to be complex.

Distress tolerance (DT) is the perceived capacity and behavioral ability to tolerate negative emotional aversive states elicited by some stressor (Leyro, Zvolensky, & Bernstein, 2010). Although recent research has documented that DT is implicated in several forms of anxiety psychopathology (Norr et al., 2013), a limited number of studies have explored associations across anxiety symptoms. Studies that have evaluated this relationship have shown that lower DT is associated with greater mood and anxiety psychopathology. In a sample of adults who were HIV positive, associations between DT and both anxiety and depressive symptoms were found (Brandt, Zvolenzky, & Bonn-

Miller, 2013). Evidence has been found that individuals with lower levels of DT also tend to have anxiety psychopathology relative to nonclinical samples (Mitchell, Riccardi, Keough, Timpano, & Schmidt, 2013). In nonclinical samples, there is evidence for a relationship between lower DT and Generalized Anxiety Disorder (GAD) symptoms and severity of worry (Huang, Szabó, & Han, 2009; Keough, Riccardi, Timpano; Starr & Davila, 2012). Similarly, lower DT was found to be associated with a GAD diagnosis and worry severity in a sample of outpatient adults (Allan, Macatee, Norr, & Schmidt, 2014). Regarding OCD symptoms, lower DT was related to obsessions in nonclinical samples (Cougle, Timpano, & Goetz, 2012; Cougle, Timpano, Fitch, & Hawkins, 2011) and predicted the frequency of obsessions Cougle et al., 2011). Unlike GAD and OCD, even fewer studies have explored the relationship between panic symptoms and DT. Kutz, Marchall, Bernstein, and Zvolensky (2010) found that AS, but not DT was significantly related to panic symptoms with fearful responding on a biological task. In nonclinical samples, research has been mixed, especially when taking into account other competing vulnerabilities. Recent studies have examined DT across multiple categories of anxiety symptoms in the same participants and found that lower DT was correlated with generalized anxiety, social anxiety, and obsessive-compulsive symptoms (Keogh et al., 2010; Laposa, Collimore, Hawley, & Rector, 2015; Norr et al., 2013) and panic symptoms (Keogh et al., 2010). However, Laposa et al. (2015) and Michel, Rowa, Young, & McCabe, 2016) found that DT was not a significant predictor across anxiety disorder symptoms when accounting for other psychological vulnerabilities (i.e., AS and Intolerance of Uncertainty). DT not being a significant predictor when accounting for AS and Intolerance of Uncertainty (IU) might suggest that DT is a broader vulnerability that

greatly overlaps with similar vulnerabilities (Michel et al., 2016). One limitation to these studies is that regression models were predicting disorder-specific anxiety symptoms and excluded measuring functioning and interference that are primary to anxiety.

Compared to anxiety-related problems, a considerable amount of research has linked DT as a pathway to motivation and alcohol use problems (Khan et al., 2018). While some studies have linked AS and DT as risk factors for alcohol use problems, these findings have been inconsistent. Low DT has been linked to motivation to use alcohol to cope with negative affect (Howell et al., 2010; Khan et al., 2018). Winward, Bekman, Hanson, Lejuez, & Brown, (2014) found that adolescents displaying heavy episodic drinking reported poor DT. On the other hand, Wolitzky-Taylor et al., (2015) found that AS, but not DT, mediated the anxiety-alcohol association. The inconsistent findings from Wolitzky-Taylor et al. (2015) might be explained by the lower average age of the sample (i.e., 14.5 years old), which could suggest that DT is more relevant when entering adulthood. With regard to motive for drinking, Howell et al., (2010) found differential effects between DT and AS. DT was related to coping motives and AS was related to conformity motives (not DT; Howell et al., 2010). Findings from Howell et al. (2010) might suggest that DT is more relevant to generalized tension reducing beliefs and AS is related to social beliefs. Given some mixed findings for DT and AS as risk factors towards risky alcohol use, replication of these findings is indicated.

Perceived control over anxiety-related events (PAC) is another cognitive factor that may have theoretical relevance to both anxiety and alcohol use problems. According to Barlow's (2002) triple vulnerabilities model of psychopathology, perceived control is a person's evaluations of control over internal emotional experiences and external threats

or distressing environments. Reduced perceptions of control of aversive events and emotional experiences is conceptualized as a generalized vulnerability factor that develops from early experiences (Gallagher, Naragon-Gainey, & Brown, 2014). According to Barlow (2002), reduced perceptions of control function as a mediator between early negative experiences and anxiety. However, this mediation is posited to transform into a crystallized trait that moderates the influence of environmental stressors on the development and expression of anxiety (Barlow, 2002). Therefore, perceived control is posited as an important vulnerability factor that has implications for specific risk toward developing anxiety-related problems.

While research examining perceived anxiety control in the alcohol literature is scant, researchers have shown perceived control is an important risk factor for anxiety disorders (McGinn, Nooner, Cohen, & Leaberry, 2015). For example, lower levels of perceived emotional control have predicted higher levels of panic disorder (Bentley et al. 2013; McGinn et al., 2015; White et al. 2006), OCD (Moulding & Kyrios, 2007; Moulding et al. 2009), social anxiety (Glick & Orsillo, 2011; Hofmann 2005), GAD (Cannon & Weems, 2010; Stapinski et al., 2010) and trait measures of anxiety (Brown et al. 2004; Rapee et al. 1996). According to findings from a meta-analysis, the effect size for perceived control was largest for GAD; however, perceived control appeared to be a significant predictor across anxiety disorders (Gallagher et al. 2014). Despite limited research, some research has examined the relationship between perceived control and substance use. Research primarily conducted among adolescents suggests that low perception of control over the environment may lead to maladaptive use of substances as a means to cope, whereas higher perceptions of control may function as a protective

factor for such problems (Adalbjarnardottir & Rafnsson, 2001; Hussong & Chassin, 1997). One study examining the relationship between negative control (i.e., perceived lack of control) and alcohol use found that negative control was related to alcohol use problems, but not consumption (Simons, Hahn, Simons, & Gaster, 2015). Similar research has found low or poor control to be associated with alcohol-related problems (Dvorak, Simons, & Wray, 2011; Simons, Carey, & Wills, 2009). While some research has examined the link between a more general form of perceived control and alcohol problems, perceived control over anxiety-related events remains unexplored. Therefore, research is needed to evaluate the perceived control over anxiety-related events as a possible risk factor for alcohol use problems.

Fear of negative evaluation (FNE) as a core feature of social anxiety has been studied in relation to alcohol use among college students, but mostly in predicting social anxiety. Individuals high on FNE tend to see themselves as the focus of social evaluations, which tend to be highly self-critical. Higher FNE has been predictive of both social anxiety and performance deficits (Blumenthal, Cloutier, Baxley, & Lasslett, 2018; Carleton, Collimore, & Asmundson, 2007, 2010; Haikal & Hong, 2010; Rapee & Heimberg, 1997). Fear of negative evaluation may play an important role in substance use among college students because they may use alcohol to avoid potential negative scrutiny or they believe drinking is acceptable for lessening anxiety in social situations (Schry & White, 2013). In the Avoidance-Coping theoretical model, alcohol use can result in decreased anxiety for some individuals (Bacon & Ham, 2010). Understanding the relationship between alcohol use and social anxiety is particularly relevant because college students are likely to be in situations where drinking is a social norm and can

happen in excess. The relationship between alcohol use and social anxiety problems appears strong as evidenced by the finding that 43% of college students with social anxiety also meet criteria for clinical alcohol use problems (Kushner & Sher, 1993; Richton, Armeli, & Tennen, 2017).

According to a review of literature, research has mostly been mixed regarding the comorbidity of social anxiety and substance use problems (Richton et al., 2017; Schry & White, 2013). For studies that have found either an inverse or no relationship, one possible reason is that socially anxious individuals may primarily avoid social situations and then only use alcohol to cope with their anxiety in those social situations that cannot be avoided (Norberg, Norton, & Oliver, 2009). Recently, studies have found that social anxiety is positively related to alcohol related problems (Buckner, Heimberg, & Schmidt, 2011; Buckner & Heimberg, 2010). While results from Ham (2009) and LaBrie, Pedersen, Neighbors, and Hummer (2008) do not support the anxiety and alcohol use relationship, part of the discrepancy might be due to how alcohol use problems are conceptualized and measured (i.e., problems resulting from alcohol use rather than simply the quantity and frequency of use [Buckner et al., 2006]). However, the complex association between social anxiety and hazardous drinking among college students might be better understood through examination of psychosocial vulnerabilities or mechanisms that alter risk.

Alcohol Expectancies and Valuations as Specific Risk Factors

Expectancy-value theory is a framework of motivation that incorporates a social learning perspective whereby behavior is explained by individuals having expectations of specific reinforcing effects as the outcome of performing the behavior (Bandura, 1977;

Jones, Corbin, & Fromme 2001). Regarding alcohol, consumption is the behavior that is explained by individuals having alcohol outcome expectations. That is, individuals appear to consume alcohol in such a way that is consistent with the effects that they expect (Jones, et al., 2001). Whether or not the outcome expectations are valid, the expectations simply need to be held in order to have an effect of behavior. Within a social learning framework, the particular alcohol outcome expectations are a result of an individual's direct and indirect experience with alcohol (Jones, et al. 2001). While there is some variability in specific alcohol expectancies depending on experience, alcohol expectations could be represented by a dichotomy. According to Jones and colleagues (2001), positive expectations (i.e., 'I expect to be the life and soul of the party if I have a few drinks') represent an important component of motivation to drink whereas negative expectations (i.e., 'I expect to have a hangover if I have a few drinks) represent a motivation to restrain. If the expectancy outcome is valued neutrally (as neither positive or negative), endorsing that particular expectancy is speculated to have little role in adopting or maintaining an alcohol-related behavior (Nicolai, Morten, & Demmel, 2018). Expectancy-value theory would predict that an individual is more likely to engage in a specific behavior based on: (a) the more they perceive that the behavior will produce a specific positive outcome and (b) the more highly an individual values the outcome. Therefore, expectancy-value theory within a social learning framework provides a structure of alcohol motivations that can be examined in relation to problematic drinking.

Alcohol expectancies are the beliefs about the likelihood of specific affective, cognitive, and behavioral effects of using alcohol and are predictors of alcohol-related outcomes (Nicolai, et al., 2018). Having social or relaxation expectancies about alcohol

use has been shown to predict initiation and maintenance of problematic drinking in a sample of adolescents (Jester et al., 2015). Having positive alcohol expectancies in adolescence has been shown to predict changes from alcohol use toward misuse in adults (Patrick et al., 2010). While negative expectancies also predicted change from alcohol use to misuse in adulthood, having positive alcohol expectancies was a stronger risk factor for developing alcohol-related problems. The role of positive alcohol expectancies has been studied more broadly in predicting alcohol frequency, quantity, and negative alcohol –related consequences. In samples of college students, the relationship between positive alcohol expectancies and greater drinking and subsequent alcohol-related problems is well documented (Fromme & D'Amico, 2000; Ham, Stewart, Norton, & Hope, 2005; Vilenne & Quertemont, 2015; Young, Connor, Ricciardelli, & Saunders, 2006). As such, holding both positive or negative alcohol expectancies appears to be a factor in predicting alcohol outcomes.

Based on expectancy-value theory, Bandura (1977) argues that having both high expectancies and high valuations are important for predicting behavior change. Valuations are the interpretation that the effect of an expectancy as "good" or bad." Bandura (1977) suggested that increases in behavior would result when the expected outcome is valued as highly positive and the behavior decreases if the outcome is valued as highly negative. While the combined effects of both alcohol expectancies and valuations appears important for understanding alcohol outcomes, few researchers have studied these factors together. Leigh (1987) found that evaluations of alcohol effects significantly predicted frequency and quantity of drinking independent of expectancy-related effects. Other researchers using a sample of adolescents have suggested that

valuations of the alcohol expectancies may be more important for negative versus positive expectancies when understanding alcohol use. Ham and Hope (2005) indicate that assessing both expectancies and valuations of alcohol's effects is important for understanding the alcohol-social anxiety relationship. Moreover, Ham and Hope (2005) found that both expectancies and valuations uniquely predicted alcohol-related problems and consumption.

In a social context, holding a certain expectancy belief may predict how an individual uses alcohol depending on their emotional state. According to Ham et al. (2016), a socially anxious student who believes that alcohol will reduce social discomfort (positive expectancy) is more likely to drink compared to another individual who believes that alcohol will influence behavior that is embarrassing (negative expectancy). The impact of negative and positive expectancies on drinking behavior is perhaps better understood by the specific beliefs underlying those expectancies. For instance, tension-reduction expectancies have been shown to be the strongest predictor of hazardous drinking in college students compared to other expectancies (Brown, 1985). Moreover, hazardous drinkers have endorsed greater tension-reduction alcohol expectancies compared to non-hazardous drinkers (Schmitt, 2003). Similarly, holding worry-reduction alcohol expectancies have also been associated with heavier college drinking (Tran, Smith, & Angkaw, 2005). Socially anxious individuals may heighten their risk for hazardous drinking when tension-reduction expectancies are stronger than expectancies related to embarrassing social consequences (Ham et al., 2015). Holding certain alcohol expectancies may increase the likelihood that individuals drink to cope with negative affect, and research supports the notion that these expectancies precede the motivated use

of alcohol (Cooper et al., 1995). Several studies have evaluated the effect of positive and negative expectancies on hazardous drinking in the context of social anxiety. Tran, Haaga, and Chambless (1997) found that socially anxious college students with low positive alcohol expectancies drank less compared to non-anxious students. Similarly, another study found that students reporting, higher social facilitation alcohol expectancy, and lower self-efficacy for avoiding heavy drinking also reported higher drinking levels (Gilles, Turk, & Fresco, 2006). However, other studies did not find that positive social alcohol expectancies moderated the relationship between social anxiety and hazardous drinking (Cludius, Stevens, Bantin, Gerlach, & Herman; 2013; Ham et al., 2009). Recent research and a meta-analytic review supports the overall contention that social anxiety is related to alcohol-related problems through mechanisms of positive and negative alcohol expectancies, but not to alcohol use independent of problems (quantity and frequency; Ham, Bacon, Carrigan, Zamboanga, & Casner, 2016; Ham et al., 2015; Schry & White, 2013). Research consistently supports that expectancies function as a mediator and not moderator between social anxiety and alcohol use problems (Ham et al., 2016; Richton et al., 2017). Therefore the development of positive expectancies for alcohol use, particularly for reducing negative affect, appears to mediate the relationship between internalizing symptoms and subsequent risk for developing alcohol use problems.

Peer influence, which is conformity to *perceived social norms*, has been shown to predict alcohol use among college students (Borsari & Carey, 2001; Jacob & Leonard, 1994; Ham & Hope, 2005; Simons, Hahn, Simons, & Murase, 2017). Among younger adults, peer influence is an important component of socialization (Clasen & Brown, 1985). Perceived social norms shapes an individuals sense of identity, which behaviors

are acceptable versus not (Bandura, 1977; Studer et al., 2014). According to Studer and colleagues (2014), peer influence is not a unitary construct, but rather a multidimensional one often consisting of: peer involvement (i.e. involvement in social activities), misconduct (i.e. using substances or other maladaptive behaviors), peer conformity (i.e. conformity to dress, grooming, tastes), school involvement (i.e. working with others), and involvement with family (i.e. showing respect for authority). Perceived norms are indicated as a strong predictor of alcohol use and alcohol-related consequences among college students (Hustad, Pearson, Neighbors, & Borsari, 2014; Lewis, Rees, & Lee, 2009;Villarosa, Kison, Madson, & Seigler-Hill, 2016). The effect of peer pressure on drinking may also be direct and indirect. Direct peer pressure may be represented by explicit invitations to drink whereas indirect peer pressure may exist as part of the internalization of alcohol-related cognitions (e.g. personal norms, beliefs, expectations, and motivation (Studer et al., 2014).

Peer influence can be manifested indirectly through conformity to perceived social norms and strengthened through direct offers to drink (Brown, Clasen & Eicher, 1986). According to Buckner, Ecker, and Proctor (2011), college students who experience social anxiety might be more at risk for harmful drinking and alcohol-related consequences due to their worry about peer evaluation for expected behaviors on college drinking. A review from Schry and White (2013) found that undergraduates with social anxiety endorse drinking for conformity motives, which is posited as a problem of lack of assertiveness to refuse alcohol in social situations to achieve more acceptance. Villarosa et al. (2014) supported the above contention when they found conformity motives mediated the relationship between social anxiety and alcohol-related negative

consequences. Similarly, Buckner and Shah (2015) found that men and women with higher social anxiety endorsed higher drinking to conform motives compared to those with less social anxiety. If alcohol is perceived as an important part of social interactions and peers are perceived to approve use, then alcohol use increases in the context of peer relationships (Borsari & Carey, 2006). Moreover, Wood Read, Palfai, and Stevenson (2001) found that perceived peer approval of alcohol use was related to harmful drinking and indirectly related to alcohol-related negative consequences. Therefore, peer influence to drink has implications for risky alcohol use among college students.

Resistance to peer influence is an individual's tendency to not be influenced by and conform to the opinions, beliefs, and behaviors of their peers (Steinberg & Monahan, 2007). Resistance to peer influence has predicted less alcohol use among college students (Borsari & Carey, 2001). Some research has suggested that resistance to peer influence could be a target of intervention and prevention in college student populations through discussions of college student drinking norms (Wood et al., 2001). However, little research has examined the role of peer influence as a factor for anxiety and alcohol use problems. Ham and Hope (2005) found that perceived drinking norms was a unique predictor of both alcohol-related problems and consumption independent of other factors (i.e. expectancies, valuations, living environment, and religious involvement). In a more recent study, researchers found that college students with higher levels of social anxiety and more vulnerable to peer influence reported more alcohol-related negative consequences (Villarosa et al., 2015), Villarosa and colleagues (2015) indicated that socially anxious individuals might have been drinking more in order to be accepted by their peers, which resulted in them engaging in more problematic drinking behaviors

compared to individuals with less anxiety. Therefore, individuals who have greater resistance to peer influence are less likely to engage in harmful drinking behaviors.

Drinking Motives as a Risk Factor for Alcohol-Related Problems

Researchers examining risk factors associated with harmful drinking behaviors have identified drinking motives as a proximal pathway for greater alcohol use (Cooper, 1994; Kuntsche et al., 2005; Martins, Bartholow, Cooper, Von Gunten, & Wood, 2018). Cooper (1994) found four types of drinking motives that are associated with greater alcohol use such as: (1) social and (2) enhancement motives, which are positive drinking motives used to enhance positive affect, and (3) conformity to social norms and (4) coping with negative affect, which are understood as negative drinking motives. In another sample of college students, researchers have found additional support that coping, conformity, enhancement, and social motives were related to alcohol use (Oglesby, Albanese, Chavarria, & Schmidt, 2015).While all of these drinking motives are associated with higher alcohol use, drinking for coping, conformity, and enhancement are particularly associated with heavier alcohol use while social motives are associated with more moderate use (Kunsche et al., 2005). Positive drinking motives (i.e. enhancement) have been shown to predict alcohol-related problems when related to alcohol consumption (Cooper et al., 2005). Social type motives, which are beliefs that an individual drinks to be more sociable, has also been demonstrated as a factor toward alcohol-related problems (Hasking et al., 2011).

Negative drinking motives, such as coping and conformity motives, are often associated with maladaptive type drinking as a way to cope with negative affect or avoid negative outcomes (e.g., social rejection, Cooper, 1994; Martins et al., 2018). These

motives may also emerge from earlier coping expectancies related to alcohol use (Kuntsche, Knibbe, Engels, & Gmel, 2007). Individuals who use alcohol to cope with negative affect also report greater difficulty with alcohol use problems even after controlling for alcohol consumption (Cooper et al., 1992; Cooper, 1995). Drinking to cope with negative affect is one of the most common motive types reported by college students, but can result in negative consequences such as increased alcohol use, more frequent-drinking related problems, and greater negative affect (Carpenter & Hasin, 1999; Park & Levenson, 2002). Additionally, individuals who drink for reasons consistent with conformity are more likely to drink in situations where they feel pressured to conform in order to avoid social rejection (i.e., at parties; Stewart et al., 2006). Similar to coping motives, researchers have found that conformity motives are a significant predictor of risk for alcohol-related problems even after controlling for the effect of alcohol consumption (Cooper, 1994). According to Hussong (2011), deviant peer groups may also reinforce these motives, given evidence for social transmission and reinforcement of both alcohol and coping motives associated with heavy drinking. While the negative outcomes of drinking motives are clear, factors that influence coping and drinking conformity motives are not clearly established.

Coping motives for drinking appear to be more predictive of a problematic course of alcohol use (Baines et al., 2016; Carpenter & Hasin, 1999; Martins et al., 2018). Together with the addictive process, self-medication might be motivated by the desire to avoid the affective symptoms of withdrawal. In a classic negative reinforcement model of alcohol and drug use, the following three targets of motivation are conceptualized: (1) the primary motive for substance use might be to escape the affective components of

withdrawal, (2) motivation to use substances may occur outside awareness and related to interoceptive cues that precede affective symptoms of withdrawal, and (3) negative reinforcement learning may generalize to aversive states that are unrelated to withdrawal (Hussong, et al., 2011).

Links Between Drinking Motives and Other Risk Factors for Risky Alcohol Use

To help explain the relationship between cognitive vulnerabilities and problematic alcohol use, *drinking motives* have been examined as a more proximal pathway towards drinking. Specifically, individuals following an internalizing pathway toward alcohol use problems may develop strong motives to drink as a way to reduce tension, negative affect, or anxiety-related sensations. AS appears to be associated with coping and conformity motives (Paulus et al., 2017; Stewart et al., 1997). In particular, individuals with higher AS reported more drinking to manage negative affect compared to those with lower AS (Paulus et al., 2017; Stewart et al., 1997). Additionally, individuals with higher AS are less likely to report that their drinking motive is social (Stewart et al., 1997). High AS individuals are also more likely to report increased conformity-motivated drinking compared to low AS individuals (Stewart, Svolensky, & Eifert, 2001). Therefore, it appears that AS is related to drinking motives, which are also linked to increased alcohol consumption and greater incidence of alcohol problems (Stewart et al., 1999). DT is another risk factor that has been linked with drinking motives for alcohol use. In particular, Howell et al., (2010) found that DT predicted coping motives for alcohol use while controlling for AS and discomfort intolerance. Khan and colleagues (2018) found that drinking to cope mediated the relationship between components of distress tolerance (i.e. tolerance, absorption, and appraisal) and alcohol use problems. These findings

suggest that individuals who are unable to withstand AS and distress are motivated to drink to manage or avoid negative emotional states and rejection.

Model for Anxiety-Related Risk Factor and Alcohol Use Problems

Ham and Hope (2005) developed several models of alcohol-related problems predicted by social anxiety, perceived drinking norms, valuations, and religious involvement. While the predictors and mediators remained the same across models, separate models were tested for alcohol consumption and alcohol-related problems. Results from both models were consistent such that the relationship between social anxiety and alcohol-related problems/consumption were mediated by perceived drinking norms and expectancies. While Ham and Hope (2005) presented a strong model of alcohol-related problems as predicted by social anxiety and other risk factors, their model could be improved by testing alcohol-related problems simultaneously in a multivariate framework that controls for unique effects. Given the cross-sectional nature of their data, evaluating the relationships of these risk factors across time would provide support for temporal precedence and could help to inform targeted treatment on these risk factors.

Statement of Problem

Given the rates of comorbidity between disorders, many researchers have began studying cognitive-affective mechanisms in hopes of supporting a dimensional system of disorder (Insel et al., 2010; Norton & Paulus, 2018). While some evidence for both internalizing and externalizing pathways for developing affect-related alcohol use problems appears promising, specificity of the mechanisms that simultaneously explain drinking behaviors is less understood. High risk alcohol consumption among college students remains a major public health problem, despite efforts by university officials,

clinicians, and researchers to improve campus policies and develop primary prevention and intervention strategies to combat it (Wechsler et al., 2002). One aspect of this work has been examination of emotional disorders, including anxiety-related disorders, as a risk factor for excessive alcohol use (Ham & Hope, 2005). However, much of this work has been has been from a *disorder* perspective, which contrasts with more recent efforts to examine *cross-cutting constructs* that may underlie these disorders associated with negative affect (Barlow, 2004; Hussong et al., 2011.) To the extent that cross-cutting constructs, such as anxiety sensitivity, have been investigated, the studies have tended to examine one construct at one point in time. What is needed is a prospective study that simultaneously evaluates promising constructs in the context of a sophisticated model of college drinking that includes known predictors of problematic alcohol use such as alcohol expectancies and drinking motives. Such a study would lead to development of a prevention strategy aimed at reducing negative affect risk factors that predict problematic alcohol use among college students.

Aims of Study and Corresponding Hypotheses

The purpose of this study is to examine the risk factors that predict excessive alcohol use, related problems, and severity and interference from anxiety (i.e., functioning). The specific objectives and corresponding hypotheses are as follows:

Objective 1.

The first goal of the study is to evaluate the strength of each NAS risk factor (anxiety sensitivity, fear of negative evaluation, distress tolerance and perceived anxiety control) on alcohol and anxiety-related problems. To reduce the complexity of the final model, the NAS risk factor with the strongest correlation with anxiety and alcohol use

problems (i.e. outcome) will be selected for inclusion. The results from this analysis will inform the selection of the first predictor in the model described in objective 2.

Hypothesis 1. Higher AS, FNE, lower PAC and DT will be related to higher alcohol use problems and anxiety interference.

Objective 2.

The second objective of this study is to evaluate the strongest correlated NAS risk factor as a predictor with other risk factors established in a model by Ham and Hope (2005) to examine their contribution to alcohol-related problems across three time points simultaneously (see Figure 1).

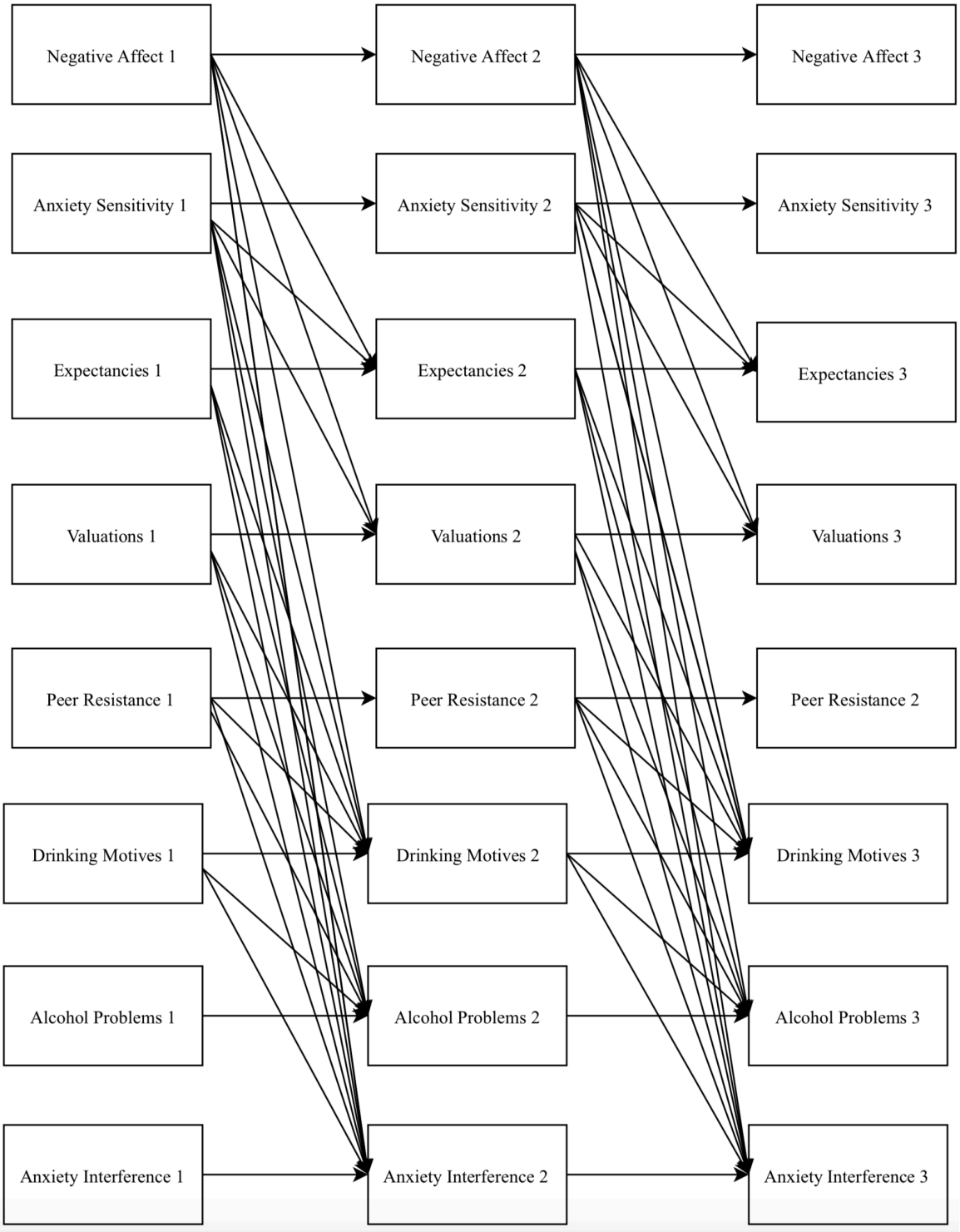

Figure 1. Conceptual panel model of risk factors for anxiety and alcohol use problems. Reciprocal paths omitted for parsimony.

Hypothesis 2.1. It is hypothesized that higher AS, FNE, and lower PAC and DT will predict higher anxiety and alcohol use problems.

Hypothesis 2.2. It is hypothesized that lower resistance to peer influence, higher alcohol expectances, and higher alcohol valuations will predict higher drinking motives.

Hypothesis 2.3 It is hypothesized that lower resistance to peer influence, higher alcohol expectances, and higher alcohol valuations will predict higher anxiety and alcohol use problems.

Objective 3.

Hypothesis 3.1. Specific paths between a NAS risk factor and co-occurring anxiety-and drinking problems will be mediated by resistance to peer influence, alcohol expectancies, and valuations (see Figure 2).

Hypothesis 3.2. Paths between a NAS risk factor and drinking motives will be mediated by resistance to peer influence, alcohol expectancies, and valuations.

Hypothesis 3.3. Specific paths between a NAS risk factor and co-occurring anxiety-and drinking problems will be serially mediated through each alcohol risk factor (i.e. resistance to peer influence, alcohol expectancies, valuations) via drinking motives.

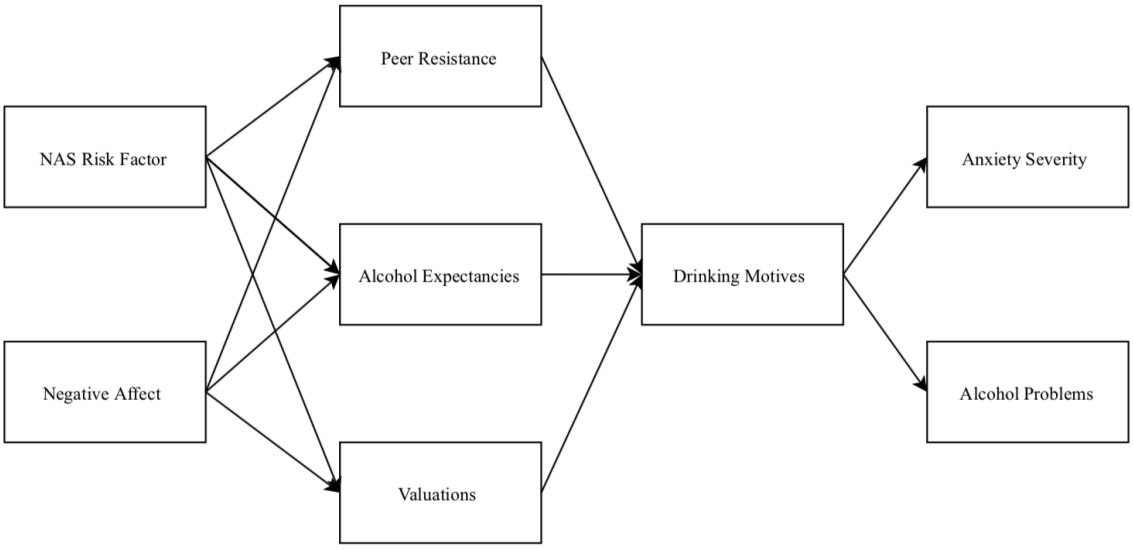

Figure 2. Conceptual path model of risk factors for anxiety and alcohol use problems.

CHAPTER 2: Method

Design Overview

The present investigation assessed the four cross-cutting constructs of NAS (AS, FNE, PAC and DT) and anxiety and alcohol use and problems in undergraduate college students at the beginning (T1), middle (T2 and T3), and end (T4) of their first semester of college (N = 297). Participants were administered all measures across T1-T4. Data collected across all time points were tested using a panel model to measure change variance and a path model at T1 to maximize power in testing mediation models that extends a model proposed by Ham and Hope (2005).

Participants

A sample of 307 college freshman recruited from the University of Nebraska-Lincoln through the Department of Psychology pool of students in Introductory Psychology. Participants were at least 18 years old, although the legal age of consent in Nebraska is 19. For individuals who are younger than 19, a consent waiver was obtained

from the study IRB, which allows participants younger than 19 to participate without parental consent. Participants' average age was 19.56 years (*SD* = 1.94, range 18 – 30). Many participants were freshmen (50%), 15.8% were sophomores, 14.3% were juniors, 15.1% were seniors, 2.6% were seniors plus one year, and 2.2% did not report. Regarding gender, 208 participants identified as female (76.5%), 57 identified as male (21.0%), 3 Transgender Non-Conforming (1.1%), 1 Transgender Female-Male (.04%), and 3 did not report sex/gender (1.1%). The majority of participants identified as heterosexual (89%), 6.3% identified bisexual, 2.9% identified gay or lesbian, and 1.9% selected other or declined to answer their sexual orientation. When reporting their current legal marital status, about half of participants (53.3%) indicated that they were single, 43.4% were in a committed dating relationship, 1.8% were engaged or married, and 1.5% declined to report relationship status.

The majority of participants were White (71.3%), 12.5% reported other, 6.6% were Asian or Pacific Islander, 6.3% were Latino, Hispanic, or of Spanish origin, 1.5% were African American/Black, 1.1% did not report ethnicity, and .07% were Native American. The majority identified as (68%) middle class, 19.9 % were working class, 9.2% were upper class, 1.1% were lower class, and 1.8% declined to report socioeconomic class. Most participants (63.6%) were full-time students and did not work, 32.4% worked part-time, and 4% did not report.

Measures – Cross-Cutting NAS Constructs

Participants completed a variety of assessments including self-report measures of anxiety symptoms and quality of life. Many of the measures were selected based on their use in previous studies to enhance comparability across studies.

The Distress Tolerance Scale (DTS; Simons & Gaher, 2005) is a 15-item questionnaire that measures an individual's ability to tolerate affective and physical distress. According to Simons and Gaher (2005), affective distress tolerance is multidimensional involving a persons' anticipation of an experience with negative emotions such as: ability to tolerate, assessment of emotional situation as acceptable, how the individual regulates their emotion, and how much attention is affected by the emotion as well as interference with functioning. Participants respond to statements regarding distress response (e.g., "I'll do anything to avoid feeling distressed or upset") from Strongly Disagree (=5) to Strongly Agree (=1). A multiple wave study found acceptable support for the four factor structure (Tolerance $\alpha = .72$, Appraisal $\alpha = 82$, Absorption $\alpha = .78$, and Regulation $\alpha = .70$; Simons & Gaher, 2005). The DTS appears to have a higher order factor with good reliability $\alpha = .82$. For the present study, internal consistency (as measured via Cronbach's α) in the present study was excellent, $\alpha = .90$. Howell et al. (2010) found that high scores on DT were associated with discomfort intolerance as evidence of convergent validity.

Anxiety Control Questionnaire-Revised (ACQ-R; Brown, White, Forsyth, & Barlow, 2004) was used to measure perceptions of control for anxiety-related events. Respondents indicate their level of agreement on a 6-point Likert-type scale (0 = strongly disagree to 5 = strongly agree) for control-oriented beliefs (e.g., ''When I am put under stress, I am likely to lose control''). The ACQ-R was developed from the original 30-item ACQ that measures perceived internal and external control of events (Rapee, Craske, Brown, & Barlow, 1996). Given research that showed varying factor structures, Brown and colleagues (2004) recommended using the revised version of the ACQ as the

confirmatory factor models fit the data better with a reduced set of items on a sample of both clinical and nonclinical individuals in a large sample (>1000 anxiety patients). The three factors were termed: Emotional Control, Threat Control, and Stress Control (Brown et al., 2004). Overall reliability appears strong (r = .85-.89; Brown et al., 2004; Gerolimatos, Gould, & Edelstein, 2012). For the present study, the ACQ-R had excellent reliability (internal consistency, Cronbach's $\alpha = .87$). Convergent validity with the original ACQ has been established with the anxiety subscale from the Depression Anxiety and Stress Scale in an undergraduate sample, but not locus of control, suggesting that the ACQ is an independent risk factor (Rapee, Craske, Brown, & Barlow., 1996).

Anxiety Sensitivity Index-3 (ASI-3). The ASI-3 is an 18-item self-report measure that assesses fear of anxiety and anxiety-related sensations (Taylor et al., 2007). The ASI was originally developed as a 16-item measure of the degree to which one is concerned about possible negative consequences of anxiety symptoms. While the original ASI was constructed to represent a unidimensional construct (Reiss & McNally, 1985), factor analytic studies have suggested that the ASI consists of three lower-order domains: physical symptoms, observable anxiety symptoms, and cognitive dyscontrol (Olatunji & Wolitzky-Taylor, 2009). Given the psychometric problems associated with the original ASI, the ASI-R was developed to reflect an improved multi-dimensional measure of AS (Taylor & Cox, 1998). This 36-item measure included previous items, but also measured fear of anxiety-related sensations based on beliefs about their harmful consequences. While measurement of AS through the ASI-R improved, some items measured confounding constructs that threatened validity (Deacon et al., 2003).

The ASI-3 was constructed for an improved multidimensional measure of AS that

reflects fear of anxiety-related symptoms across three domains: physical (α = .79), cognitive (α = .84), and social concerns (α = .79; Taylor et al., 2007). Analyses by Taylor and colleagues (2007) indicated that the ASI-3 measured dimensions of AS better than the original measure supported through evidence of reliability and validity. Evidence suggests that the ASI-3 has strong convergent validity given its strong associations with intolerance of uncertainty as expected in a nonclinical sample (Norr et al., 2013). Taylor and colleagues (2007) found discriminant validity for the ASI-3 using dissimilar anxiety sensitivity subscales. Respondents are asked to rate the degree to which each statement applies to them on a 5-point Likert-type scale (0 = very little to 5 = very much). The ASI-3 consists of three subscales: physical concerns, social concerns, and cognitive concerns, although the total scale will be utilized. For the present study, internal consistency was excellent (Cronbach's α = .93).

Brief Fear of Negative Evaluation Scale. The Brief Fear of Negative Evaluation (BFNE) consists of 12 items that measure the extent to which participants fear that others have unfavorable views of them, a core feature of social anxiety disorder. The respondent indicates the extent to which each item describes themselves on a Likert Scale ranging from 1 (Not at all) to 5 (Extremely). Eight items describe the presence of fear or worrying, while the remaining items describe the absence of fear or worrying. The BFNE was developed from the 30-item Fear of Negative Evaluation (FNE) Scale (Watson & Friend, 1969), but the BFNE is more concise and has been used in much anxiety research (Rodebaugh et al., 2004). Psychometrically, the BFNE has strong convergent validity with the FNE (r = .96) and strong four-week test-retest reliability (r = .75). Research has consistently supported a two-factor solution conceptualized as positive scored factor (α =

.94) and a negative score factor (α = .73) with overall reliability between .80 to .97 (Duke, Krishnan, Faith, & Storch, 2006; Rodebaugh et al., 2004; Weeks et al., 2005). For the present study, Cronbach's α for the BFNE had poor reliability α = .57.

Overall Anxiety Severity and Impairment Scale (OASIS; Norman et al., 2006). The OASIS consists of five items that measure the frequency and severity of anxiety, as well as level of avoidance, work/school/home interference, and social interference associated with anxiety. The instructions orient the participant to consider a wide range of anxiety symptoms (e.g., panic attacks, worries, flashbacks) when answering the questions, and the time frame is "over the past week." Respondents select among five different response options for each item, which are coded 0–4 and summed to obtain a total score. A psychometric analysis of the OASIS in an undergraduate sample suggested that the scale was unidimensional and had good internal consistency *(r* = .80), test–retest reliability (α = .82), and convergent validity with the Spieberger Trait Anxiety Questionnaire (Norman et al., 2011). Cronbach's α in the present study was excellent, α = .90.

Alcohol Related Measures

Resistance to Peer Influence Scale (RPIS; Steinberg & Monahan, 2007) is a ten-item, self-report measure on the ability of individuals to resist conforming to the behaviors and attitudes of others. Participants indicate the degree to which each set of statements is true for them using scales that range from 1 (sort of true for me) to 4 (really true for me). An example of an item is, ''Some people think it's more important to be an individual than to fit in with the crowd'' BUT ''Other people think it is more important to fit in with the crowd than to stand out as an individual." Higher scores indicate greater

resistance to peer influence (less conformity), whereas lower scores indicate lower resistance to peer influence (more conformity). Villarosa et al. (2016) found the measure to demonstrate good internal consistency (α = .80) in a college sample. Cho and Chung (2012) also found that the RPIS correlated negatively with peer pressure as evidence for validity. For the present study, the RPIS had poor reliability α = .50. Given poor internal consistency of these items, six items based on the inter-item correlation matrix and correlations within the range of .15 to .50 were selected as a measure of resistance for peer influence. The following items from the resistance to peer influence scale were: 1, 2, 3, 5, 8, and 10.

Comprehensive Effects of Alcohol Scale (B-CEOA; Addictive Behaviors Research Center, 1997) is a brief version of the original 38-item CEOA (Fromme et al., 1993) that assesses both positive and negative expectancies, as well as valuations about these effects. The four B-CEOA expectancy scales consist of risk and aggression/liquid courage/sociability, self-perceptions/cognitive and behavioral impairment, sexuality, and tension reduction. Valuations scales consist of tension reduction/sociability/sexuality, liquid courage/risk and aggression/self-perceptions, and cognitive and behavioral impairment (Ham, Stewart, Norton, & Hope, 2005). The total scores for each of the expectancy and valuation scales were utilized in the present study. The CEOA has adequate internal consistency (α = .66–.86), test–retest reliability (r =.66–.81 for CEOA expectancy scales, r =.52–.78 for CEOA valuation scales), and criterion validity with the Rutgers Alcohol Problem Index (Ham, Stewart, Norton, & Hope, 2005). For the present study, the Cronbach's α for B-CEOA expectancy total score was acceptable α = .73 and valuation total score also had acceptable internal consistency α = .77.

Drinking Motives Questionnaire-Revised (DMQ-R). The DMQ-R (Cooper, 1994) is a 20-item self-report measure that assesses motives for alcohol use across four domains: social, enhancement, coping, and conformity. Respondents rate the degree to which their own drinking is motivated by each of the statements on a 5-point Likert-type scale from 1 = almost never/never to 5 = almost always/always. Four drinking motives are part of the DMQ-R such as: enhancement (internal, positive; e.g., to have fun, coping (internal, negative; e.g. to forget problems), social (external, positive; e.g., to be sociable), and conformity (external, negative; e.g., to fit in with a group). High scores on a particular DMQ-R subscale indicate the individual typically attributes their drinking to that motive, and scores are independent of drinking frequency. The DMQ-R has demonstrated stronger evidence for a four-factor structure compared to alternative models (Cooper, 1994). Cooper (1994) also showed evidenced of subscale validity for the DMQ-R by their unique associations with patterns of alcohol use and drinking-related outcomes. Kuntsche, Stewart, and Cooper (2008) found additional support for the four-factor model, and results further provided evidence of validity by scale associations with alcohol use, risky drinking, and alcohol-related problems. For the present study, the Cronbach's α was excellent, α = .91.

The Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) is a 23-item questionnaire designed to assess problems with drinking among individuals aged 12–21. For each item, respondents indicated on a scale of 0–4 (0= never, 4=more than 10 times) the number of times during the past 6 months that they have experienced the particular problem because of their alcohol use. Psychometrics of the RAPI collected via longitudinal data (i.e., adolescents ages 12, 15, 18, and 21) revealed that the RAPI is

associated with evidence of high internal consistency (α=.92) and convergent validity for all age groups (White & Labouvie, 1989). More recent research has demonstrated convergent validity of the RAPI by positive correlations with frequency of drinking, weekend drinking, and drinks per week (Martens, Neighbors, Dams-O'Conner, L., & Larimer, 2007). For the present study, Cronbach's α for the RAPI was good, α = .87.

Alcohol Use Disorders Identification Test (AUDIT). The AUDIT is a 10-item self-report measure that is used to identify individuals with alcohol problems (Babor, de la Fuente, Saunders, & Grant, 1992). The AUDIT was developed by the World Health Organization to identify individuals whose alcohol consumption had become hazardous or harmful to their health (Conely & Hare, 2007). The AUDIT was designed to measure distinct dimensions such as: (1) alcohol consumptions, (2) dependence, and (3) problems. Therefore, the instrument has specific items that represent each of these dimensions. Despite this, researchers have found conflicting findings in both clinical and nonclinical samples. In clinical samples of primary care patients, a two-factor structure has been replicated in various studies (Karno, Granholm, & Lin, 2000; Kelly & Donavan, 2001; Maisto et al., 2000). Together, these studies suggest that the AUDIT consists of a consumption factor and alcohol-related problems factor. When examining the psychometrics of the AUDIT in college samples, O'Hare and Sherrer (1999) found evidence for a two-factor structure of alcohol consumption and drinking problems. Similarly, Conely and Hare (2007) presented data to suggest that the AUDIT is composed of two-factors in a college sample, but their reliability estimates appeared questionable (α = .56-.75). Reliability for the overall scale was respectable (α = .76). Particularly in college samples, evidence of poor reliability for subscales suggest that the AUDIT is

better suited as a unidimensional measure given its inability to distinguish dependency from harmful drinking. Evidence of convergent validity has been established by associations of AUDIT subscales to drinking patterns in a sample of drunk drivers participating in a mandatory treatment program (Conely & Hare, 2007). For the present study, Cronbach's α for the AUDIT was acceptable, α = .77.

The Positive and Negative Affect Scale Short Form (I-PANAS-SF). The 10-item I-PANAS-SF (Thompson, 2007) was used to measure positive and negative affect. Participants were asked to read the listed adjectives (e.g., "determined" as indicator of positive affect and "ashamed" as indicator of negative affect) in detail and think if they have those feelings generally. Items were on a 5-point scale ranging from 1 (None) to 5 (Very much). Subscale scores were created by calculating the mean of relevant item ratings. Higher scores indicated greater levels of either positive or negative affect. The Chronbach's α reported in the original validation study was .78 for positive affect and .76 for negative affect (Thompson, 2007). Estimates for Chronbach's α in the present study was mostly consistent with previous research (positive affect, α = .74; negative affect, α = .80). However, only the negative affect scale was utilized in the present study.

Procedure

All study procedures were approved by the University of Nebraska-Lincoln Institutional Review Board.

Recruitment. Participants (N = 307) were drawn from an Psychology Department participant pool through the University of Nebraska-Lincoln Department of Psychology mass screening across Spring 2017, Fall 2018, and Spring 2018 academic semesters. Upon participating in the department mass screening, all participants read a

written copy of the Informed Consent Form at each time point (T1-T4). To help recruit individuals who would be most ideal for observing effects between variables of interest, a sample of items with highest item-total correlation loadings from ASI, DT, AUDIT, and RAPI were selected from pilot data. Sample items along with other alcohol-related items were administered through the department mass screening. Inclusion criteria were: (1) participants with the highest mean scores from ASI, DT, and AUDIT, and (2) one binge-drinking episode in the last six months. Exclusion criteria included: frequent binge drinking defined as weekly. Limitations to these inclusionary and exclusionary criteria are discussed below. All measures were administered at each time point for a total of four times equally spaced across the 16-week (four week intervals) academic semester. To assist in the accuracy of data entering, data were collected through Qualtrics, a secure online survey service. To reduce attrition over time, participants from T1 were sent reminders at each time point of upcoming research one week before via email and text message. Participants who indicated their willingness to participate with a "YES" response after the reminder message were sent the invitation email to participate for T2-T4. In order to link participant data across time, each participant was asked to provide the following type of partial identifying information: (a) last four digits of their phone number and (b) the first two letters of their last name followed by the first letter from their first name. After the study was completed and data linked for each time point, these pieces of identifying information were replaced with participant identification numbers. One day before the Qualtrics survey closed for each time point, participants were sent a reminder email or text message that the survey would close in one day.

Compensation. Preference for type of compensation was gathered from pilot data gathered during a previous academic semester. Previous studies using undergraduate samples have demonstrated the lottery method effective for retaining a considerable subset of participants at later time points (Bowling et al., 2016; Gleibs, Mummendey, & Noack, 2008). Therefore, a combination of course credits and lottery for Amazon gift cards was used for compensation in the present study. Course credit was given at T1, $5 Amazon gift card for all participants at T2, 20 $10 gift cards or a choice of 2 guaranteed course credits (not both) awarded at T3, and 10 $20 gift cards or a choice of 2 guaranteed course credits (not both) awarded at T4 in the form of an Amazon gift card. Compensation was sent electronically to the emails that participants provided on a separate Qualtrics survey not linked to their original data responses. To further reduce attrition, participants who complete all four time points were eligible for a drawing for $100 in the form of an Amazon gift card.

CHAPTER 3: RESULTS

Preliminary Analyses

The data were carefully screened for accuracy and completeness. Screening data resulted in 10 participants being excluded from analysis because they failed a validity check item (e.g. “If you are paying attention, select answer 1 on the scale”). After the data were screening for validity, the final sample (N = 297) was used for main analyses below. Of the 297 participants in the study, the attrition rate after the first time point was approximately 77% comparing T1 to T2. Possible reasons for this degree of attrition as well as limitations to generalizability are explained in the discussion section. While a final sample of individuals (N = 297) participated at any given time point (e.g. T1-4), 25

participants who did not participate at time 1 were still invited to participate at time 2 to strengthen sample size at time 3. Therefore, the time 1 sample estimate is smaller than the total sample. Data were analyzed for time points 1-3 only due to the high amount of missing data at time 4 (86%). Sample sizes for all three waves of data were as follows: time 1 (n = 272), time 2 (n = 118), and time 3 (n = 65). Missing data were addressed using maximum likelihood (ML) estimation. ML is currently the gold standard approach to addressing missing data and allows for retention of all incomplete cases. Research has shown that ML is appropriate method for addressing missing data in small longitudinal samples (Enders, 2011; Shin, Davison, & Long, 2016; Yuan, Yang-Wallentin, & Bentler, 2012).

Data screening. Additional preliminary analyses were conducted to determine if the data met assumptions for being normality distributed. Distributions of all variables used at each time point were examined and did not exhibit excess skewness (skewness > 3) or kurtosis (kurtosis > 3). There were no concerns about multicollinearity (*rs* < .70) between each variable used as predictors, mediators, and outcomes in the model.

Primary Analyses

Objective 1. Correlations between all hypothesized predictor variables and each outcome variable at T1 are displayed in Table 1. As shown in Table 1, the correlation between the largest hypothesized NAS risk factor (i.e. anxiety sensitivity and anxiety control) and alcohol measures were similar. While similar, anxiety sensitivity was selected as the NAS risk factor for objective two below given a growing literature supporting a direct link between anxiety sensitivity and alcohol use (Lejuez et al., 2006; Paulus et al., 2017). Excluding anxiety control from the model will be discussed in the

limitations. In addition, none the NAS risk factors were significantly correlated with the AUDIT. With regard to alcohol specific risk factors, alcohol expectancies and drinking motives were positively correlated with the RAPI and AUDIT. Alcohol expectancies and drinking motives were positively correlated with the OASIS. As expected, distress tolerance and anxiety control were negatively correlated and BFNE positively correlated with the OASIS. Alcohol valuations and resistance to peer influence were not significantly correlated with the OASIS, RAPI, or the AUDIT.

Table 1
Descriptive Statistics for T1 NAS Risk Factors and Outcome Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	
1. Distress Tolerance	-											
2. Anxiety Control	.68**	-										
3. Anxiety Sensitivity	-.54**	-.52**	-									
4. BFNE	-.47**	-.38**	.62**	-								
5. Alcohol Expectancies	-.24**	-.19**	.26**	.26**	-							
6. Alcohol Valuations	.02	-.08	.09	0.05	.26**	-						
7. Peer Resistance	.13*	.24**	-.15*	-.18**	-.13*	-.10	-					
8. Drinking Motives	-.16**	-.17**	.23**	.22**	.49**	.32**	-.08	-				
9. RAPI	-.12*	-.20**	.19**	.12*	.29**	.01	-.05	.36**	-			
10. AUDIT	-.11	-.10	.09	.03	.27**	.05	.04	.48**	.62**	-		
11. OASIS	-.57**	-.58**	.59**	.49**	.16**	.00	-.11	.15**	0.11	.09	-	
12. Negative Affect	-.56**	-.51**	.65**	.49	.27	.02	-.18	.29**	.22**	.14*	.60**	-
M	3.33	4.03	2.00	2.62	2.63	2.76	2.60	2.54	1.22	1.58	2.11	1.90
SD	0.75	0.73	0.75	0.54	0.43	0.58	0.58	0.69	0.26	0.34	0.81	.70

Note. N = 272, BFNE = Brief Fear of Negative Evaluation, RAPI = Rutgers Alcohol Problems Index, AUDIT = Alcohol Use Identification Test, OASIS = Overall Anxiety Severity and Interference Scale, ** $p < 0.01$, * $p < 0.05$.

Objective 2. The extent to which the hypothesized predictors and dependent variables change across time was tested using panel modeling with maximum likelihood below.

Table 2 provides estimated means and standard deviations for all variables configured in the hypothesized models across time 1-3.

Table 2.
Estimated Means and Standard Deviations for Variables Across All Waves of Data

Variable	Mean	SD
Anxiety Sensitivity		
Wave 1	2.00	.73
Wave 2	2.37	.83
Wave 3	1.93	.91
Negative Affect		
Wave 1	1.90	.70
Wave 2	2.10	.93
Wave 3	1.95	.73
Alcohol Expectancies		
Wave 1	2.62	.43
Wave 2	2.65	.53
Wave 3	2.67	.51
Alcohol Valuations		
Wave 1	2.76	.58
Wave 2	2.67	.66
Wave 3	2.73	.68
Peer Resistance		
Wave 1	2.60	.57
Wave 2	2.55	.67
Wave 3	2.75	.61
Drinking Motives		
Wave 1	2.53	.69
Wave 2	2.48	.76
Wave 3	2.54	.73
Alcohol Problems		
Wave 1	-.01	.92
Wave 2	.06	.70
Wave 3	.09	1.03
OASIS		
Wave 1	2.12	.81
Wave 2	2.03	.79
Wave 3	2.06	.83

Note. T1 (n = 272), T2 (n = 118), and T3 (n = 65). OASIS = Overall Anxiety Severity and Interference Scale.

Statistical assumptions. Several fit indices were used to assess whether the model was a good fit to the data; chi-square, root mean-square error of approximation (RMSEA; Browne & Cudeck, 1993), the comparative fit index (CFI; Bentler 1990), and the Standard Root Mean Residual (SRMR; Hu & Bentler, 1999). Although a nonsignificant chi-square is preferred, chi-square as a measure of good fit can be

unreliable, especially in large samples (Brown & Moore, 2006). Values of at least .90 reflect adequate model fit to the data for the CFI. For the RMSEA and SRMR, values of .05 or less indicate good fit, values up to .08 indicate reasonable fit, values ranging from .08-.10 indicate mediocre fit, and values greater than .10 indicate poor fit (MacCallem, Browne, & Sugawara, 1996). Once a model was determined to have acceptable fit to the data, parameter estimates were interpreted. In testing indirect effects of mediation analyses, a bootstrap approach (Shrout & Bolger, 2002), which maximizes power while minimizing Type I error rate, was utilized. Bootstrapping provides an empirical approximation of sampling distributions of indirect effects to produce confidence intervals (CI) of estimates. If zero does not fall within the CI, one can conclude that an indirect effect is different from zero. A nonparametric resampling method (bias-corrected bootstrap) was performed with 1000 resamples drawn to derive the 95% CIs for the indirect effect of an NAS risk factor on anxiety and alcohol use problems through mediators (i.e. alcohol expectancies, alcohol valuations, and drinking motives).

Model 1 specification. A repeated measures panel model was conducted across three waves of data to model change variance while testing mediation pathways over time. (Note that separate mediation analyses were also conducted exclusively at time 1 to maximize power for testing hypotheses given the high rates of missing data at times 2 and 3----see objective 3, Models 2 and 3, below.) Dependent variables were measured by consumption and alcohol interference (RAPI; White & Labouvie, 1989), problematic alcohol use (AUDIT; Babor, et al., 1992) and anxiety interference (OASIS; Norman et al., 2006). Scores from the AUDIT and RAPI were first standardized and then aggregated into a single outcome variable. The OASIS was specified as a second outcome variable.

The predictor variable was specified as anxiety sensitivity (i.e. NAS risk factor) and negative affect was added as a control. Mediator variables were specified as the following: resistance to peer influence, alcohol expectancies, valuations, and drinking motives, A full panel model was implemented such that all time 3 variables were regressed on all time 2 variables, and all time 2 variable were regressed on all time 1 variables. Residuals from the same time point were covaried. Autoregressive paths controlling for levels of a given variable at a previous time point were included. Global fit indices suggested that the model as specified did not adequately fit the data, χ^2 (58, N = 297) = 225.36, p <.001, CFI = .86, SRMR = .06, and RMSEA = .09. The poor global fit indices from the model suggested that there were other time-lagged paths that could be estimated.

Model 1 respecification. Given the poor global fit of the model, I reviewed the standardized residuals; the largest standardized residuals for time-lagged paths were identified, and additional paths were added one at a time until adequate global model fit was observed. The first time-lagged path was added between time 3 alcohol expectancies and time 1 expectancies. The second time-lagged path was added between time 3 anxiety sensitivity and time 1 anxiety sensitivity. After adding these time-lagged paths (one at a time), the respecified model had acceptable global model fit, χ^2 (56, N = 297) = 175.13, p <.001, CFI = .91, SRMR = .05, and RMSEA = .08. The respecified model accounted for a considerably high proportion of variance in alcohol use problems (R^2 = .68), anxiety interference (R^2 = .69), and drinking motives (R^2 = .75), respectively. Total variances explained (R-square estimates) for all outcomes are presented in Table 5.

Time 3 alcohol problems and anxiety interference. From time 2 to 3 (see Table 3), controlling for the other variables in the model, both alcohol use problems and anxiety interference were positively associated with change variance in alcohol problems at time 3 (i.e., "changes" in alcohol problems controlling for earlier levels of alcohol problems or residualized change). Specifically, greater alcohol use problems and more anxiety interference were significantly associated with increases in alcohol problems at the subsequent time point. Greater alcohol expectancies at time 2 were associated with increases in alcohol problems at time 3. Lastly, time 2 anxiety sensitivity was negatively related to changes in time 3 alcohol use problems such that greater anxiety sensitivity was associated with decreases in alcohol use problems at the subsequent time point. Time 2 anxiety interference was positively related to changes in anxiety interference at time 3. As expected, anxiety sensitivity at time 1 was positively associated with changes in time 3 anxiety interference.

Time 3 drinking motives, expectancies, valuations, and peer resistance. From time 2 to 3, alcohol use problems and drinking motives were positively associated with time 3 changes in drinking motives. Lower anxiety sensitivity (reverse effect) and peer resistance was associated with higher changes in time 3 drinking motives. Regarding expectancies, time 2 alcohol use, anxiety interference, expectancies (time 1 and 2), and valuations predicted positive changes in expectancies at time 3. Anxiety sensitivity and peer resistance was negatively related to alcohol expectancies. For alcohol valuations, higher time 2 valuations and lower anxiety sensitivity was associated with higher changes in time 3 valuations. For peer resistance, time 2 peer resistance and anxiety sensitivity was positively related to changes in time 3 peer resistance.

Time 3 anxiety sensitivity and negative affect. For time 3 anxiety sensitivity, time 1 anxiety sensitivity and anxiety interference were positively associated with time 3 anxiety sensitivity. For negative affect, time 2 negative affect, expectancies, anxiety interference, and alcohol use problems were positively related to time 3 negative affect.

Table 3
Parameter Estimates for Time 1 to Time 3 for Panel Model

	Unstandardized				Unstandardized		
	Estimate	SE	*p*		Estimate	SE	*p*
Alcohol problems 3 ON				OASIS 3 ON			
Alcohol problems 2	1.15	.17	.000	Alcohol problems 2	.22	.13	.090
OASIS 2	.30	.14	.034	OASIS 2	.74	.10	.000
Motives 2	-.17	.17	.318	Motives 2	.01	.12	.935
Expectancies 2	.75	.19	.000	Expectancies 2	.01	.14	.892
Valuations 2	-.29	.18	.106	Valuations 2	-.01	.12	.900
Peer resistance 2	.00	.18	.982	Peer resistance 2	.15	.13	.258
Anxiety Sensitivity 2	-.31	.13	.024	Anxiety sensitivity 2	.06	.10	.521
Negative affect 2	.16	.18	.357	Negative affect 2	.01	.13	.900
Anxiety Sensitivity 1	-.25	.15	.101	Anxiety sensitivity 1	.30	.11	.009
Negative affect 1	-.16	.21	.430	Negative affect 1	-.23	.15	.127
Motives 3 ON				Expectancies 3 ON			
Alcohol problems 2	.52	.10	.000	Alcohol problems 2	.32	.07	.000
OASIS 2	.02	.08	.770	OASIS 2	.10	.04	.018
Motives 2	.36	.10	.000	Motives 2	-.12	.07	.072
Expectancies 2	-.07	.11	.514	Expectancies 2	.22	.08	.011
Valuations 2	.17	.10	.117	Valuations 2	.24	.07	.001
Peer resistance 2	-.30	.11	.008	Peer resistance 2	-.19	.07	.011
Anxiety sensitivity 2	-.25	.08	.002	Anxiety sensitivity 2	-.20	.05	.000
Negative affect 2	.06	.10	.553	Negative affect 2	.06	.06	.313
Anxiety sensitivity 1	.07	.08	.363	Expectancies 1	.45	.08	.000
Negative affect 1	.02	.11	.827				
Valuations 3 ON				Peer resistance 3 ON			
Alcohol problems 2	.24	.14	.096	Alcohol problems 2	-.09	.11	.394
OASIS 2	.15	.09	.078	OASIS 2	-.19	.06	.004
Motives 2	.00	.14	1.00	Motives 2	-.00	.10	.974
Expectancies 2	-.14	.15	.370	Expectancies 2	.15	.11	.187
Valuations 2	.70	.14	.000	Valuations 2	-.09	.10	.390
Peer resistance 2	-.26	.15	.085	Peer resistance 2	.65	.11	.000
Anxiety sensitivity 2	-.21	.11	.052	Anxiety sensitivity 2	.19	.08	.016
Negative affect 2	.12	.13	.332	Negative affect 2	-.10	.09	.287
Anxiety sensitivity 3 ON				Negative affect 3 ON			
Alcohol problems 2	.08	.13	.510	Alcohol problems 2	.32	.14	.025
OASIS 2	.30	.08	.000	OASIS 2	.46	.08	.000
Motives 2	-.06	.12	.586	Motives 2	-.09	.13	.508
Expectancies 2	-.01	.13	.909	Expectancies 2	.29	.15	.055
Valuations 2	-.14	.12	.252	Valuations 2	-.14	.14	.296
Peer resistance 2	.12	.13	.352	Peer resistance 2	.11	.14	.423
Anxiety sensitivity 2	.13	.09	.156	Anxiety sensitivity 2	-.08	.10	.407
Negative affect 2	.00	.11	.942	Negative affect 2	.28	.12	.022
Anxiety sensitivity 1	.49	.08	.000				

Note. T1 (n = 272), T2 (n = 118), and T3 (n = 65). OASIS = Overall Anxiety Severity and Interference Scale.

Time 2 effects. Time 1 alcohol problems, motives, and expectancies predicted positive changes in alcohol use problems at time 2 (see Table 4). For anxiety interference, negative affect and anxiety interference resulted in positively associated changes in anxiety interference at time 2. Higher changes in drinking motives was predicted by higher time 1 motives and valuations. Regarding expectancies, expectancies and alcohol use problems at time 1 were positively associated with expectancies at time 2. For valuations, drinking motives and valuations were positively related to changes in time 2 valuations. Significantly higher changes for peer resistance, anxiety sensitivity, and negative affect at time 2 was predicted by previous time 1 levels.

Summary of key panel model findings. Expectancies predicted positive changes across both time 2 and time 3 alcohol use problems. Time 2 anxiety sensitivity predicted negative changes in time 3 alcohol use problems, drinking motives, expectancies, and valuations. Moreover, time 2 anxiety sensitivity predicted positive changes in time 3 anxiety interference and peer resistance. Lastly, time 1 drinking motives was associated with positive changes in alcohol use problems at time 3. No significant indirect effects linking time 1 to time 3 variables were found.

Summary of reciprocal effect findings. Time 2 anxiety interference was positively associated with changes in time 3 alcohol use problems, expectancies, anxiety and sensitivity. Anxiety interference at time 2 was negative related to changes in peer resistance at time 3. Additionally, alcohol use problems at times 1 and 2 were positively associated with changes in expectancies for both phases of time (i.e. times 2 and 3). No other reciprocal effects were found.

Table 4
Parameter Estimates for Time 1 to Time 2 for Panel Model

	Unstandardized Estimate	SE	*P*		Unstandardized Estimate	SE	*p*
Alcohol problems 2 ON				OASIS 2 ON			
Alcohol problems 1	.46	.05	.999	Alcohol problems 1	-.03	.06	.586
OASIS 1	-.02	.06	.692	OASIS 1	.65	.08	.000
Motives 1	.21	.08	.008	Motives 1	-.13	.09	.156
Expectancies 1	.20	.10	.059	Expectancies 1	-.02	.12	.861
Valuations 1	-.03	.06	.634	Valuations 1	.02	.07	.785
Peer resistance 1	.04	.06	.460	Peer resistance 1	-.11	.07	.135
Anxiety Sensitivity 1	.02	.07	.785	Anxiety Sensitivity 1	-.03	.09	.666
Negative affect 1	.08	.08	.290	Negative affect 1	.22	.10	.025
Motives 2 ON				Expectancies 2 ON			
Alcohol problems 1	.05	.05 .07	.442	Alcohol problems 1	.16	.05	.003
OASIS 1	-.10	.09	.241	OASIS 1	-.10	.06	.113
Motives 1	.60	.10	.000	Motives 1	-.10	.07	.194
Expectancies 1	.22	.14	.110	Expectancies 1	.72	.10	.000
Valuations 1	.16	.08	.053	Valuations 1	.02	.06	.716
Peer resistance 1	.04	.08	.620	Peer resistance 1	-.00	.06	.937
Anxiety Sensitivity 1	.08	.10	.402	Anxiety Sensitivity 1	.05	.07	.485
Negative affect 1	.05	.11	.603	Negative affect 1	.06	.08	.422
Valuations 2 ON				Peer resistance 2 ON			
Alcohol problems 1	-.08	.06	.217	Alcohol problems 1	-.12	.07	.090
OASIS 1	-.10	.08	.217	OASIS 1	.02	.09	.764
Motives 1	.25	.10	.011	Motives 1	-.01	.10	.910
Expectancies 1	.14	.13	.277	Expectancies 1	-.21	.14	.134
Valuations 1	.59	.07	.000	Valuations 1	.01	0.0	.877
Peer resistance 1	.13	.08	.082	Peer resistance 1	.58	.08	.000
Anxiety Sensitivity 1	.06	.09	.519	Anxiety Sensitivity 1	-.00	.10	.941
Negative affect 1	.04	.10	.640	Negative affect 1	.05	.11	.625
Anxiety sensitivity 2 ON				Negative affect 2 ON			
Alcohol problems 1	.22	.13	.102	Alcohol problems 1	.10	.10	.331
OASIS 1	.13	.16	.424	OASIS 1	.00	.12	.978
Motives 1	-.23	.19	.229	Motives 1	-.02	.15	.981
Expectancies 1	.22	.26	.402	Expectancies 1	.08	.19	.654
Valuations 1	.14	.16	.363	Valuations 1	.11	.12	.357
Peer resistance 1	-.13	.12	.406	Peer resistance 1	-.17	.12	.158
Anxiety Sensitivity 1	.50	.18	.007	Anxiety Sensitivity 1	.09	.14	.525
Negative affect 1	-.05	.20	.797	Negative affect 1	.54	.15	.000

Note. T1 (n = 272), T2 (n = 118), and T3 (n = 65). OASIS = Overall Anxiety Severity and Interference Scale.

Table 5
R-Square Estimates for Panel and Path Models

Panel Model 1		Path Model 2 with Negative Affect	
Variable	R^2	Variable	R^2
Alcohol problems 3	.68	Alcohol problems	.25
OASIS 3	.69	OASIS	.43
Motives 3	.75	Motives	.29
Expectancies 3	.79	Expectancies	.08
Valuations 3	.55	Valuations	.01
Peer resistance 3	.56	Peer resistance	.02
Anxiety sensitivity 3	.64		
Negative affect 3	.56	Path Model 3 with Negative Affect	
		Variable	R^2
Alcohol problems 2	.68	Alcohol problems	.25
OASIS 2	.63	OASIS	.35
Motives 2	.54	Motives	.26
Expectancies 2	.48	Expectancies	.06
Valuations 2	.48	Valuations	.008
Peer resistance 2	.33	Peer resistance	.02
Anxiety sensitivity 2	.20		

Note. OASIS = Anxiety Severity and Interference Scale. N = 272.

Objective 3.

Model 2 specification. A path model was constructed to test the hypothesized mediation model exclusively with the time 1 data (n = 271). Similar to model 1 above, dependent variables were measured by consumption and alcohol interference (RAPI; White & Labouvie, 1989), problematic alcohol use (AUDIT; Babor, et al., 1992) and anxiety interference (OASIS; Norman et al., 2006). Scores from the AUDIT and RAPI were first standardized and then aggregated into a single outcome variable. The OASIS was specified as a second outcome variable. Mediator variables were specified as resistance to peer influence, alcohol expectancies, and valuations, followed by drinking motives as a serial mediator. Anxiety sensitivity (i.e. NAS risk factor) was specified as a predictor and negative affect was added as a control.

The initial model was identified and global fit indices suggested that the model as specified had good fit to the data based on the majority of fit indices, χ^2 (3, N = 297) = 23.12, p <.001, CFI = .94, SRMR = .04, and RMSEA = .13. Unstandardized coefficients

(and SEs) are reported in Table 5. Results revealed that lower valuations, higher expectancies, and higher motives were uniquely associated with higher alcohol use problems. Peer resistance, anxiety sensitivity, and negative affect were not uniquely associated with alcohol use problems. For anxiety interference, higher anxiety sensitivity and negative affect were uniquely related to anxiety interference, but not other factors. Drinking motives, higher expectancies, higher valuations, and higher negative affect were uniquely associated with drinking motives. Both anxiety sensitivity and negative affect were unique positive predictors of expectancies. Higher anxiety sensitivity was a unique predictor of peer resistance and valuations while controlling for negative affect.

Table 6
Parameter Estimates for Path Model 2 Controlling for Negative Affect

	Unstandardized				Unstandardized		
	Estimate	SE	*p*		Estimate	SE	*p*
Alcohol problems ON				OASIS ON			
Motives	.58	.06	.000	Motives	-.02	.04	.533
Expectancies	.24	.10	.020	Expectancies	-.02	.08	.762
Valuations	-.21	.06	.001	Valuations	-.04	.06	.534
Peer Resistance	.05	.03	.124	Peer Resistance	-.02	.04	.531
Anxiety Sensitivity	.01	.05	.794	Anxiety Sensitivity	.37	.08	.000
Negative affect	.04	.05	.411	Negative affect	.44	.08	.000
Motives ON				Expectancies ON			
Expectancies	.62	.09	.000	Anxiety Sensitivity	.08	.04	.055
Valuations	.26	.02	.000	Negative affect	.11	.04	.012
Peer Resistance	.02	.02	.407				
Anxiety Sensitivity	-.01	.02	.805				
Negative affect	.19	.06	.002				
Peer Resistance ON				Valuations ON			
Anxiety Sensitivity	-.10	.05	.058	Anxiety Sensitivity	.11	.02	.000
Negative affect	-.02	.08	.753	Negative affect	-.06	.06	.351

Note. N = 272, OASIS = Anxiety Severity and Interference Scale.

No evidence of mediation was found for any of the hypothesized paths when controlling for negative affect (see Table 6). With negative affect remaining as a predictor in the model, motives mediated the relationship between negative affect and alcohol use problems. However, the direct effect between alcohol use problems and negative affect was not significant, .04, 95% CI [-.14, .22]. The indirect effect .11, 95%

CI [0.04, .19] of negative affect on alcohol use problems via motives did not contain zero. Expectancies and motives serially mediated the relationship between negative affect and alcohol use problems, .04, 95% CI [.005, .08]. Additionally, the relationship between negative affect and motives was mediated via expectancies, .06, 95% CI [.008, .13]. The direct effect between negative affect and motives was statistically significant, .19, 95% CI [.06, .32].

Model 3 specification. A reduced path model based on model 2 above was tested by removing negative affect as the control variable (see Table 7). Model 3 was identified and global fit indices suggested that the model as specified had reasonable fit to the data based on the majority of fit indices, χ^2 (3, N = 297) = 21.64, p <.001, CFI = .94, SRMR = .05, and RMSEA = .15. Unstandardized coefficients (and SEs) are reported in Table 6. Results were similar to those revealed from Model 2 except that anxiety sensitivity was now positively associated with drinking motives and negatively associated with peer resistance.

Table 7
Parameter Estimates for Path Model 3 after Removing Negative Affect

	Unstandardized				Unstandardized		
	Estimate	SE	*p*		Estimate	SE	*p*
Alcohol problems ON				OASIS ON			
Motives	.58	.06	.000	Motives	.04	.07	.546
Expectancies	.24	.10	.048	Expectancies	.01	.11	.871
Valuations	-.21	.06	.006	Valuations	-.09	.08	.251
Peer Resistance	.05	.03	.459	Peer Resistance	-.03	.06	.590
Anxiety Sensitivity	.04	.05	.505	Anxiety Sensitivity	.62	.06	.000
Motives ON				Expectancies ON			
Expectancies	.66	.08	.000	Anxiety Sensitivity	.14	.03	.000
Valuations	.24	.07	.000				
Peer Resistance	.01	.06	.779				
Anxiety Sensitivity	.10	.04	.034				
Peer Resistance ON				Valuations ON			
Anxiety Sensitivity	-.11	.04	.006	Anxiety Sensitivity	.07	.04	.107

Note. N = 272, OASIS = Anxiety Severity and Interference Scale.

Anxiety sensitivity and alcohol use problems were mediated through the indirect effects of motives, .06, 95% CI [.006, .12] and expectancies, .03, 95% CI [.001, .08]. The direct effect between anxiety sensitivity and alcohol use problems was not significant, .04, 95% CI [-.07, .17]. Additionally, the path between anxiety sensitivity and drinking motives was mediated through expectancies, .10, 95% CI [.05, .14]. The direct effect between anxiety sensitivity and motives was also significant after bootstrapping, .10, 95% CI [.01, .19]. Lastly, the effect of anxiety sensitivity on alcohol use problems was serially mediated via expectancies and motives, .05, 95% CI [.03, .09]. Anxiety sensitivity and anxiety interference were not mediated through peer resistance, expectancies, valuations, or motives.

CHAPTER 4: Discussion

The broad goal of this study was to evaluate whether an NAS risk factor and other alcohol-specific risk factors would influence anxiety and alcohol use problems, which is an extension of a model proposed by Ham and Hope (2005). Within this broad goal, there were three primary objectives. The first objective was to evaluate the strength of the association for each proposed NAS risk factor (i.e. anxiety sensitivity, distress tolerance, perceived anxiety control, fear of negative and evaluation) with alcohol use problems and select the NAS factor for inclusion in a larger model. The second objective was to evaluate an NAS risk factor together with other alcohol-specific risk factors (i.e. peer resistance, expectancies, valuations, and drinking motives) as predictors of anxiety and alcohol use problems across time. The third objective was to examine the indirect effects between an NAS risk factor and anxiety and alcohol use problems through peer resistance, alcohol expectancies, valuations, and serial mediator, drinking motives.

Findings related to these objectives are discussed below, including a discussion of limitations, future directions, and clinical implications.

Correlational Findings from Objective 1

Based on previous studies, it was hypothesized that higher anxiety sensitivity, higher fear of negative evaluation, lower perceived anxiety control, and lower distress tolerance would be associated with higher anxiety and alcohol use problems. This hypothesis was supported and consistent with the literature showing positive relationships among anxiety sensitivity, alcohol use, and anxiety-related problems (Howell, et al., 2010; Novak, et al, 2003; Schmidt, et al., 2007). Anxiety sensitivity was selected as the NAS predictor for a model in objectives 2 and 3 based on having the largest correlation with alcohol use problems.

Alcohol Problems

In the present study, there was a trend for alcohol problems increasing over time among college students. This finding could highlight that college students are likely to experience considerable stress, which may lead to the development of risky substance use. Other possible explanations for the trend in increasing alcohol use among college students is that their tolerance or access to alcohol could also be increasing over time. Moreover, the finding from this study supports previous research that suggests the transition from high school to college is associated with increased risk of substance use (Arnett, 2000; White et al., 2005). As a developmental pathway, the present finding that alcohol increased overtime is also consistent with researchers who demonstrate that early substance use is part of an externalizing pathway for poorer outcomes (Hussong, Jones, Stein, Baucom, & Boeding, 2011; Zucker, 2006). While evidence exists for this

externalizing pathway, understanding the internalizing pathway toward alcohol use problems provides more clarity into the underlying mechanisms that are contributing to risk substance use.

As hypothesized in objective 2, changes in higher alcohol expectancies in the current study also led to changes in higher alcohol use problems over time while also controlling for other factors. This finding adds to a number of research studies that have also found alcohol expectancies to predict problematic drinking in adolescents (Jester et al., 2015; Patrick et al., 2010) and young adults (Fromme & D'Amico, 2000; Ham, Stewart, Norton, & Hope, 2005; Vilenne & Quertemont, 2015; Young, Connor, Ricciardelli, & Saunders, 2006). The modeling approach in the present study strengthens previous research findings in the relationship between expectancies and alcohol use. That is, the relationship between alcohol expectancies and problematic alcohol use was examined in an autoregressive framework where previous levels of alcohol use problems were controlled. Therefore, any residual levels in alcohol use problems after controlling for previous levels could be attributed to other remaining factors, such as alcohol expectancies. The hypothesized relationship between peer resistance and anxiety and alcohol use problems, this hypothesis was not supported.

Based on previous research (Ham et al., 2015), it was hypothesized that valuations would predict change variance in alcohol use problems over time. However, the present study did not find evidence for this relationship, which is similar to the null result found by Ham and Hope (2005) in a sample of college students. The original hypothesis by Ham and Hope (2005) was based on the notion that when college students perceive the effect of alcohol as positive (e.g. “I will feel at ease”), they are more likely

to engage in more hazardous drinking compared to having the perception that alcohol has negative effects (e.g. “I will make a fool out of myself,” Ham & Hope, 2005). The null valuations finding for alcohol use problems in the present study might be explained by a difference in population for whom valuations are more relevant. For example, individuals who are socially anxious might be more concerned about how the effect of alcohol will change their social performance and ultimately motivate additional fears of being negatively evaluated. In contrast, individuals who are less socially anxious are less concerned about how the effect of alcohol will influence their performance or how others will perceive them. In fact, researchers have often studied alcohol expectancies as a pathway between social anxiety and alcohol use problems. In particular, Ham and colleagues (2015) found that positive expectancies of alcohol predicted higher alcohol use problems in more socially anxious college students. Regarding negative expectancies, Ham and colleagues (2015) found that having negative alcohol expectancies was associated with lower alcohol use problems. Therefore, the relationship between positive versus negative expectancies on alcohol use problems might better be explained for individuals for whom peer evaluation is more relevant.

Higher drinking motives were associated higher alcohol use problems, which supports the hypothesized relationship. However, changes in motives to drink influenced changes in higher alcohol use problems only from time one to two (i.e. no changes in drinking motives and alcohol use problems at time three). The findings between drinking motives and higher alcohol use from the present study are broadly consistent with existing research (Oglesby et al., 2015). Oglesby and colleagues (2015) found that coping, conformity, and social motives were related to alcohol use in college students.

Although speculative, the null finding between drinking motives and alcohol use at more distal time points in the present study could be associated with the relevance of differential drinking motives. For instance, researchers have found that when motives for drinking consist of coping, conformity, or enhancement, then those motives are more related to heavier alcohol use (Kunsche et al., 2005). In contrast, when the motives for drinking consist of drinking for social norms, then those motives are associated with more moderate levels of drinking (Kunsche et al., 2005). While differential drinking motives were not tested in the present study, the motives driving drinking patterns in the sample of students from the present study could have less to do with coping or enhancement from drinking.

The present study found evidence that anxiety sensitivity was associated with alcohol use problems, but opposite of the expected direction in the panel modeling. The opposite of the hypothesized direction between anxiety sensitivity and alcohol in the panel modeling was inconsistent with results from correlational and path modeling in the present study. In the present study, lower anxiety sensitivity at time 2 was found to be associated with higher changes in alcohol use problems when controlling for the effects of other factors (e.g. time 1 negative affect and anxiety sensitivity, drinking motives, expectancies, valuations, peer resistance, and anxiety interference). After the common variance was accounted for by other factors in the model, the residual variance of anxiety sensitivity was negatively associated with changes in alcohol use problems (i.e., suppressor effect). The positive relationship between higher anxiety sensitivity and higher alcohol use problems in the literature is consistent with correlational findings in the present study (Collins et al., 2018; DeMartini & Carey, 2011; Brown, 2003; Howell,

et al., 2010; Novak, et al.,; Schmidt, et al., 2007). Additionally, when the shared variance between anxiety sensitivity and other mood factors were accounted for, then anxiety sensitivity no longer contributed to more problematic levels of drinking. The current study strengthens the current literature between anxiety sensitivity and alcohol use problems as these effects are now supported longitudinally.

Anxiety Severity and Interference

Anxiety sensitivity, peer resistance, expectancies, valuations, and drinking motives were hypothesized to influence changes in anxiety severity and interference (i.e. OASIS). This broad hypothesis was partially supported. As expected, anxiety sensitivity was positively associated with changes in anxiety interference. However, the relationship between anxiety sensitivity and anxiety severity over time was only true at time 2 (i.e. approximately mid-semester). Interestingly, there was an exploratory finding between anxiety sensitivity and anxiety interference when examining the reciprocal relationship from panel modeling. For example, anxiety interference was related to positive changes in anxiety sensitivity at more distal time points, suggesting an important reciprocal relationship. Similar to the trend for alcohol use problems, anxiety interference increased over time in the current study. This finding might highlight the gradual increase in academic stressors college student face, such as exams, term papers, and the aggregate of other life stressors associated with college transition.

Modeling anxiety sensitivity as a risk factor for anxiety severity and interference while controlling for negative affect provides support for a growing transdiagnostic literature. Measuring anxiety problems as interference and severity as opposed to specific symptoms allowed for a more robust measurement of anxiety-related problems. As such,

the present findings extend the understanding between anxiety sensitivity and anxiety psychopathology that is more consistent with Barlow's (2004) conceptualization of NAS. Anxiety pathology has been separated into distinct anxiety disorders despite commonalities (i.e. maladaptive emotions, cognitions and dysfunctional avoidance behavior), which has resulted in a lot of research methodology designed to focus disorder-specific outcomes (Cox, Borger, & Enns, 1999; Olatunji & Wolitzky-Taylor, 2009; Reiss, 1991). While the strength between anxiety sensitivity and Panic Disorder is strong (Olatunji & Wolitzky-Taylor, 2009), anxiety sensitivity is also implicated as transdiagnostic factor across anxiety disorders (Calamari, et al., 2008; Rapee & Heimberg, 1997; Rodriguez et al., 2004; McNally & Steketee, 1985; Taylor, 2003). While not a primary target of interest in this study, negative affect was positively associated with changes in anxiety interference between time 1 and 2.Therefore, consistent with Barlow's conceptualization of negative affect syndrome, the present study included a transdiagnostic measure of anxiety by focusing on severity and interference associated with anxiety rather than disorder-specific symptomology.

Drinking Motives

Similar to trends for alcohol and anxiety interference increases over time, a trend for drinking motives increasing was observed in the present study. These findings are consistent with recent college student research that explored relations between drinking motives, social anxiety and alcohol problems across three waves of time (Collins, et al., 2018). It was hypothesized that anxiety sensitivity would be positively related to drinking motives, but the finding in the present study was opposite to the expected direction. In the present study, anxiety sensitivity was negatively related to drinking

motives, which is also discrepant from the self-medication hypothesis supported in some research (Collins, et al., 2018; DeMartini & Carey, 2011; Khantzian, 1997). Similar to the findings for alcohol, the opposite that hypothesized direction is likely a product of a suppressor effect where residual variance in anxiety sensitivity changes the coefficient to negative after other factors account for common variance. While not directly comparable to the current study, Collins and colleagues (2018) found a positive association between social avoidance and several drinking motive types (i.e. coping with anxiety, conformity, social motives, enhancement motives), which supports the self-medication hypothesis for anxiety. Baines and colleagues (2016) found that there was no direct effect between anxiety sensitivity and coping motives. Differences between the current study from Baines and colleagues (2016) could be attributed to how drinking motives were measured. Baines and colleagues (2016) also examined only one type of motives (i.e. coping) whereas the current study modeled drinking motives that included several more facets of motives (i.e. conformity, enhancement, and social). Therefore, the relationship between anxiety sensitivity and drinking motives in the current study is likely reflected by more than one source of motivation to drink. Taken together, the relationship between anxiety sensitivity and drinking motives appears to be complex such that the self-medication hypothesis may only be relevant depending on the specific motivation for drinking.

As hypothesized, partial support was found between peer resistance being negatively related to drinking motives. That is, resistance to peer influence was negatively related to changes in drinking motives, but only from time two to three. In other words, individuals who are higher conformers were more likely to have stronger

motives for drinking. While the link between peer influences on drinking behaviors is well established in adolescents (Hustad, Pearson, Neighbors, & Borsari, 2014; Kison, Madson, & Seigler-Hill, 2016), the finding from the present study provides more evidence between drinking motives and peer influence in adult populations. Although speculative, the scant research in adults could be attributed to the constructs that have been of major focus. For instance, measurement constructs such as peer influence and drinking motives tend to share overlapping facets. Measures that assess drinking motives, such as the DMQ-R (Cooper, 1994), inherently capture peer influences as a facet of motivation to drink and therefore used to explain the effect of peer norms on drinking. In effect, measuring peer influences as a separate mechanism is scant in research. Additionally, alcohol-focused research does not typically measure peer influence as a broader construct. In the present study, peer influence (i.e. resistance to peer influence) was measured more broadly and as opposed to specific social reasons to use alcohol. As such, the broader measurement of peer influence in the present study is considered a strength because assumptions about alcohol use are not being made. For example, the assumption that lower conformity contributes to drinking motivations was not made, which further strengthens social reasons as a source of motivation for drinking when support is found.

Mixed support was found for the hypothesized relationship between expectancies and drinking motives. Results from panel modeling do not support a relationship between expectancies and drinking motives. However, there was positive support between expectancies and motives in the current study when examining this relationship on the first wave of the data only, which was consistent with research (Baines et al., 2016;

Cooper et al., 1995; Fischer et al., 2004; Kuntsche, Knibbe, Engels, & Gmel, 2007; Urbán, Kökönyei, & Demetrovics, 2008). When examining the influence of alcohol valuations, valuations were positively related to changes in drinking motives at time two. Moreover, this finding is consistent with the notion that when the effect of alcohol is positive, then individuals are more likely to drink (Blume & Guttu, 2015). While expectancy-motive relationship findings align with previous research using cross-sectional data, the relationship based on the panel model reveals a unique narrative on the stability of these factors. Given that change variance for was found for valuations, but not expectancies, beliefs about alcohol could be less susceptible to change. That is, the beliefs on alcohol fluctuate less regarding motivations to drink compared to the perception of alcohol use as a positive or negative effect. The current study is also the first to examine expectancies in relation to valuations using longitudinal data. More studies are needed to replicate these findings to better understand the relationship between expectancies and motives to use over time.

Expectancies

Mixed evidence in the relationship between anxiety sensitivity and expectancies were found between the panel and cross-sectional path models. For the panel model, anxiety sensitivity was negatively associated with changes in alcohol expectancies, which was opposite to the hypothesized direction. In the path model, anxiety sensitivity was positive associated with expectancies and valuations. The negative association is likely explained by a suppressor effects as discussed above. To date, previous research has not directly evaluated the relationship between anxiety sensitivity and alcohol expectancies. Baines and colleagues (2016) tested a model where both anxiety sensitivity and

expectancies were predictors of alcohol use, but they did not directly test the relationship between these predictors. Based on the self-medication hypothesis (Khantzian, 1997), it was anticipated that individuals with higher anxiety sensitivity may hold beliefs (i.e. expectancies) that using alcohol would help dampen the intensity of the anxious symptoms. The self-medication hypothesis was supported by data from the path model, but controlling for other alcohol and social factors in the panel model (i.e. including bi-directional effects) resulted in the unique variance in anxiety sensitivity to have a reverse effect.

One advantage to examining the relationships between alcohol risk factors using panel modeling was the ability to explore reciprocal relationships between predictors as well as and outcomes from a previous time point. From social-cognitive theory (Bandura, 1989), the notion of reciprocal determinism, which suggests that individual behavior can influence cognitions as well as be influenced by them is relevant in understanding the interplay between the present mechanisms. Therefore, it appears likely that individual changes in behavior outcome can also influence beliefs and motivations later on. For instance, distal alcohol expectancies and valuations were associated with positive changes in expectancies over time. Regarding some reciprocal relationships, alcohol use problems and anxiety interference (i.e. outcomes) were positively associated with changes in expectancies. Another reciprocal effect was that drinking motives was positively related to changes in valuations. The bi-directional findings provide evidence that the relationship between expectancies, motivations, and resulting negative consequences (i.e. anxiety and alcohol problems) are dynamically related. While speculative, findings from this study could be interpreted as expectancies and anxiety and

alcohol use problems function as mutually reinforcing along a vicious cycle of maladaptive responses to stressors. Another exploratory finding was that that peer resistance was negatively associated with changes in alcohol expectancies. While this relationship was not hypothesized in the study, this finding is supported by recent research (Janssen, Padovano, Merrill, & Jackson, 2018). In particular, in a sample of adolescents ages 11-16, greater alcohol expectancies were associated close friends and same age peer norms (Janssen et al., 2018). While there is some research examining the direct relationship between alcohol expectancies and peer norms together, there is scant research in adult populations. One such study examined the role of proximal peer norms and negative expectancies as independent predictors of alcohol use in college athletes, but did not evaluate the direct relationship between them (Lewis, et al., 2017). Therefore, additional research is needed to understand how externalizing behaviors or symptoms shape individuals alcohol-related beliefs towards future behavior as well as the intervening factors (e.g. peer norms) that influence those beliefs (e.g. alcohol expectancies).

Peer resistance

While there were no hypotheses predicting peer resistance, interesting exploratory findings were found. First, peer resistance was found to be positively associated with changes in more distal measure of peer resistance. Anxiety interference at time 2 was negatively associated with changes in peer resistance at time 3, which was an unexpected direction. With anxiety sensitivity as a predictor, higher anxiety sensitivity was associated with higher changes in peer resistance. While the relationship between anxiety sensitivity and peer resistance has not been examined in the literature, the direction of the

relationship in the current study is consistent with the social anxiety literature (Buckner & Shaw, 2015; Villarosa et al., 2014). Like socially anxious individuals, it appears that individuals with higher anxiety sensitivity are likely to conform to social norms or expectations.

Mediation models

Based on a model proposed by Ham and Hope (2005), it was hypothesized that the relationship between anxiety sensitivity and anxiety and alcohol use problems would be mediated through peer resistance, expectancies, valuations, and drinking motives. However, this hypothesis was not supported when controlling for the effects of negative affect. Exploratory results when controlling for negative affect were found. Negative affect and alcohol use problems were mediated via expectancies and drinking motives. These findings are generally consistent with the self-medication hypothesis that individuals hold beliefs that using alcohol helps to reduce the intensity of negative mood states (Khantzian, 1997). Despite researchers suggesting that individuals with higher anxiety sensitivity are more likely to drink to cope with negative affect (Booth & Hasking, 2009; Stewart et al., 2001; McCaul, Hutton, Stephens, Xu, & Wand, 2017), the mechanism that links them has infrequently been tested. Only one study found evidence for anxiety sensitivity and alcohol use problems via alcohol expectancies, but researchers did not control for negative affect (Baines et al., 2016; O'Conner, Farrow, & Craig, 2008). After controlling for common variance in negative affect in the current study, unique variance in anxiety sensitivity does not appear to significantly contribute to alcohol use problems through expectancies, valuations, peer resistance, or drinking motives. After removing negative affect from the mediation model of the current study,

there appears to be evidence of independent pathways anxiety sensitivity is associated with alcohol use problems. One pathway independent pathway is through expectancies and another pathway is through drinking motives. A third pathway (combined) in the relationship between anxiety sensitivity and alcohol use problems is through serial mediators such as alcohol expectancies and drinking motives.

The indirect effect of anxiety sensitivity on alcohol use problems findings via expectancies has implications for research with similar aims. While evidence for the indirect effect of anxiety sensitivity on alcohol use problems was found via expectancies, other recent research has not found this (Baines et al., 2016). Differences between the current study and other research likely are influenced by differences in statistical modeling approaches. The current study utilized structural equation methodology, which simultaneously controls for the effects of competing variables, while other results have been guided using univariate regression modeling (Ham & Hope, 2005, Ham et al., 2015; O'Conner, Farrow, & Craig, 2008). Therefore, when controlling for the effects of negative affect in the present study, anxiety sensitivity was not indirectly related to anxiety and alcohol use problems via alcohol-specific risk factors. Univariate-based findings from other researchers could result in higher bias by promoting distinct effects that may not actually be present because these effects are often tested in piecemeal.

The current study both replicated and expanded a model proposed by Ham and Hope (2005). The results are similar to Ham and Hope (2005) such that an NAS risk factor (e.g., anxiety sensitivity) was associated with alcohol use problems through the indirect effect of expectancies. Similar to Ham and Hope, the relationships were observed when not controlling for the effects of negative affect. The current study also expands the

model proposed by Ham and Hope (2005) by revealing evidence that anxiety sensitivity as another NAS risk factor that contributes to and is also mediated by alcohol expectancies. Since Ham and Hope (2005) first proposed their model, the literature has expanded to show the importance of drinking motives as a more proximal factor towards alcohol use problems (Mackinnon et al., 2014). Therefore, the current study strengthens the Ham and Hope's (2005) model by examining these relationships in a multivariate framework and providing support for expectancies and motives as serial mediators.

Limitations

Specific aims for the present study were limited by sample size, especially at more distal time points. While attrition was expected to be close to 30%, the actual attrition rate observed was considerably higher (approximately 80% at time 4). The reason for higher attritions rate is not clear, but the study methodology could have unintentionally contributed to poor participant retention. For instance, emailing was used to send invitations to participants and some of these invitations were caught in recipient spam filters. Another possible reason for earlier attrition was having too few reminder messages for upcoming and ending participation opportunities. Although this limitation was remedied mid-way into the study after IRB revisions, the effect of more reminders seemed to improve retention minimally. Due to sample size limitations, change variance was not modeled out to the fourth wave of data. As a result, temporal precedence for the proposed serial mediation model could not be established.

As part of inclusion criteria in the study, drinking behaviors were screened and individuals were included if they endorsed at least one binge-drinking episode in the past year. While this inclusion criterion help to optimize observation of alcohol effects in a

short period of collecting data, this criterion is also a limitation as well. For example, asking about drinking behavior prior to the presence of a stressor directly challenges the aim of establishing NAS cognitive vulnerability as a risk factor for developing alcohol-related problems. Conisidering the limitations above, the relationship between a NAS risk factor and alcohol-related problems could be bi-directional as well, especially during the maintenance stage of alcohol problems.

In the present study, a convenience sample of college students was utilized from three academic semesters, reflecting both the Fall and Spring. These groups of students could represent two diverse groups with regard to adjustment. For example, it is more likely that Fall students are in early transition from high school to college life where the initial transition period results in higher stress. Spring semester students may be better adjusted. Despite these possible differences, the present study did not examine potential differences in adjustment by semester due to sample size issues. Additionally, attrition for the present study was extremely high (e.g. 50% decrease after every time point) despite attempts to improve retention (e.g. increase in mobile and email reminders, offering increases and variability in compensation, etc.). While maximum likelihood estimation is suited for dealing with missing data, the amount of score estimation bias could be considerable at later time points relative to time 1. Aside from statistical limitations, individuals who chose to remain in the study could represent a higher functioning population of students which would limit the generalizability of the present results.

Results from the present study did not find strong evidence that resistance to peer influence was a predictor of drinking or anxiety problems, which could be a limitation of measurement. Resistance to peer influence was only related to alcohol and anxiety related

problems after controlling for other factors. The differences between the results from the present study and what previous research has found might be due to what components of peer norms are being represented in the research and sample selection bias. For example, peer norms are a multidimensional construct represented by peer involvement, misconduct (i.e. substance misuse), peer conformity, school involvement, and family involvement (Studer et al., 2014). Some researchers showing the effect between peer influence and drinking behaviors have measured peer norms as misconduct specific to substance use or peer pressure specific to substance use (Hustad et al., 2014). However, the present study examined the conformity dimension of peer norms that was not specific to drinking. According to Studer and colleagues (2014), the effect of peer influence on increased drinking is both a direct (i.e. explicit invitations to drink) and implicit process (i.e. internalization of alcohol-related cognitions). Additionally, the RPIS (Steignburg & Monahan, 2007) did not yield adequate reliability in the present sample despite the good internal consistency and validity that has been reported in other college samples (Cho & Chung, 2012; Villarosa et al., 2016). Therefore, role of poor reliability and possibly lack of validity is not clear in explaining the lack of strong effects for peer resistance.

Less change variance was observed between time 1 and time 2 variables compared to time points that were more distal. On one hand, the limited change variance might suggest that anxiety and alcohol-related risk factors are more stable than expected. On the other hand, three times points with 4 week intervals may not be a sufficient sample of time to observe how changes in NAS risk factors contributes to changes in anxiety and alcohol use problems. In other words, following individuals longitudinally longer than a 16-week semester could help us to understand how the factors in the present

study contribute to poorer outcomes over time. Future research should examine these anxiety and alcohol-related risk factors over a longer period of time and increase the interval between time points to fully understand the stability of these factors. While a discussion of factor stability (e.g. state versus trait of anxiety control, anxiety sensitivity, etc.) is beyond the scope of this paper, the stability of these factors is less relevant in clinical practice. For instance, a persistent presentation of anxiety (e.g. generalized anxiety) or alcohol phenomenon (e.g. chronic alcohol use problems) is often successfully treated through reduction of maintaining behaviors (i.e. avoidance) in the present moment. Overall, the change variance that was observed across time could be attributed to the increase in academic stressors (i.e. studying, exams, term paper, finals, etc.).

The homogeneity of the sample across a number of demographic characteristics certainly limits the generalizability of the present findings. All of the participants in the study were college students, most identified as heterosexual, and White. Additional research is needed to examine how these findings generalize as alcohol-related problems vary by ethnic group. Therefore, it remains unclear how the results of the present study generalize to more diverse populations including those from more working class backgrounds.

Future Directions

Future research in encouraged to explore relationships limited by methodological limitations in the present study and to answer new questions resulting from this study. At the onset of this study, four waves of data were planned for data collection to examine how multiple factors change along with anxiety and alcohol use problems. While results from this methodological approach could have yielded strong evidence for temporal

precedence between variables, high attrition did not allow for reliable examination of effects at the fourth wave. Future research with sufficient sample sizes through four waves should examine how anxiety sensitivity together with peer resistance, expectancies, valuations, and motives contributes to change in anxiety and alcohol use problems. A four-wave data design would help understand how anxiety sensitivity and alcohol use problems are temporally related via expectancies and drinking motives. Additionally, the panel modeling approach allowed for the exploration of bi-directional relationships between other predictors and outcomes. While some research argues that motives are a more proximal predictor of alcohol use compared to other factors (Collins et al., 2018), other research suggests that motives might precede expectancies (Anthenien, Lembo, & Neighbors, 2017). In fact, Anthenien and colleagues (2017) found a positive indirect effect of enhancement motives on quantity of drinking through expectancies. Therefore, it is recommended that future research explore the temporal precedence of motivations to drink as well as examining the reciprocal effects.

Other factors could have been explored as a as a pathway leading to anxiety and alcohol use problems. While the complexity of adding other NAS factors in the present study was a limitation, future research should examine the contribution of other factors such as distress tolerance, anxiety control, or even intolerance of uncertainty. Intolerance of uncertainty is another cognitive-affective mechanism that has been implicated as a cross-cutting mechanism for various anxiety pathology (Laposa, Collimore, Hawley, & Rector, 2015) and should be examined as another possible vulnerability to toward developing alcohol use problems. Another avenue for future research is to examine distress tolerance as a broader level risk factor compared to anxiety sensitivity or

intolerance of uncertainty. Some research has shown that distress tolerance no longer becomes significant in predicting anxiety problems after controlling for other factors (Laposa et al., 2015). Therefore, what is needed is more research exploring both the hierarchical and possibly unique effects of these NAS risk factors on anxiety and alcohol use problems.

Clinical Implications

Findings from the present study may help inform clinical interventions aimed at reducing problematic alcohol use, particularly on college campuses. Results from this study revealed that alcohol use and anxiety severity and interference problems (i.e. OASIS) increased over time compared to the start of the academic semester. To reduce this problem, interventions aimed at teaching coping with anxiety for some students would likely result in better anxiety and alcohol outcomes. In the context of a stressor (i.e. following or in preparation for a stressor), students who are struggling managing their anxiety from these stressors could benefit from brief cognitive-behavioral or acceptance-focused interventions that result in more balanced thinking about a stressor. A brief psychotherapy intervention may help reduce the risk for some students to engage in drinking or other maladaptive coping behaviors to cope with stress. Primary care settings appear to be developing models for implementing brief and targeted interventions that address milder forms of anxiety and substance use problems (Fellman, Athenour, &Stewart, 2013). These interventions could also incorporate the role of having positive social influences to reduce the risk of engaging in maladaptive drinking behaviors.

For alcohol harm reduction interventions where control over anxiety is not a contributing factor, interventions aimed at the function of an individual's alcohol use

through the lens of expectations and motivations for drinking may help provide insight in reducing use. For example, an individual might have coping expectancies that using alcohol would be effective for coping and therefore having stronger motivations to drink toward maladaptive levels. As an initial intervention, motivational interviewing techniques could help highlight the discrepancy between initial alcohol expectations and actual negative outcomes associated with maladaptive alcohol use.

Conclusions

Although some research has examined the relationship between anxiety sensitivity and alcohol use problems, the cognitive-affective mechanisms that link them have not been examined longitudinally. One broad goal of this study was to extend cross-sectional model proposed by Ham and Hope (2005) by examining how an NAS risk factor along with other alcohol-specific risk factors contribute to changes in anxiety and alcohol use problems across time. Similar to Ham and Hope (2005), alcohol expectancies, an NAS risk factor (i.e. anxiety sensitivity), but not valuations contributed to changes in alcohol use problems over time. Except for anxiety sensitivity, none of the other risk factors (i.e. peer resistance, expectancies, valuations, and drinking motives) contributed to changes in anxiety severity and interference over time. Resistance to peer influence and anxiety sensitivity were negatively associated with drinking motives over time. Also, anxiety sensitivity was negative associated with changes in expectancies and valuations and positively associated with changes in peer resistance. From meditational models, the hypothesized indirect effects between anxiety sensitivity and anxiety and alcohol use problems via alcohol risk factors were not found when controlling for the effect of negative affect. Consistent with Ham in Hope (2005), an NAS risk factor (i.e.

anxiety sensitivity) was indirectly related to alcohol use problems through expectancies and valuations when removing negative affect from the model. Moreover, the proposed model was expanded with the finding that relations between anxiety sensitivity and alcohol use problems were serially mediated through: (a) expectancies and drinking motives and (b) valuations and drinking motives. These meditational findings provide evidence that drinking to cope motives is a proximal mechanism compared to other factors (i.e. expectancies and valuations) in linking the relationship between anxiety sensitivity and alcohol use problems. Despite not finding strong evidence for peer resistance as a risk factor, anxiety sensitivity, alcohol expectancies, valuations, and motives for drinking are all implicated for higher risk of alcohol use problems. Taken together, results highlight the importance of targeting specific cognitive-mechanisms among early college students to reduce the risk of alcohol use problems.

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APPENDIX A:

Demographics

1. What is your age? _____ (1=16, 2=17, 3=18, ...)

2. What is your sex/gender? (1= Male/Man, 2=Female/Woman, 3=Transgender M-F, 4=Transgender F-M)

3. Which of the following categories best reflects your ethnic/racial identity? (check only one) (1=African American, 2=Caucasian: Non-Hispanic, 3=Native American, 4=Asian/Pacific Island, 5=Hispanic, 6=Other)

4. What is the highest level of education you have completed? (1=Less than high school graduate, 2=High school graduate, 3=Some college, 4=Graduated college, 5=Some graduate or professional school, 6=Finished graduate or professional school)

5. What is your religious background? (1=Catholic, 2=Protestant, 3=Jewish, 4=Hindu, 5=Buddhist, 6=Muslim, 7=Mormon, 8=Jehovah's Witness, 9=Other, 10=Agnostic, 11=Atheist, 12=I believe in God, but I do not have a particular faith.)

6. What is your religious background? Please specify _____

7. What is your current work status? (Check one) (1=Employed full time, 2=Employed part time, 3=Student)

8. What is your occupation? _____

9. What is your political affiliation? (1=Democrat, 2=Republican, 3=No affiliation, 4=Other)

10. Please indicate your sexual orientation. (1=Bisexual, 2=Gay/lesbian, 3=Heterosexual, 4=Other)

11. Please indicate your socio-economic status. (1=Upper class, 2=Middle class, 3=Working class, 4=Lower class)

12. What is the highest education level your mother has completed? (1=Less than high school graduate, 2=High school graduate, 3=Some college, 4=Graduated college, 5=Some graduate or professional school, 6=Finished graduate or professional school)

13. What is the highest education level your father has completed? (1=Less than high school graduate, 2=High school graduate, 3=Some college, 4=Graduated college,

5=Some graduate or professional school, 6=Finished graduate or professional school)

14. What is your major(s)? _____

15. What is your minor(s)? _____

16. What is your year in school? (2=Freshman, 3=Sophomore, 4=Junior, 5=Senior, 6=Senior+, 7=Graduate Student)

17. Are you single? (1=Yes, 2=No)

18. Are you in a (self-defined) committed, dating relationship? (1=Yes, 2=No)

19. Are you living with your partner? (1=Yes, 2=No)

20. Are you engaged or married to your partner? (1=No, 2=Engaged, 3=Married)

APPENDIX B:
Informed Consent Form

University of Nebraska Lincoln

IRB# 20170116597EP
Date Approved: 03/22/2017
Valid Until: 01/03/2018

DEPARTMENT OF PSYCHOLOGY

Updated Consent Form

As we were reviewing our procedures, we realized that we did not have good plan in place to connect your responses across time, and we didn't clearly explain how we would do that. The Institutional Review Board has asked us to update the informed consent form. The form below is exactly the same as the one you signed previously except the portions that appear below in red which are:

> We are going to ask you to create a code that you can remember (certain letters of your name and parts of your phone number) to help us connect your responses when you fill out the survey at different time points. When you complete participation, this information will be converted to a randomly selected participant number that cannot be linked to you in any way.

Please be assured that your privacy has been and will be protected. If you have any questions, please contact the IRB or the researchers. Contact information is at the end of this document.

Informed Consent for Research Participation

Title: Adjusting to College Life (ACL)

Summary: The entire consent form below contains details of participating in the study.

- This research is aimed at how individuals psychologically adjust to college stressors.
- You will complete several questionnaires with the opportunity to participate up to fours times.
- Compensation: 1st time = course credit, chance to win gift cards at times 2-4, and participating at all four times qualifies you for a $100 Grand prize gift card.
- There are no unforeseen risks and participation is voluntary.

Purpose:

This research project is aimed at examining how individuals psychologically adjust to college stressors, which may impact their academic functioning and ways in which they cope with stress. You have been selected based on your responses to the mass screening questionnaire.

Procedures:

You will be asked to complete several online self-report questionnaires including mood, coping with stress, experiences with drinking alcohol, and demographic information (i.e., age, gender). There will be an opportunity to participate up to four times with approximately four weeks in between. Each time will take approximately 50-60 min to complete.

Benefits:
There are no direct benefits to you except to the extent you may learn about the conduct of psychological research in conjunction with your psychology coursework. Although not a direct benefit to you, the knowledge gained from this research is expected to inform prevention efforts designed to reduce the risk of developing adjustment-related problems among college students. The benefits associated with this study are outweighed by the potential risks of the study.

Risks and/or Discomfort:
Answering questions about stress and alcohol use might be distressing. If this study evokes negative feelings greater than you expect, we have provided contact information to the following institutions for counseling or psychological treatment:

UNL Psychological Consultation Center
(402) 472-2351
Psychological treatment available on a sliding fee scale

University of Nebraska Counseling and Psychological Services
(402) 472-7450

You may refuse to participate or withdraw at any time without harming your relationship with the researchers or the University of Nebraska- Lincoln, or in any other way receive a penalty or loss of benefits to which you are otherwise entitled.

Confidentiality:
All information you provide in the survey will be kept confidential. In other words, your name and other contact information will be separated from the information that you will provide us. Your name and contact information will be kept in a separate database, and will only be used to award course credits. All other information you provide us will be kept anonymous. All data will be stored on a password-protected computer in a locked office that may only be accessed by researchers. Data may be kept until seven years and then deleted. All collected information will be grouped with all other participants and averages of group responses will be disseminated in publications to professional journals, presentations at professional meetings, or in grant preparations. Furthermore, your name will not be used in any report or in any publication we make about this study. We are going to ask you to create a code that you can remember (certain letters of your name and parts of your phone number) to help us connect your responses when you fill out the survey at different time points. When you complete participation, this information will be converted to a randomly selected participant number that cannot be linked to you in any way.

Compensation:
A combination of course credit and lottery for Amazon gift cards will be used for compensation. Two course credits in SONA will be awarded the first time, 135 $5 gift cards for the second time, 20 $10 gift cards at the third time, and 10 $20 gift cards at the last time in the form of an Amazon gift card. Participants completing all four time points will be eligible for a drawing to win a grand prize of $100 gift card. The odds of earning any amount of compensation at time points 2-4 will be no higher than the following: time 2 = 135/200; time 3 = 10/100; time 4 = 5/100; grand prize = 1/200.

Opportunity to Ask Questions:

The primary researchers conducting this study are Vincenzo Roma, M.A. and Debra Hope, Ph.D. You may contact Vincenzo Roma (vincenzo.g.roma@gmail.com, 338 Burnett Hall) or Dr. Debra Hope (dhope@unl.edu, 402-472-3196, 322 Burnett Hall) with any questions you have. If you have questions about your rights as a research participant that have not been answered by the researcher, or if you have concerns regarding the study and would like to talk to someone other than the researcher(s), contact the University of Nebraska-Lincoln Institutional Review Board; (402) 472-6965.

Consent, Right to Receive a Copy:

You are voluntarily making a decision whether or not to participate in this research study. Clicking below certifies that you have decided to participate having read and understood the information presented. If you would like a hard copy of the consent form please contact Vincenzo Roma (vincenzo.g.roma@gmail.com, 338 Burnett Hall).

There will be two links to click at the bottom of screen to proceed. One will say "I give my consent and wish to continue in the study" The other will say "I do not wish to continue in the study. Please delete any data I have already provided"

APPENDIX C:

University of Nebraska – Lincoln Institutional Review Board Approval

University of Nebraska Lincoln

Official Approval Letter for IRB project #16597 - New Project Form

January 4, 2017

Vincenzo Roma
Department of Psychology
273 Parkside Ln Lincoln, NE 68521-2742

Debra Hope
Department of Psychology
318 BURN, UNL, 68588-0308

IRB Number: 20170116597EP
Project ID: 16597
Project Title: Adjusting to College Life

Dear Vincenzo:

This letter is to officially notify you of the approval of your project by the Institutional Review Board (IRB) for the Protection of Human Subjects. It is the Board's opinion that you have provided adequate safeguards for the rights and welfare of the participants in this study based on the information provided. Your proposal is in compliance with this institution's Federal Wide Assurance 00002258 and the DHHS Regulations for the Protection of Human Subjects (45 CFR 46).

You are authorized to implement this study as of the Date of Final Approval: 01/04/2017. This approval is Valid Until: 01/03/2018.

o Review conducted using expedited review category 7 at 45 CFR 46.110
o Date of Approval: 1/4/2017
o Date of Expedited review: 12/20/2016
o Date of Acceptance of Revisions: 1/4/2017
o Funding: Internal funding
o Consent waiver: Waiver of parental consent for participants age 18 at 45 CFR 46.116(d)(1-4) and waiver of consent documentation at 45 CFR 46.117(c)(2)
o Review of specific regulatory criteria (contingent on funding source): N/A
o Subpart B, C or D review: Subpart D at 45 CFR 46.404 (Research with children no greater than minimal risk)

We wish to remind you that the principal investigator is responsible for reporting to this Board any of the following events within 48 hours of the event:
* Any serious event (including on-site and off-site adverse events, injuries, side effects, deaths, or other problems) which in the opinion of the local investigator was unanticipated, involved risk to subjects or others, and was possibly related to the research procedures;
* Any serious accidental or unintentional change to the IRB-approved protocol that involves risk or has the potential to recur;
* Any publication in the literature, safety monitoring report, interim result or other finding that indicates an unexpected change to the risk/benefit ratio of the research;
* Any breach in confidentiality or compromise in data privacy related to the subject or others; or
* Any complaint of a subject that indicates an unanticipated risk or that cannot be resolved by the research staff.

For projects which continue beyond one year from the starting date, the IRB will request continuing review and update of the research project. Your study will be due for continuing review as indicated above. The investigator must also advise the Board when this study is finished or discontinued by completing the enclosed Protocol Final Report form and returning it to the Institutional Review Board.

If you have any questions, please contact the IRB office at 402-472-6965.

Sincerely,

Rachel Wenzl, CIP
for the IRB

Full Accreditation