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INDIVIDUAL DIFFERENCES AND ALCOHOL CONSEQUENCES

THE ROLE OF INDIVIDUAL DIFFERENCE FACTORS IN PREDICTING
ALCOHOL-RELATED CONSEQUENCES IN COLLEGE STUDENTS

by

Ashley A. Dennhardt

A Thesis

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Abstract

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Although alcohol-related consequences are high in college students, there is significant variability in the number experienced, even among students who drink heavily. Caucasian students drink more and experience more alcohol-related problems than African American students, but little research has investigated the potentially unique predictors of problems among these students. Depression, Distress Tolerance and Delay Discounting may be predictors of alcohol problem severity. We examined the relationship between these variables and alcohol-related problems among Caucasians and African American students using multivariate models. For Caucasian students, depression was associated with alcohol problems. For African American students, depression, distress tolerance, and delay discounting were associated with alcohol problems; and Distress Tolerance mediated the relationship between depression and problems. These results suggest that for African American students, the inability to tolerate negative emotions and to organize their behavior around future outcomes may be especially relevant risk factors for alcohol-related consequences.

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Introduction

Heavy drinking among college students has been recognized as a major public health concern for over a decade and recent nationwide surveys indicate little improvement (Hingson, Zha, Weitzman, 2009). Although relatively few college students show patterns of daily heavy drinking characteristic of alcohol dependence, college students often drink large quantities of alcohol over relatively brief time periods, which can result in dangerously high blood alcohol concentrations (Fournier, Ehrhart, Glindemann, & Geller, 2004). An estimated 44.7% of all college students report one or more heavy drinking episode (4 or more drinks for women, 5 or more for men) in the past month and research suggests that many students drink far beyond this 4 or 5-drink threshold (Hingson et al., 2009; White, Kraus, & Swartzwelder, 2006). A recent study of first-year students found that roughly 20% of men and 10% of women drank at twice the binge threshold (10+ drinks and 8+ drinks respectively) at least once in the past two weeks (White et al., 2006). This pattern of heavy drinking puts students at risk for a number of alcohol-related consequences (Hingson et al., 2009).

Results from the College Alcohol study, an ongoing survey of over 15,000 students at 140 U.S. colleges, also indicate that drinking at the binge level and beyond has a significant impact on college students' academic performance, social relationships, and health (Wechsler & Nelson, 2008). Students who drink at this level miss more classes and achieve lower grade point averages (Wechsler, Lee, Kuo, & Lee, 2000). Heavy drinking also increases risk-taking behaviors in college students. An estimated 1,825 college students die each year from alcohol-related injuries (Hingson et al, 2009). The majority of these deaths are related to driving after consuming alcohol. Nearly 13%

of college students report driving after drinking 5 or more drinks (Wechsler, Lee, Nelson & Lee, 2003). Heavy drinking is also related to risky sexual behavior, including inconsistent condom use (Graves, 1995), and sexual violence. Nearly three quarters (72%) of rape victims are intoxicated at the time of the rape (Mohler-Kuo, Dowdall, Koss, & Wechsler, 2004). Many students experience multiple negative consequences as result of their drinking; those who drink at the binge level or beyond three or more times in a 2-week period report experiencing five or more alcohol-related problems (Wechsler et al., 2000). Thus, although drinking in college has long been considered a normative rite of passage, research over the past 20 years clearly indicates that it results in significant academic, health and social consequences and is likely the most substantial public health issue facing colleges and universities.

Factors that Contribute to College Drinking

There has been a lot of research examining the possible causes for the high rates of heavy drinking among college students (Borsari, Murphy, & Barnett, 2007; Ham & Hope, 2003). Social and contextual factors related to the college environment are widely recognized as significant contributors. Alcohol is often readily available on college campuses. Research has shown that the number of alcohol outlets in close proximity to campus is strongly associated with college-drinking outcomes (Kypri, Bell, Hay & Baxter, 2008; Scribner et al., 2008). Another factor that contributes to the accessibility of alcohol on college campuses is the low cost of drinking. Many college bars offer deeply discounted drink special such as \$1 pitchers of beer or all-you-can-drink specials. A sizable body of research demonstrates that higher alcoholic drink prices are associated with lower levels of alcohol consumption and alcohol-related problems and students are

more likely to drink heavily at lower prices (Chaloupka, Grossman, & Saffer, 1998; Murphy & MacKillop, 2006). Additionally, the college environment may protect students from legal and driving-related consequences that might otherwise curb excessive drinking (Barnett et al., 2003).

There are also many social benefits associated with drinking for college students that may influence alcohol consumption. Students report that drinking allows them to feel close to their peers, enhances socializing and increases the amount of fun they experience (Park, 2004). Conversely, when students make drinking reductions, they report less socialization and a lower level of enjoyment (Murphy, Correia, Colby & Vuchinich, 2005). Given these reported benefits of drinking, it is not surprising that many college students drink frequently.

Social norms theory has also received a lot of attention in the college drinking literature. Social norms theory posits that people's behavior is influenced by their perception of how other members of their social group behave. Despite the fact that the majority of college students are light drinkers or abstainers, students tend to think of heavy drinking as normative, and this erroneous perception is associated with higher levels of consumption (Lewis & Neighbors, 2004; Neighbors, Dillard, Lewis, Bergstrom, & Neil, 2006). Perceived descriptive drinking norms refer to the perceived prevalence of drinking by the typical college student. Students who report higher perceived descriptive norms for alcohol use among their peers also report heavier drinking themselves (Neighbors et al., 2006). Perceived injunctive norms refer to the perception of how much others approve of a particular behavior and have also been found to be related to heavy drinking in college students. Heavy-drinking students tend to perceive the attitudes of

their peers to be more lenient and positive about drinking than those who are not heavy drinkers (Perkins & Berkowitz, 1986). Additionally, studies have found that when college students are asked to compare their drinking behavior to that of other college students, they consistently estimate that other students drink more than them (Baer & Carney, 1993). This often leads students to consider their consumption as below average and therefore not problematic. Although there has been substantive research investigating what predicts drinking in college students, there has been considerably less work examining what contributes to alcohol-related problems in college students who drink.

Risk Factors for Alcohol-related Consequences

Although levels of heavy drinking and alcohol-related consequences are high in college students, there is significant variability in the number and type of consequences experienced, even among students who drink heavily (Gruenewald, Johnson, Light, Lipton, & Saltz, 2003). Although consumption level is an obvious and consistent predictor of the occurrence of alcohol-related problems, there is substantial variability in levels of alcohol problems that is not explained by consumption levels (Borsari et al., 2001; White & Labouvie, 1989). Some heavy drinkers report low levels of alcohol-related problems, while some relatively light or moderate drinkers experience high levels of alcohol-related problems (White & Labouvie, 1989). In a study conducted by Borsari and colleagues (2001), the number of drinks consumed per week accounted for only 31% of the variance when statistically predicting alcohol-related consequences. Further, the authors found that frequency of binge drinking and peak blood alcohol levels did not contribute any explanation when added to the model that already included number of drinks per week. It is evident that the presence of heavy drinking and indices of

consumption are not able to completely explain the presence or absence of alcohol-related consequences. Similarly, variables such as normative perceptions of use, which predict consumption levels, may not predict alcohol problems (Benton et al., 2006; Clapp & McDonnell, 2000; Wood, Read, Palfai, & Stevenson, 2001). It is clear that more research is necessary to identify risk factors for experiencing alcohol-related consequences.

Research is also needed to identify predictors of chronic alcohol problems that persist in the year following college graduation. Despite the high prevalence of heavy drinking in college students, many students will decrease their consumption in the years following college graduation. This phenomenon is referred to as “maturing out” and is thought to be associated with the natural assumption of adult roles (e.g., spouse and parent) and a more conventional lifestyle (e.g., a full time job) after college (Bachman et al., 2002). However, not all students successfully make this transition. Of the more than 40% of college drinkers that are classified as risky drinkers, roughly 20% of these students will continue this behavior into adulthood (Campbell & Demb, 2008). A recent study found that college students who are more likely to continue a pattern of heavy drinking post-college drink more frequently, drink greater quantities of alcohol, binge drink more often, black out more often, are more likely to have peers that drink and use drugs, and are more likely to use drugs other than alcohol themselves during college (Campbell & Demb, 2008). Other studies have found that individuals who said they drank to feel self confident or to deal with personal problems were more likely to be adult persistent high risk drinkers (Campbell & Demb, 2008; Vik, Cellucci, & Ivers, 2003). It is also possible that risk for an escalating pattern of drinking and consequences following

graduation might be more heavily influenced by individual difference factors than by the contextual and social factors that influence drinking levels among college students.

Another overlooked area of study involves the different types and differing level of severity of alcohol-related consequences in college students. Most studies examine only general levels of consequences and ignore important potential differences in types of consequences. Alcohol-related consequences is a term used to describe a range of behaviors and perceptions, and includes different types of consequences from negative outcomes (e.g., got into trouble at work or school, did poorly on a test), to risky behaviors (e.g., driving after drinking), to dependence symptoms (e.g., drinking more than had planned, finding it hard to limit drinking). In one study, experiencing blackouts (not being able to remember a period of time while drinking) was an early indicator of poor academic performance later on in the semester, whereas experiencing consequences that indicated impaired control or dependence symptoms was predictive of continued risky drinking at the end of the semester, which suggest that the types of consequences students experience may have unique correlates and implications (Read, Merrill, Kahler, & Strong, 2007). Dependence symptoms may be especially important predictors of long-term drinking trajectories. Simons, Carey, and Wills (2009) showed that whereas poor behavioral control had an effect on alcohol abuse and not dependence, affective lability, which refers to the frequency, speed and range of changes in affective states, had a direct effect on dependence symptoms and not abuse. This suggests that the presence of certain alcohol-related consequences may help identify those students who are more at risk for long-term alcohol problems versus those who will “mature out” of heavy drinking.

Surprisingly, little research has looked at what might be predictive of certain types of alcohol-related consequences. Students often experience consequences in a number of areas such as in their social relationships, related to their academic performance, or propensity to engage in risk taking behaviors. Many studies utilize only global measures of alcohol problems and for that reason, identifying risk factors for specific problem domains is an area that is relatively unexplored.

Overall, current research does not adequately address the issues of who will experience consequences, what type of consequences will they experience, and who will continue a pattern of risky drinking after college. There have been several factors that have been implicated in adult substance use. Although little research have looked that these in college students, they may prove useful in identifying heavy-drinking students who experience greater levels of problems and possibly serve as an indicator of a more severe trajectory.

Predictors of Alcohol-Related Problem Severity

As previously mentioned, research suggests that consumption alone cannot explain the degree of alcohol-related problem severity. Delay discounting, distress tolerance, and negative affect/depression have all been implicated as playing a role in adult substance abuse and may be important predictors of alcohol problem severity among college students.

Delay discounting. Delay discounting refers to the decrease in the subjective value of a reinforcer as a function of the time until it is delivered and provides a behavioral economic index of impulsivity (Ainslie, 1975). All things being equal, individuals will prefer larger rewards over smaller rewards. However, if the receipt of the

larger reward is shifted into the future, while the smaller rewards remains immediate, individuals will often switch preference and select a smaller immediate reward over a larger delayed reward. For example, when given a choice between receiving \$50 immediately and \$1,000 in 2 months, almost everyone would choose to wait and receive the \$1,000 in 2 months. However, if the choice is altered and now the person must decided between \$500 now and \$1,000 in 2 months, some individuals may elect to receive the smaller amount (\$500) immediately, rather than wait for the larger reward of \$1,000 (Petry, 2001). This can also be illustrated by the college student who initially plans not to drink the night before an exam, but ends up drinking anyway. When the student initially plans to go hang out with friends and not drink, he or she valued the arguably larger, more delayed reward of a good grade on the test the next day more than drinking. However, the preference reversal occurs when the student makes the decision to drink when he or she arrives at the party. Now, the immediate reward of drinking becomes valued over the larger delayed reward of doing well on the test. In this case and in many others, alcohol use provides an immediate source of reinforcement through a feeling of euphoria, stress reduction and often increased socialization with friends, while the consequences of the alcohol use are delayed. Additionally, many of the “rewards” that compete with drinking for college students are delayed such as vocational success and good health.

Delay discounting is commonly assessed using laboratory measures in which an individual is presented with a series of choices between smaller, sooner rewards and larger, later monetary rewards. Research using both real and hypothetical rewards has

also shown that people's discounting curves can be described by a hyperbolic function (e.g., Mazur, 1987):

$$V = A / (1 + kD),$$

In this function, V is the present value of the delayed reward, A is the amount of the reward, D is the length of the delay and k is a free parameter that determines the discount rate. The discounting parameter (k) is considered to be the index of impulsiveness (higher k value = more impulsive).

It is well established that behavioral impulsivity (i.e., delay discounting) plays a role in substance use and abuse. Numerous studies have looked at discounting rates in smokers, stimulant dependent individuals, opiate dependent individuals and problematic gamblers. Results consistently demonstrate that individuals with these addictive behaviors have higher rates of delay discounting than controls (Baker, Johnson, & Bickel, 2003; Dixon, Marley, & Jacobs, 2003; Heil, Johnson, Higgins, & Bickel, 2006; Madden, Petry, Badger, & Bickel, 1997). There have also been many studies that have examined the role of discounting in alcohol use. Research demonstrates that higher discounting rates are associated with higher rates of consumption and with alcohol-related problems. Kollins (2003) looked at discounting and substance abuse variables in college students and found that higher levels of discounting were significantly associated with younger age of first alcohol use and “passing out” from alcohol use. Vuchinich and Simpson (1998) also looked at discounting rates in college students and found that both heavy social drinkers and problem drinkers demonstrated greater discounting than light social drinkers. Similarly, Field, Christianson, Cole, and Goudie (2007) compared light drinking adolescents to heavy drinking adolescents and found that the heavy drinkers showed

higher discounting of delayed hypothetical monetary and alcohol rewards. Research also suggests that delay discounting may be associated with a more severe pattern of drinking. Tucker, Vuchinich, Black, and Rippens (2006) found that a measure of delay discounting was able to distinguish between those problem drinkers who quit and those who continued even after controlling for prerelation drinking and problems. Overall, high rates of delay discounting have been shown to be related to more problematic substance use and may be related to a number of alcohol-related consequences.

Distress tolerance. Recent studies suggest that distress tolerance is related to problematic substance use. Distress tolerance is an individual difference factor that refers to an individual's ability to experience and withstand negative psychological states (Simons & Gaher, 2005). Distress tolerance is considered to be related to one's emotional response to their own emotion and is referred to as a meta-emotion construct. Distress tolerance refers to how people think about their negative emotions and how they evaluate them in regard to (1) how tolerable and aversive they are, (2) how acceptable they are, (3) how attention commanding/disruptive they are, and (4) how likely they are to cause a person to take action to reduce or avoid feelings of upset related to negative emotions. Those low in distress tolerance are more likely to report distress as being unbearable and to feel ashamed about feeling distressed and that the feelings are unacceptable. These individuals also tend to feel as though they have inferior coping skills in comparison to others to deal with the distress. Individuals low in distress tolerance also tend to go to great lengths to put an end to the distress. If the individual is unsuccessful, he or she tends to feel overwhelmed or consumed by their emotions. This can get in the way of normal functioning during the periods in which the person feels distressed.

Distress tolerance is a higher-order factor that consists of several aspects of affect & behavior regulation. Gross (1998) identified five instances in which affect or behavior can be regulated. They are (1) selecting the situation, (2) modifying the situation, (3) allocating attention, (4) changing cognitions, or (5) modulating responses. With the first four instances, regulation occurs as an antecedent process and it is within these processes where differences in distress tolerance may manifest. This can occur through tendencies to avoid or change situations in which distressing emotions might occur or by how much a person allows their attention to be absorbed by the distressing emotions. In the fifth process, a person low in distress tolerance may try to modulate the distressing feelings by not expressing the feelings or using alcohol or drugs to reduce the feelings. Overall, a person's level of distress tolerance can have marked effects on the ways in which that person manages affect.

Distress tolerance is thought to play a role in substance use through coping methods. Using alcohol and other drugs to cope is considered to be an emotion-focused coping strategy. Alcohol or drug use can quickly alleviate distress when an individual is faced with a negative emotion and may be a common strategy in those with low levels of distress tolerance (Simons & Gaher, 2005). Studies show that between 10 and 25% of adults who drink alcohol do so at least partially as a method of coping with negative affect (Cooper, Russell, Skinner, Frone, & Mudar, 1992). Using alcohol as a method of alleviating negative emotions suggests a difficulty in tolerating negative emotions.

Despite the theory behind the connection between distress tolerance and substance use, there was very little research in the area until fairly recently. Research suggests that distress tolerance may play a role in precipitating relapse and predicting treatment

completion. A recent study compared smokers who had at least one successful quit (abstinent for 3 months or more) with smokers who had not been able to abstain for longer than 24 hours despite having tried to quit (Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005). Brown and Colleagues (2005) found that those who relapsed within 24 hours also gave up sooner on stressful math tasks, which in this study were conceptualized as measures of distress tolerance. Daughters, Lejuez, Kahler, Strong and Brown (2005) examined abstinence success and distress tolerance in an inner-city residential treatment center and found that longer periods of abstinence duration were related to higher levels of distress tolerance when controlling for amount of previous substance use level and level of negative affect. Thus, it appears that substance users that have higher levels of distress tolerance may be able to quit more easily than those who have lower levels of distress tolerance.

There has been minimal research to date looking at the role of distress tolerance in college student heavy drinking; however, the existing research points to distress tolerance as a relevant construct in this phenomenon. In a study examining the relationship between depression and substance use in college students, Buckner, Keough, and Schmidt (2007) found that distress tolerance mediated the relationships between depression and alcohol and marijuana problems. In other words, those who had higher levels of depression also had higher level of problems related to their drinking and marijuana use; however, this relationship is explained by the level of distress tolerance. Those who had lower levels of distress tolerance experienced more alcohol and marijuana related problems than those with higher distress tolerance. Another recent study on motives to using marijuana in college students found that lower levels of distress tolerance were related to coping

motives of using marijuana (Zvolensky et al, 2009). In other words, students who have lower distress tolerance are more likely to use marijuana to cope with their negative affect. Overall, those who are unable to tolerate negative affect seem to be more likely to use substances to cope and also experience more substance-related problems than those who have higher distress tolerance.

Negative affect/depression. Extensive research has established that in general adult samples, there is a positive association between alcohol consumption and depression (Alati et al., 2005; Rodgers et al, 2000). A recent meta-analysis of 74 studies found that 60.5% of individuals exhibiting above-average levels of depressive symptoms also have above-average levels of alcohol use and impairment whereas only 39.5% of individuals with below average levels of depressive symptoms exhibit that pattern (Connor, Piquart, & Gamble, 2009). The meta-analysis also revealed that the association between depression and alcohol-related impairment was slightly stronger than that of depression with alcohol consumption or frequency of consumption although this difference was not statistically significant (Connor et al., 2009). There is also some evidence that a history of a depressive disorder may confer risk for later alcohol abuse. Dixit and Crum (2000) estimated that the of the risk for heavy drinking in women with a history of depressive disorder was 2.60 times greater than the risk in women with no history of depressive disorder. Depression also appears to play a role in treatment outcomes. Greenfield and colleagues (1998) found that individuals diagnosed with both depression and alcohol dependence exhibit greater relapse to drinking rates than those with alcohol-dependence alone. Another recent study revealed that adolescents with

comorbid depression and alcohol or substance dependence have been shown to relapse earlier than those who do not have a substance use disorder (Cornelius et al., 2004).

The association between depressive symptoms and alcohol consumption in college students is less clear. Many studies have failed to find significant correlations between alcohol use and depressive symptoms or related constructs like negative affect (Nagoshi, 1999; Patock-Peckham, Huchinson, Cheong, & Nagoshi, 1998; Geisner, Larimer & Neighbors, 2004). Although studies have failed to show a relationship between depressive symptoms and consumption, some studies have demonstrated that there is an association between depressive symptoms and alcohol-related problems (Nagoshi, 1999; Patock-Peckham et al., 1998). Costanzo and colleagues (2007) found that although heavy drinking drops off after college, the subset of individuals who continue to drink heavily exhibit elevated levels of hostility, anxiety and depressive symptoms while in college. There has also in been some evidence of ethnic differences in the relationship between negative emotions and alcohol-related outcomes. In the study by Costanzo and colleagues (2007), only 20% of the Caucasian students had the psychological profile related to adulthood heavy drinking (i.e., hostility, anxiety and depressive symptoms), whereas 50% of the African American students exhibited those characteristics. However, it is of note that the rates of heavy drinking were similar between the two groups. Another recent study looking at negative emotions in college student drinking revealed that negative emotions predicted higher levels of alcohol dependence symptoms for British White students, but not for British Indian students (Brar & Moneta, 2009). Research suggests that negative affect and depressive symptoms are risk factors for alcohol-related problems in heavy-drinking college students, but more

research is necessary to confirm this link. Additionally, the amount of risk may differ for college students of different ethnicities and is an area that warrants further exploration.

Ethnic Differences in College Student Drinking

Studies of drinking rates across all college students reveal that Caucasian students are more likely than ethnic minority students to exhibit a pattern of heavy drinking (Wechsler et al., 2003). Several studies report that Caucasian students drink at the highest rate, followed by Latino students, and then African American students at the lowest rate (Chen, Dufour & Yu, 2004). Although literature on heavy drinking in African American students is relatively sparse, one study found that African American students experience fewer alcohol-related consequences than Caucasian students (Siebert, Wilke, Delva, Smith, & Howell, 2003). Siebert and colleagues (2003) also examined protective behaviors such as eating before drinking and counting the number of drinks consumed. They found that, in general, African American students employed these types of strategies more regularly than Caucasian students; however, this was not true when looking at the protective strategy of choosing a designated driver. This puts these students at increased risk for a DUI or alcohol-related car accident. Another recent study found positive associations between alcohol consumption and risky sexual behaviors in African American students (Poulson, Bradshaw, Huff, Peebles, & Hilton, 2008). These studies suggest that although African American students may experience fewer consequences related to their alcohol use, they are nonetheless at risk for many of the same negative consequences as Caucasian students. Overall, there has been little research on the nature and impact of the alcohol-related problems relative to the amount of research conducted with Caucasian students.

Despite the fact that African American college students drink less and experience fewer alcohol-related consequences than Caucasian students, it is important to recognize that a significant and increasing number of African American students report heavy drinking (Wechsler et al, 2002). Data from the College Alcohol Study indicate that the percentage of African American college students who report heavy drinking in the past two weeks has increased significantly from 16.7 % in 1991-1992 to 21.7% in 2001-2002. Although African American students report fewer alcohol related consequences than Caucasian students, heavy drinking may nevertheless have detrimental long-term consequences for the educational attainment of African American students. The United States Department of Education (2001) reported that only 37% of African American students who start at a four-year college graduate, compared to 57% of Caucasian students. Prior research has identified a negative association between heavy drinking and study practices among African American college students (dePyssler, Williams, & Windle 2005). It is possible that through the mechanism of study practices, heavy drinking is a factor that contributes to lower graduation rates for African American students.

While it appears that drinking does, in fact, have negative consequences for African American college students, research suggests that severity of these consequences increases as the students enter into adulthood. Ten to 15 years after college, researchers have documented what has been referred to as the “age crossover effect” (French, Finkbiner, & Duhamel, 2002). Whereas in college Caucasian students drink more and experience more alcohol-related consequences, by age 35 African Americans exhibit higher rates of alcohol dependence and experience more alcohol-related problems than

Caucasians (Harford, Grant, Yi, & Chen, 2005; Merline, O'Malley, Schulenberg, Bachman, & Johnston, 2004). This phenomenon cannot be fully explained by an increase in drinking in African Americans as research has found that even with similar levels of alcohol consumption as Caucasians, African American adults experience more alcohol-related problems (Herd, 1988). Studies have also shown that African Americans may be at higher risk than Caucasians for alcohol-related illnesses or injuries such as cirrhosis or alcohol-related car accidents (Caetano & Clark, 1998).

It also appears that some factors commonly implicated in problematic alcohol use may play a larger role for African Americans than for Caucasians. Cooper and colleagues (1992) examined the relationship between stress, coping and alcohol use in Caucasians and African Americans. They found that across all individuals who reported tendencies to use avoidance coping strategies to deal with stress (e.g., keep feelings to themselves, took it out on other people), this type of coping was more strongly related to alcohol consumption and level of alcohol-related problems for African Americans than for Caucasians. This research suggests that predictors of problematic alcohol use may be different for African Americans and Caucasians.

Overall, while Caucasian students drink more, there are nonetheless a sizable percentage of African American students (16.7%) who report heavy drinking. Research also suggests that African Americans are at greater long-term risk for heavy drinking and related consequences than their Caucasian counterparts; however, there is a paucity of research focusing on African American college student drinking. More research is necessary to describe the specific types of consequences experienced by African

American college students and to identify possible risk factors for heavy drinking and alcohol related consequences among these students.

Current Study

Research to date does not adequately explain the individual difference factors that might confer risk for negative alcohol-related consequences. The proposed study, will examine delay discounting, distress tolerance, and depressive symptoms as factors that might contribute to alcohol-related consequences above and beyond consumption level in a sample of Caucasian and African American heavy drinking college students. The first hypothesis is that delay discounting will be positively associated with alcohol-related consequences. The second hypothesis is that distress tolerance will be negatively associated with alcohol-related consequences (lower levels of distress tolerance will be related to greater levels of alcohol-related problems). The third hypothesis is that depressive symptoms will be positively associated with alcohol-related consequences. We will extend previous research by utilizing a multidimensional measure of alcohol problems that includes specific scales that measure social-interpersonal consequences, impaired control, self-perception, self-care, risk behaviors, academic/occupational consequences, physical dependence, and blackout drinking. We will also examine whether the relations between these risk factors and alcohol related consequences are moderated by ethnicity (African American vs. Caucasian). Finally, we attempt to replicate Buckner and colleagues' (2007) mediational findings that distress tolerance mediates the relationship between depression and alcohol-related problems.

Method

Participants

Participants were 206 undergraduate students (53% female, 47% male; Mean age = 19.51, $SD = 1.99$) from a large metropolitan public university in the southern United States. The sample was ethnically diverse; 68% of participants self-identified as White/Caucasian, 27.7% as Black/African American, 3.4% as Hispanic/Latino, 1.5% as Asian, 1.9% as Native American, and 0.5% as Hawaiian. Participants were allowed to choose multiple ethnic identities. Participants were eligible to participate in the study if they reported one heavy drinking episode (5/4 or more drinks in one occasion for a man/woman) in the past month. The mean number of past month heavy drinking episodes was 5.82 ($SD = 4.86$). Participants reported drinking an average of 16.10 standard drinks during a typical week in the past month ($SD = 13.48$).

Procedure

All procedures were approved by the university's institutional review board, and all participants provided written informed consent to participate in the study. Data for this study were derived from the baseline assessment of a randomized controlled trial of brief interventions for heavy drinking among college students. Participants were recruited from two sites: 1) the on-campus health center (all students other than second semester seniors were potentially eligible) and 2) a required university-wide course for first year students. For both recruitment streams, students completed an informed consent document and screening evaluation and eligible students were invited to a laboratory room to complete the assessment battery as part of the baseline assessment for the clinical trial. Once students arrived at the laboratory, all procedures, risks and benefits of the research were described and students were asked to sign an informed consent document. Each student

then completed paper/pencil study measures in a laboratory room separate from other students. Participants completed all study measures prior to completing the intervention.

Measures

Alcohol consumption. Number of drinks per week was assessed using the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985). On the DDQ, respondents estimate the total number of standard drinks they consumed on each day during a typical week in the past month. The DDQ has been used frequently with college students and is a reliable measure that is highly correlated with self-monitored drinking reports (Kivlahan, Marlatt, Fromme, Coppel, & Williams, 1990). Participants were also asked the number of times in the past month that they engaged in a heavy drinking episode as well as the number of times they had been drunk/intoxicated.

Delay discounting. The Monetary Choice Questionnaire (Kirby, Petry, & Bickel, 1999) was used to assess rate of discounting. Participants were presented with 27 items in which they were asked to choose between two hypothetical amounts of money. Hypothetical money choices have been shown to be equivalent to actual money awards in assessing delay discounting rates (Madden, Begotka, Raiff, & Kastern, 2003). For each of the 27 choices, one of the amounts was a smaller, immediate reward, while the other option was a larger, delayed reward (e.g., Would you prefer \$54 today, or \$55 in 117 days?). Each of the 27 items featured varying amounts and delays, with each choice contributing to the estimate of the participant's discounting rate parameter (k) using a well-established algorithm (Mazur, 1987). Higher k values reflected a greater proportion of choices for the smaller immediate monetary amounts (e.g., a higher level of impulsiveness).

Alcohol-related problems. Alcohol-related problems were assessed using the Young Adult Alcohol Consequences Questionnaire (YAACQ; Read, Kahler, Strong, & Colder, 2006). Participants are given a list of 49 potential problems (e.g., “I have become very rude, obnoxious, or insulting after drinking”; “I have driven a car when I knew I had too much to drink to drive safely”; “I’ve not been able to remember large stretches of time while drinking heavily”) related to their alcohol use and asked to indicate whether or not they have experienced that problem in the past 6 months. The YAACQ contains 8 subscales (Social-Interpersonal Consequences, Impaired Control, Self-Perception, Self-Care, Risk Behaviors, Academic/Occupational Consequences, Physical Dependence, and Blackout Drinking) that all load on a single, higher-order factor. The YAACQ has demonstrated strong psychometric properties including internal consistency and predictive validity (Read, Merrill, Kahler, & Strong, 2007). Internal consistency for the YAACQ was .92 in our sample.

Distress tolerance. Distress tolerance was measured by the Distress Tolerance Scale (DTS; Simons & Gaher, 2005). The DTS self-report instrument that consists of 14 statements to which individuals indicate the amount they agree on a 5-point Likert scale (5 = strongly disagree, 1 = strongly agree). The measure includes items like “Feeling distressed or upset is unbearable to me” and “I’ll do anything to avoid feeling distressed or upset.” The scale has been shown to have strong internal consistency (.89), showed convergence with other appropriate measures of affective distress and regulation and adequate test-retest reliability over 6-months (Simons & Gaher, 2005). Internal consistency in our sample was .89.

Depressive symptoms. Depressive symptoms were measured using the Center for Epidemiological Studies Depression Scale (CESD; Radloff, 1977). Participants are given 20 statements (e.g., “I felt depressed”) and rate how often in the past week they have felt that way ranging from 0 = Rarely or none of the time (“*less than 1 day*”) to 3 = Most or all of the time (“*5-7 days*”). Four of the items are reverse scored (e.g., “I enjoyed life”). Internal consistency for the CESD was .98 in this sample.

Data Analysis Plan

All distributions were checked for outliers and skewness and kurtosis prior to analysis. If necessary, the appropriate transformations were used to correct the distributions. A series of *t*-tests were conducted to test for ethnic and gender differences on drinking and alcohol-related problem variables and relationships between all variables were examined using bivariate correlations.

Regression equations were used to examine whether or not delay discounting, distress tolerance, and depressive symptoms predicted levels of alcohol-related problems. Level of alcohol consumption (drinks per week) was included as a covariate to evaluate the extent to which these potential risk factors accounted for unique variance in alcohol problems above and beyond level of alcohol consumption. Separate regression analyses were used to evaluate the total alcohol problem score as well as each of the subscale scores. To examine possible moderation effects, the regression equations were run separately for Caucasian and African American students. Because previous research indicates that when looking at delay discounting predicting problems, we controlled for income in our discounting analyses. Finally, we attempted to replicate Buckner and

Colleagues' (2007) mediational findings that distress tolerance mediated the relation between depression and alcohol-related problems.

Results

All variable distributions were checked for outliers and normality. Variables that were skewed or kurtotic were transformed using both a square-root and logarithmic transformation. For final analysis, the transformation which best corrected skewness and kurtosis was used. The following variables were log-transformed: drinks per week, discounting, self-perception problems subscale, self-care problems subscale, physical dependence problems subscale and academic consequences problems subscale. The following variables were square-root transformed: CESD (depression) and total YAACQ score (total alcohol-related problems). All final variables had acceptable levels of skewness and/or kurtosis.

Descriptive Statistics

Overall, participants reported consuming an average of 16.1 ($SD = 13.49$) drinks on a typical week and a total of 12.67 ($SD = 8.56$) alcohol-related problems over the past 6 months. The mean levels of depression, distress tolerance, and delay discounting were 13.10 ($SD = 8.02$), 3.37 ($SD = .78$), and .045 ($SD = .056$), respectively. A score of 16 or higher has been used extensively as the cut-off point for high depressive symptoms (Radloff, 1977); so overall participants in this sample were not highly depressed. There are no established cut-offs for delay discounting or distress tolerance. Means and standard deviations of the alcohol-related problem subscales were as follows: Social-Interpersonal subscale = 2.35 (1.77); Impaired Control subscale = 2.05 (1.59); Self-Perception subscale = .68 (1.17); Self-Care subscale = 1.29 (1.84); Risk Behaviors

subscale = 2.10 (1.94); Academic/Occupational subscale = .60 (.98); Physical Dependence subscale = .61 (.88); and Blackout Drinking subscale = 2.99 (1.92). These numbers reflect the mean number of problems reported on each of these subscales.

Ethnic and Gender differences in Drinking, Alcohol-related Problems, Depression, Distress Tolerance and Discounting

There were a number of significant differences between Caucasian and African American students (see Table 1). Caucasian students reported more drinks per week and alcohol problems than African American students. Caucasian students also reported experiencing significantly more consequences in the following problem domains:

Social/Interpersonal, Self-Perception, Self-Care, Risk Behaviors,

Academic/Occupational, and Black-Out Drinking. There were no differences on the impaired control or physical dependence subscales. African American students also had higher discounting rates than the Caucasian students, $t(75) = 2.44, p < .05$. There were no significant differences between Caucasian and African American students in rates of depression or level of distress tolerance.

We also examined gender differences (see Table 2). Men reported drinking significantly more than women. There was not a significant difference between men and women on total alcohol-related problems, but men reported more problems on the physical dependence, risk behaviors, blackout drinking, and the social/interpersonal problems subscales. There was also a gender by ethnicity interaction for social/interpersonal problems ($F[2, 199] = 3.77, p < .05$).

Table 1
Ethnic Differences in Drinking, Mood, and Decision-making Related Variables

	Ethnicity		<i>t</i> -statistic (df)
	African American <i>n</i> = 57 <i>M</i> (<i>SD</i>)	Caucasian <i>n</i> = 133 <i>M</i> (<i>SD</i>)	
<i>Drinking and Individual Difference Variables</i>			
Drinks consumed per week	7.11 (7.24)	19.68 (13.64)	<i>t</i> (188) = -8.02**
Discounting rate	.064 (.073)	.038 (.04)	<i>t</i> (75) = 2.44* _a
Depression	14.25 (9.40)	12.60 (7.41)	<i>t</i> (186) = 1.02
Distress Tolerance	3.25 (.849)	3.39 (.730)	<i>t</i> (187) = -1.13
<i>Alcohol-related consequences total and subscales</i>			
Total alcohol-related consequences	8.79 (8.00)	14.44 (8.48)	<i>t</i> (188) = -4.83**
Social-Interpersonal subscale	1.68 (1.59)	2.63 (1.79)	<i>t</i> (188) = -3.45*
Impaired Control subscale	1.74 (1.75)	2.14 (1.53)	<i>t</i> (187) = -1.61
Self-Perception subscale	.33 (.81)	.87 (1.30)	<i>t</i> (149.74) = -3.46** _a
Self-Care subscale	.84 (1.57)	1.48 (1.90)	<i>t</i> (184) = -2.55*
Risk Behaviors subscale	1.18 (1.48)	2.53 (1.99)	<i>t</i> (141.10) = -5.18** _a
Academic/Occupational subscale	.37 (.79)	.68 (1.04)	<i>t</i> (130.80) = -2.39* _a
Physical Dependence subscale	.54 (.87)	.66 (.90)	<i>t</i> (188) = -1.00
Blackout Drinking subscale	2.14 (1.83)	3.41 (1.86)	<i>t</i> (187) = -4.32**

_a - denotes cases in which equal variances could not be assumed.

* $p \leq .05$. ** $p \leq .01$

Table 2
Gender Differences in Drinking, Mood, and Decision-making Related Variables

	Gender		<i>t</i> -statistic (df)
	Men	Women	
	<i>n</i> = 97 <i>M</i> (<i>SD</i>)	<i>n</i> = 109 <i>M</i> (<i>SD</i>)	
<i>Drinking and Individual Difference Variables</i>			
Drinks consumed per week	22.31 (15.46)	10.56 (8.09)	<i>t</i> (204) = 6.02**
Discounting rate	.042 (.052)	.048 (.059)	<i>t</i> (204) = -.781
Depression	11.86 (7.12)	14.17 (8.61)	<i>t</i> (202) = -1.99*
Distress Tolerance	3.59 (.754)	3.18 (.761)	<i>t</i> (203) = 3.91**
<i>Alcohol-related consequences total and subscales</i>			
Total alcohol-related consequences	14.00 (9.36)	11.49 (7.64)	<i>t</i> (204) = 1.90
Social-Interpersonal subscale	2.65 (1.97)	2.09 (1.54)	<i>t</i> (203) = 2.26*
Impaired Control subscale	1.91 (1.49)	2.19 (1.67)	<i>t</i> (203) = -1.25
Self-Perception subscale	.78 (1.27)	.59 (1.08)	<i>t</i> (203) = 1.09
Self-Care subscale	1.29 (1.99)	1.28 (1.69)	<i>t</i> (200) = -.272
Risk Behaviors subscale	2.66 (2.05)	1.61 (1.69)	<i>t</i> (184.79) = 3.97** ^a
Academic/Occupational subscale	.69 (1.06)	.52 (.89)	<i>t</i> (203) = 1.25
Physical Dependence subscale	.76 (.94)	.49 (.80)	<i>t</i> (203) = 2.43*
Blackout Drinking subscale	3.32 (1.93)	3.41 (1.86)	<i>t</i> (203) = 2.35*

^a - denotes cases in which equal variances could not be assumed.

* $p \leq .05$. ** $p \leq .01$.

While African American females ($M = 1.90$, $SD = 1.57$) reported more problems on this subscale than African American males ($M = 1.22$, $SD = 1.59$), Caucasian females ($M = 2.27$, $SD = 1.55$) had fewer problems in this domain than Caucasian males ($M = 2.97$, $SD = 1.94$). There were also significant gender differences on depression and distress tolerance, but not for discounting. Women had lower levels of distress tolerance than men and higher levels of depression than men.

Depression, Distress Tolerance and Discounting Predicting Alcohol-related Problems

Bivariate relations. Bivariate correlations between individual difference variables (discounting/impulsivity, distress tolerance, and depression) and alcohol-related problem total and subscales were run separately for Caucasian and African American students (see Table 3.)

Table 3

Bivariate Relations between Drinking Variables and Mood and Decision-making Variables

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Gender	--	-.405**	-.054	.044	-.148	-.149	-.198*	.089	-.009	.052	-.290**	-.086	-.275**	-.150
2. Drinks per week	-.178	--	.046	-.017	.098	.420**	.329**	.282**	.016	.170	.403**	.283**	.366**	.301**
3. Discounting rate	.064	.173	--	-.010	-.083	-.135	-.098	-.092	-.011	-.227**	-.148	-.106	-.075	.027
4. Depression	.244	-.121	.252	--	-.436**	.195*	.196*	.100	.171	.165	.109	.144	.204*	.108
5. Distress Tolerance	-.389**	.041	-.261	-.402**	--	-.002	-.006	-.002	-.072	-.091	-.012	-.044	.033	.129
6. alcohol-related consequences	.076	.391**	.335*	.331*	-.289*	--	.730**	.664**	.681**	.690**	.735**	.583**	.515**	.706**
7. Social-Interpersonal	.199	.209	.168	.166	-.295*	.760*	--	.429**	.454**	.373**	.508**	.295**	.350**	.434**
8. Impaired Control	.115	.389*	.276*	.201	-.201	.858**	.643**	--	.506**	.445**	.331**	.320**	.323**	.335**
9. Self-Perception	-.140	.018	.235	.206	-.003	.577**	.467**	.386**	--	.612**	.398**	.420**	.185*	.342**
10. Self-Care	-.013	.482**	.381**	.343*	-.230	.782**	.509**	.730**	.324*	--	.362**	.559**	.267**	.277**
11. Risk Behaviors	.004	.060	.284*	.314*	-.170	.687**	.433**	.447**	.545**	.425**	--	.340**	.334**	.529**
12. Academic/ Occupational	-.156	.243	.182	.214	-.056	.535**	.239	.353**	.528**	.406**	.418**	--	.218*	.291**
13. Physical Dependence	.092	.394**	.182	.399**	-.208	.625**	.371**	.518**	.249	.613**	.323*	.309*	--	.419**
14. Blackout Drinking	-.030	.446**	.123	.257	-.227	.826**	.550**	.704**	.340*	.633**	.471**	.505**	.421**	--

Note. Pearson correlations (r) for Caucasian students ($n = 133$) are presented above the diagonal, and correlations for African American students ($n = 57$) are presented below the diagonal.

For Caucasian students, there were significant associations between discounting and the self-care problems subscale ($r(131) = -.227, p = .009$); participants with higher discounting rates (more impulsive) had *fewer* self-reported problems in the self-care domain. Also, Caucasian students with higher levels of depression also tended to have higher levels of total self-reported alcohol problems as well as higher scores on the social/interpersonal problems and physical dependence subscales ($r_s = .195, .196, .204$; $p_s \leq .05$ respectively). There were no significant associations between distress tolerance and alcohol-related problems in Caucasian students.

For African American students, higher discounting rates were associated with higher rates of total self-reported alcohol problems as well as with more problems on the Impaired Control, Self-Care, and Risky Behaviors subscales ($r_s(57) = .335, .276, .381, .284, p_s \leq .05$ respectively). Lower levels of distress tolerance were associated with greater total problems and Social Interpersonal problems ($r_s(57) = -.289, -.295, p_s \leq .05$). Additionally, higher depression scores were associated with total problems as well as higher levels of problems on the Self-Care, Physical Dependence and Risk Behaviors subscales ($r_s(56) = .331, .343, .399, .314, p_s \leq .05$).

Multivariate relations. Alcohol-related problems total and subscales were regressed on discounting, distress tolerance, and depression separately for Caucasian and African American students (see Table 4 for the significant results).

Table 4.
Depression, Distress Tolerance, and Delay Discounting Predicting Alcohol-Related Problems for Caucasian and African American Students

Variable	β consumption	B	SEB	β	<i>t</i>	ΔR^2
Caucasian						
Depression						
Total Problems	.420	.218	.084	.202	2.59*	.041
Social Interpersonal	.325	.346	.140	.201	2.47*	.041
Physical Dependence	.366	.041	.016	.210	2.63**	.044
Delay Discounting						
Self Care	.164	-3.71	1.50	-.213	-2.48*	.044
African American						
Depression						
Total Problems	.442	.378	.114	.385	3.33**	.146
Impaired Control	.421	.361	.176	.252	2.05*	.062
Self-Care	.535	.087	.023	.408	3.73**	.164
Physical Dependence	.452	.074	.018	.454	4.10**	.203
Risk Behaviors	.102	.394	.158	.326	2.50*	.105
Blackout Drinking	.477	.463	.178	.306	2.60*	.092
Distress Tolerance						
Total Problems	.409	-.413	.183	-.292	-2.28*	.072
Self-Care	.491	-.081	.039	-.262	-2.04*	.057
Black-out Drinking	.441	-.555	.282	-.255	-1.97†	.055
Delay Discounting						
Total Problems	.352	11.84	5.24	.281	2.26*	.076
Self-care	.399	2.68	1.07	.294	2.50*	.083
Risk Behaviors	-.002	14.18	7.01	.275	2.02*	.072

All regression analyses controlled for level of consumption. The regressions predicting distress tolerance also included gender in the model as a control variable. The regressions predicting discounting also included income as a control variable. Only significant and trend-level results are presented.

* $p \leq .05$. ** $p \leq .01$ † $p = .055$.

Weekly drinking was included as a covariate in all models due to the significant association between drinking and alcohol-related problems and because we were interested in each factor's relative ability to predict problems above and beyond drinking levels. Weekly drinking was not significantly associated with depression, distress tolerance or delay discounting. Additionally, gender was included in the model with distress tolerance predicting problems due to the significant correlation between gender and distress tolerance. For Caucasian students, depression was associated with total alcohol-related problems as well as problems on the Social/Interpersonal, and Physical Dependence subscales. There were trend level associations between depression and the Self-Perception and Self-Care subscales ($ps = .051$ and $.053$ respectively). Additionally for Caucasian students, higher delay discounting was associated with a *lower* level of alcohol-related problems on the Self-Care subscale. Distress tolerance was not associated with alcohol-related problems for Caucasian students. For African American students, depression was associated with the total level of alcohol-related problems as well as problems on the Impaired Control, Self-Care, Physical Dependence, Risk Behaviors, and Black-out drinking subscales. Notably, for problems on the Physical Dependence subscale, depression accounted for a sizable portion of the variance ($R^2 = .203$). Distress tolerance was associated with total alcohol-related problems, as well as problems on the Self-Care for African American students. There was also a trend-level association between distress tolerance and the Black-out drinking subscale ($p = .055$). Additionally, delay discounting was associated with total alcohol-related problems as well as Self-Care and Risk-Behavior problems.

Mediation of depression-problems relationship by distress tolerance. Buckner and Colleagues' (2007) found that distress tolerance mediated the relationship between depression and alcohol-related problems. We attempted to replicate these mediational findings conditions through a series of multiple regressions (cf. Baron & Kenny, 1986). Step 1 regressed total alcohol-related problems on distress tolerance, step 2 regressed depression on distress tolerance. These steps must indicate significant relationships between these variables before moving on to step 3. In step 3, a multiple regression included depression as the first step and distress tolerance as the second step to establish whether the inclusion of distress tolerance reduced the association between depression and alcohol-related problems. Separate mediation analyses were conducted for Caucasian and African American students. As noted above, there was not a significant relationship between distress tolerance and problems among Caucasian students ($\beta = -.028$; $t = -.316$, $p = .75$), which precluded steps 2 and 3. For African American students, results of steps 1 and 2 indicated significant relationships between alcohol problems and distress tolerance ($\beta = -.289$; $t = -2.24$, $p = .029$) and between depression distress tolerance ($\beta = -.40$; $t = -3.22$, $p = .002$). Step 3 revealed that when distress tolerance was added into the regression equation, depression no longer accounted for unique variance in alcohol-related problems ($\beta = .26$; $t = 1.89$, $p = .06$). In other words, distress tolerance partially mediated the relationship between depression and alcohol-related problems for African American students.

Discussion

The present study examined the extent to which three variables related to mood and decision making (delay discounting, distress tolerance and depression) were

associated with alcohol-related consequences in an ethnically diverse sample of college student drinkers. For both Caucasian and African American students, those with higher levels of depression were more likely to experience more total negative consequences related to their drinking as well as more symptoms of physical dependence. This effect was present after controlling for level of alcohol consumption and is consistent with prior research that has demonstrated an association between depressive symptoms and alcohol-related problems (Nagoshi, 1999; Patock-Peckham et al., 1998). It extends previous work by showing that this relationship remains significant even after controlling for level of consumption as well as by examining how ethnicity might moderate these relationships. We found that ethnicity moderated the relationship between level of depression and several subscale scores. For Caucasian students, a higher level of depression predicted a higher level of social-interpersonal and dependence-related consequences, while for African American students, higher levels of depression predicted higher scores on the Impaired Control, Self-care, Risk Behaviors, and Blackout Drinking subscales in addition to dependence related consequences. In the present study, while depressive symptoms were associated with alcohol-related problems for both African American and Caucasian students, they were associated with a host of more potentially serious consequences for African Americans (Impaired control, Risk behaviors, Blackout drinking vs. Social/interpersonal consequences). Previous research has suggested that depressive symptoms can lead to drinking to cope with negative affect, which in turn is associated with more alcohol-related problems (Wood, Nagoshi, & Dennis, 1992). The ethnic moderation results of the present study are consistent with previous research indicating that the relationship between avoidance coping and alcohol consumption and

related problems may be stronger for African Americans than for Caucasians (Cooper et al., 1992).

Ethnicity also moderated the relationships between distress tolerance and delay discounting and alcohol-related problems. Distress tolerance was not associated with alcohol-related consequences for Caucasian students, but it was for African American students. African American students with lower levels of distress tolerance reported more overall alcohol-related consequences as well as higher levels of self-care, social/interpersonal and black-out-related problems. These results suggest that for African American students, the inability to tolerate negative emotions may be key a risk factor for alcohol-related consequences. Those who are unable to do so may use alcohol or drugs to cope with negative emotions. This is consistent with Zvolensky and colleagues' (2009) finding that a lower level of distress tolerance was associated with more coping-related motives for using marijuana. Using drinking to cope with negative emotions has also been linked to riskier drinking in several studies (Park & Levenson, 2002). Further, it is of note that in this study we found that distress tolerance mediated the relationship between depression and alcohol-related problems for African American students. These results suggest that depressed African American students with lower levels of distress tolerance may be at a greater risk for alcohol-related problems than those with higher levels of distress tolerance. It appears that the inability to cope with negative emotions is driving the relationship between depression and alcohol-related problems. However, the fact that distress tolerance only partial mediates the relationship suggests that depression could also be contributing more indirectly perhaps through social relationships. Research suggests some level of rejection of depressed college

students by peers (Joiner, Alfano, & Metalsky, 1992) which may reduce the amount of social support they receive. Some students report making sure they go home with a friend, or having a friend tell them when they've had enough to drink as strategies they use to protect themselves against alcohol-related consequences (Martens et al., 2007). It is possible that those with increased depressive symptoms have fewer close friends to watch out for them while drinking and therefore are at a greater risk for alcohol related consequences. Individuals with depressive symptoms may also report experiencing more alcohol-related consequences if they have a negative attributional cognitive style. They may be more likely to interpret occurrences that happen to them while drinking as being negative and/or attribute the blame for these events to themselves. For example, a student without this cognitive style might interpret an argument while drinking as simply a part of a night of heavy drinking, while a student with depressive symptoms might view this as a reflection of himself/herself. If this is the case, it might not necessarily be true that these individuals are actually experiencing more alcohol-related consequences, but perhaps are just interpreting more situations in this way. Problems related to social interactions and self-care behaviors might be most likely to be affected by the person's interpretation, whereas problems like blacking out and drinking and driving are not.

Delay discounting also appears to confer risk for alcohol problems, though surprisingly this influence was fully moderated by ethnicity. African American students with higher levels of delay discounting (more impulsivity) had higher numbers of alcohol-related problems. Delay discounting did not predict level of overall alcohol-related consequences for Caucasian students in our sample, however, in light of previous studies showing an association between discounting and alcohol problems in primarily

Caucasian samples (Kollins, 2003), the lack of association between discounting and problems we observed could be a product of the restricted range of alcohol problems in our sample. All students in our sample were relatively heavy drinkers, and the restriction of range problem may have been more problematic with Caucasian students for whom the mean number of drinks per week as 19.68 ($SD = 13.64$) versus 7.11 (7.24) for African American students. Nevertheless it is possible that impulsivity plays a greater role in drinking consequences for African Americans than for Caucasians. Previous research has shown discounting levels to be related to heavy drinking and more alcohol-related consequences, (Field et al., 2007; Kollins, 2003; Vuchinich & Simpson, 1998), but no studies to date have looked at ethnic moderation in this relationship. Most studies reporting on this relationship fail to provide demographic information due to a small number of minority participants (Kollins, 2003, Vuchinich and Simpson, 1998) leaving the relationship between discounting and substance use relatively unexplored in this population. With a sample that is ~30% African American, we were able to examine this relationship.

In addition to finding a relationship between discounting and overall alcohol-related problems in African American students, we also found that a higher discounting rate was associated with the Risk Behaviors and Self-Care subscale. This suggests that discounting is associated with a variety of problems related to risk (e.g., drinking after driving, having unprotected sex) and self-care (e.g., not eating properly, not getting enough sleep). This is interesting because while one might expect a measure of impulsivity to be related to risky behaviors, it is less intuitive that this might contribute to

taking care of oneself. Surprisingly, for Caucasian students, higher levels of delay discounting were associated with lower levels of problems on the self-care subscale.

Overall, these results suggest that certain mood and decision making-related constructs are important in assessing risk for alcohol-related problems and may be especially relevant for African American students. This difference may in part be due to factors that have been implicated as significant predictors of heavy drinking in college. Rates of heavy drinking in African American college students are 1/3 of that of Caucasian College students (Meilman, Presley, & Lysterla, 1994.) One possible explanation lies in social norms theory. Social norms have been implicated as playing an important role in college drinking (Ham & Hope, 2003.) Research on social norms has shown that students believe that their peers drink more and experience more alcohol-related problems than they actually do (Baer & Carney, 1993). Students who tend to overestimate amount of alcohol consumed by their peers perceive this behavior as more normative and consequently are also more likely to consume more alcohol themselves (Agnostinelli, Brown, & Miller, 1995). Because heavy drinking is especially prevalent in Caucasians who attend college, social norms might play a large role in their alcohol consumption. Heavy-drinking is less normative among African American students, so it is possible that for these students drinking might be more motivated by individual difference factors such as poor mood or an impulsive decision making style. We found that for African Americans, depressive symptoms were associated with more alcohol-related problems. A possible explanation of this link is having coping motives for drinking. Coping motives involve drinking to avoid the experience of negative affective states, such as depression or anxiety. Research has shown that the use of alcohol to cope

is associated with more alcohol-related problems (Wood et al., 1992). It is important to note however, that while African American students reported greater delay discounting than Caucasian students, there were no significant differences in distress tolerance or depression levels. Therefore, the risk for negative consequences is due to more than simply the presence of these symptoms. It is also important to note, however, that there were no significant correlations between drinking and distress tolerance or depression for African Americans or Caucasians. Consequently, we should be tentative with the hypothesis that drinking may be motivated by mood issues for Caucasian or African American students. This lack of results, however, may be due to restricted range as previously suggested. It is also possible that these variables confer risk for problems when combined with specific motives to drink.

It is also possible that depressive symptoms and the steep discounting of future rewards not only put African American students at risk for drinking-related consequences, but also may partly explain the age crossover effect. The age-crossover effect refers to the tendency for Caucasian students to drink more and experience more alcohol-related consequences than African American students during college, but to report lower levels of dependence and alcohol problems than African Americans by age 35 (Harford et al., 2005). If Caucasian students experience problems that are fairly independent of more stable personality-based risk factors, they may be likely to mature-out and decrease their drinking when they are faced with a demanding job and family-related responsibilities. On the other hand, if African Americans tend to experience alcohol problems stemming from more stable mood and decision-making factors such as in response to negative emotions, they may continue to, or perhaps even increase the

extent that they experience drinking-related consequences after college when life stressors related to employment and parenting may increase.

Implications

These indices could help identify students, even within a heavy-drinking sample, who are at increased risk of alcohol-related consequences. This might be especially useful with African American students who drink less and experience fewer consequences than Caucasian students (Siebert et al., 2003), and therefore may go undetected when using traditional consumption and problem-levels for screening. Additionally, in the development of new interventions, special effort might be made to address depressive symptoms, impulsivity, and low levels of distress tolerance. To address depression and distress tolerance, part of the intervention may focus on helping students learn how to cope with negative affect in a more effective way than drinking. Cognitive behavioral interventions that have targeted personality risk factors for substance use such as depression have been shown to reduce drinking (Conrod, Stewart, Comeau, & Maclean, 2006). Student could be provided with feedback about the way in which they cope and then could be provided with a list of better alternative coping strategies. This information provided in a supportive environment might increase the student's self-efficacy about their ability to cope. Research has shown that negative expectations about one's ability to cope with negative feelings strongly contributes to problem drinking behavior (Kassel, Jackson, & Unrod, 2000), so increasing students self-efficacy about their coping skills could have positive effects on their drinking.

To further address depression, interventions could include a component to try to increase engagement in school or other activities that do not involve drinking (Murphy et

al., 2005, 2007). Research has demonstrated that substance use is positively associated with substance-related reinforcement and negatively associated to substance-free reinforcement (Correia, Simons, Carey, & Borsari, 1998). This suggests that by increasing engagement in substance-free activities, drinking and related problems may be more likely to decrease.

Limitations

Because this research is cross-sectional, no causal conclusions can be definitively drawn. Additionally, this research was conducted only with heavy drinkers. This may have caused a restriction of range problem which might have suppressed some of the associations, including the possible association between delay discounting and alcohol-related problems in Caucasian students. Further, this study only looked at Caucasian and African American students due to an insufficient number of students of other ethnic minorities. Consequently, we do not know the nature of the relationship between depressive symptoms, delay discounting, distress tolerance and alcohol-related problems for other ethnic minority students. Another possible limitation of this study is the use of self-report rather than behavioral measures of delay discounting and distress tolerance. Although several studies attest to the reliability and validity of self-report discounting (Green & Myerson, 2004) and distress tolerance measures (Simons & Gaher, 2005), it is possible that the relations might have been different with behavioral measures of these constructs.

Future Directions

This study examined the relations between delay discounting, depression, distress tolerance and alcohol-related consequences in heavy-drinking college students. Future

studies might look at these relationships in a more general sample of college students in order to see how these variables might relate to drinking and related consequences in the college population as a whole. These studies might also include drug use variables to see if there is a similar relationship between these variables and drug use and/or drug consequences.

Future studies might also examine these variables in an adult, non-college population to determine if the relationship might be different outside of the college environment. This would be interesting given the large role that social/contextual factors play in college drinking, which might suppress the relative influence of these variables among college students. Further, it would be interesting to conduct longitudinal research to determine if ethnicity continues to moderate the relative influence of these variables on alcohol problems in adulthood, which might in part account for the escalating level of drinking observed among African Americans in the decade after college graduation (French et al., 2002).

In conclusion, this study examined the role of several individual difference variables (depressive symptoms, delay discounting, and distress tolerance) in conferring risk for alcohol-related problems among Caucasian and African American college students above and beyond students' level of alcohol consumption. We found that while depressive symptoms were associated with alcohol-related problems for both Caucasian and African American students, distress tolerance and delay discounting were only associated with problems for African American students. Further, for African American students, distress tolerance mediated the relationship between depressive symptoms and alcohol-related consequences.

Table 4.
Depression, Distress Tolerance, and Delay Discounting Predicting Alcohol-Related Problems for Caucasian and African American Students

Variable	β consumption	B	SEB	β	<i>t</i>	ΔR^2
Caucasian						
Depression						
Total Problems	.420	.218	.084	.202	2.59*	.041
Social Interpersonal	.325	.346	.140	.201	2.47*	.041
Physical Dependence	.366	.041	.016	.210	2.63**	.044
Delay Discounting						
Self Care	.164	-3.71	1.50	-.213	-2.48*	.044
African American						
Depression						
Total Problems	.442	.378	.114	.385	3.33**	.146
Impaired Control	.421	.361	.176	.252	2.05*	.062
Self-Care	.535	.087	.023	.408	3.73**	.164
Physical Dependence	.452	.074	.018	.454	4.10**	.203
Risk Behaviors	.102	.394	.158	.326	2.50*	.105
Blackout Drinking	.477	.463	.178	.306	2.60*	.092
Distress Tolerance						
Total Problems	.409	-.413	.183	-.292	-2.28*	.072
Self-Care	.491	-.081	.039	-.262	-2.04*	.057
Black-out Drinking	.441	-.555	.282	-.255	-1.97†	.055
Delay Discounting						
Total Problems	.352	11.84	5.24	.281	2.26*	.076
Self-care	.399	2.68	1.07	.294	2.50*	.083
Risk Behaviors	-.002	14.18	7.01	.275	2.02*	.072

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