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The effect of perceived control and stress on college students' willingness and intention to binge drink

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ABSTRACT

The current study investigated the effect of perceived control and stress on binge drinking cognitions (i.e., willingness and intention to binge drink). College students (N = 158) were randomly assigned to a high stress (delivering a speech) or low stress (writing an essay) condition and answered items regarding their willingness and intention to binge drink (counter-balanced as a between-subjects factor). While completing the questionnaire, participants were exposed to an aversive auditory stimulus; the ability to mute the stimulus was randomly assigned to manipulate perceived control.

It was hypothesized that high stress would elicit an increase in binge drinking cognitions, and that perceived control would determine whether that change was reflected in willingness (high control) or intention (low control). Manipulation checks showed that a significant minority of participants experienced perceived control and stress incongruent with their randomly assigned conditions; therefore, an internal analysis was conducted. A significant Perceived Control x Stress Index interaction was found for willingness: participants low in perceived control and high in stress, as well as those high in perceived control and low in stress, exhibited the highest willingness. No such effect was found for intention. Likewise, no significant effects were found for question order.

Two individual difference measures moderated the effect of perceived control on binge drinking cognitions. For intention, locus of control interacted with manipulated control and stress: participants whose control condition matched their locus of control (i.e., high control condition and internal locus of control; low control condition and external locus of control) exhibited the highest intention, but only when stress was low. Secondly, for willingness and intention, propensity to cope using alcohol interacted with perceived control:

the highest binge drinking cognitions were found for participants who reported little tendency to use alcohol as a coping mechanism and experienced low perceived control, and those who reported a high tendency to cope using alcohol and experienced high perceived control.

These results suggested that binge drinking is most likely when college students are at ease. The highest willingness and intention were found for participants that were in the least aversive conditions, suggesting that these participants may have experienced a sense of relief that induced binge drinking cognitions. Except for participants who experienced low perceived control and high stress (the most aversive combination), low willingness and intention were found for participants under aversive conditions. It may be that the academic setting and focus on task performance deterred participants from endorsing binge drinking, as this activity would hinder their current goal state. Only under the most extreme aversive conditions did willingness to binge drink increase.

INTRODUCTION

Binge Drinking on U.S. College Campuses

Binge drinking, commonly defined as consuming five or more alcoholic drinks in a sitting, is a major health issue on United States college campuses. Binge drinking is a more prevalent activity among college students than tobacco use, illegal substance use, or unsafe sex (Wechsler & Wuethrich, 2002). Since 1999, the percentage of college students engaging in binge drinking has remained stable at approximately 44.0% (CASA, 2007; O'Malley & Johnston, 2002; Wechsler et al., 2002); however, the frequency with which those students binge drink has risen by 16.0% (CASA). Binge drinking has been linked to a host of negative consequences including arrests and other legal trouble, poor academic performance and college withdrawal, being a victim or perpetrator of sexual assault, unplanned and unsafe sexual encounters, interpersonal conflict, and death (Hingson, Heeren, Zakocs, Kopstein, & Wechsler, 2002; Wechsler et al.). Chronic heavy alcohol consumption also has long-term physical health consequences, including increased risk for heart disease, cancer, liver cirrhosis, and stroke (NIAAA, 2000). Binge drinking, therefore, is associated with a multitude of negative physical and social outcomes for those engaged in the activity and those around them.

Psychosocial factors have been often implicated in the occurrence of binge drinking (Ham & Hope, 2003), as alcohol use tends to be a social behavior. The current study examined the impact of two specific factors, perceived control and stress, on college students' binge drinking. Both factors have been linked to alcohol use, especially for adolescents (Adalbjarnardottir & Rafnsson, 2001; Baer, Garmezy, McLaughlin, Pokorny, & Wernick, 1987; Barnes & Farrell, 1992; Bearinger & Blum, 1997; Cox & Luhrs, 1978;

Higgins & Marlatt, 1975; Houlihan, Gibbons, & Gerrard, 2008; Hussong & Chassin, 1997; Kidorf & Lang, 1999; Newcomb & Harlow, 1986; Wills, 1986, 1990, 1994; Wills, Sandy, Yaeger, Cleary, & Shinar, 2001). The current study was designed to experimentally manipulate college students' perceived control and stress levels and examine how these psychological states interact to influence binge drinking.

Perceived Control

A somewhat limited literature connects perceived control to alcohol use and, specifically, to binge drinking. Perceived control has been defined as the belief that one has the ability to influence the aversiveness of an event (Thompson, 1981). It is important to note that most studies have found perceived control (as opposed to actual control) to be the primary determinant of how one will respond to an aversive event (Glass, Reim, & Singer, 1971; Glass & Singer, 1973; Glass, Singer, & Friedman, 1969; Reim, Glass, & Singer, 1971). Theoretically, actual control over one's environment is a complexly determined construct that is constantly in flux and, therefore, nearly impossible to measure, thus rendering its effects on alcohol use unknown. This limitation of the research, however, is largely irrelevant. Numerous studies have shown that perceived control is psychologically beneficial even when that control belief is overestimated, never acted upon, and/or false (e.g., Glass et al.; Glass & Singer; Reim et al.). Furthermore, perceived control over one's environment has been consistently linked to prevalence of alcohol use (Adalbjarnardottir & Rafnsson, 2001; Barnes & Farrell, 1992; Bearinger & Blum, 1997; Cox & Luhrs, 1978; Hussong & Chassin, 1997; Newcomb & Harlow, 1986; Wills, 1994).

Locus of Control as a Proxy for Perceived Control

Most of the aforementioned studies used locus of control as an operationalization of perceived control. Locus of control is a relatively stable personality trait referring to the extent that one attributes life outcomes to personal (internal) or to environmental (external) factors (Rotter, 1966). This construct measures one's perceived control over their environment, generalized across time and situation. Locus of control is often used as a proxy for measuring actual environmental control, under the assumption that one's perceived control reflects a psychological reality.

An internal locus of control indicates an attribution style that emphasizes the individual as the causal agent of life events, be they good or bad. An external locus of control reflects a tendency to attribute positive and negative life events to external agents, such as other people, fate, luck, or a higher power. Internal and external loci of control are considered polar ends of a single continuum. Locus of control has been shown to be a different construct than desire for control, but evidence has suggested that individuals with an internal locus of control tend to desire control whereas those with an external locus of control generally do not (Burger & Cooper, 1979). Neither internal nor external locus of control is, by definition, superior; however, many studies have found an external locus of control to be associated with or predictive of increased alcohol use.

Perceived Control and Alcohol Use

Low perceived control has consistently been linked with adolescents' vulnerability or propensity to consume alcohol. External locus of control has been found to be positively correlated with a higher likelihood of alcohol use among adolescents and pre-adolescents in the United States (Bearinger & Blum, 1997; Cox & Luhrs, 1978; Hussong & Chassin, 1997;

Newcomb & Harlow, 1986; Wills, 1994) and Europe (Adalbjarnardottir & Rafnsson, 2001). Also, 13-to-16-year-old U.S. adolescents were more likely to drink regularly if they reported that their parents frequently used coercive control, defined as physical/verbal abuse and withdrawal of privileges (i.e., "grounding"), as a means of punishment (Barnes & Farrell, 1992). It was interpreted that these adolescents had low perceived control due to their parents' punitive style, thus promoting alcohol use. Taken together, these studies demonstrated that low perceived control is associated with a higher risk of adolescent alcohol use; however, these studies have all been correlational, providing no evidence of a causal mechanism by which perceived control influences alcohol use.

Another important limitation of previous studies is that they have only examined the long-term effects of perceived control on alcohol use, using internalized and generalized measures of control (i.e., locus of control). Little is known about how an acute deprivation of control could affect short-term alcohol use. Only one study was found in which perceived control was manipulated to influence alcohol use (Higgins & Marlatt, 1975). In this study, male undergraduates involved in an alcohol taste-testing study were interrupted to answer personal questions about themselves. In the high control condition, participants could select which question to answer from four options; in the low control condition, no choice was given. Simultaneously, participants were either under high stress (fear of interpersonal evaluation) or low stress (no fear). Unfortunately, this study only found that stress increased alcohol consumption; however, the results were confounded by the fact that the control manipulation influenced stress levels. A primary goal of the current study was to provide evidence of a causal link between perceived control and binge drinking, as found in

correlational studies, and explain how an acute loss of control may elicit adolescent binge drinking.

Control and Stress

It is almost impossible to investigate perceived control without also investigating stress, as the two constructs are heavily intertwined: losing control can be stressful, and stress can make one feel like they are losing control. A body of research from the 1960s and 1970s demonstrated how losing control over one's environment increased stress. A series of studies regarding adaptation to an aversive stimulus demonstrated that exposure to uncontrollable white noise or electric shock increased tension, reduced frustration tolerance, and inhibited later task performance (Glass et al., 1971; Glass & Singer, 1973; Glass et al., 1969; Reim et al., 1971). When participants perceived they had control over the aversive stimulus, however, these negative effects were ameliorated. The experimenters manipulated perceived control by allowing some participants the option of halting the aversive stimulus; at the same time, however, they urged these participants not to exercise this control. Participants given the option to stop the aversive stimulus had less deleterious reactions, even though almost all participants followed the experimenter's requests and withstood the aversive stimulus for the duration of the experiment. Despite not enacting their control, participants experienced less stress just by believing that they had control over the situation.

In a related study, participants told they were to receive electric shock reported significantly lower negative affect when they believed they could avert the shock through successful completion of a memory task, compared to participants told that the shock was unavoidable (Houston, 1972). Importantly, in neither condition (control or no control) was electric shock delivered; unlike the aversive noise studies, this study showed that stress from

an aversive threat could be reduced by perceived control. These studies demonstrated that perceived control is an important determinant of the intensity of the stress caused by one's current situation, regardless of actual control. It has even been proposed that lack of perceived control may be a necessary, and perhaps even sufficient, condition for experiencing stress (Averill, 1973).

The negative relation between perceived control and stress has also been demonstrated in naturalistic settings. A study of Los Angeles urban bus drivers showed that high traffic congestion increased stress (measured by adrenaline and noradrenaline levels), but that this effect was moderated such that high perceived job control acted as a buffer against the impact of traffic on stress (Evans & Carrère, 1991). Among French police officers and customs agents, perceived control at work was negatively correlated with occupational burnout, defined as low job satisfaction, high health complaints, and high emotional exhaustion (Michinov, 2005). These studies showed that low perceived control in real-world situations was related to increased stress and multiple negative psychophysical outcomes. Although control is a challenging construct to measure in real-world situations, lending itself more to laboratory experiments, these studies demonstrated that perceived control is an externally valid construct to study in relation to stress.

Stress and Alcohol Use

The importance of examining the relation between perceived control and stress as it pertains to alcohol use lies in the fact that stress is a widely acknowledged precursor to alcohol use, especially among adolescents (Tate, Patterson, Nagel, Anderson, & Brown, 2007). Much research has established a positive relation between stress and substance use across all phases of use (i.e., initiation, maintenance, and relapse) and across all major

categories of substances (Wills, 1990). For alcohol, specifically, stress has been shown to predict use among adolescents. For example, high perceived stress predicted earlier alcohol initiation among adolescents, controlling for negative mood (Wills, 1986). Similarly, experience of negative (presumably stressful) life events has been shown to predict alcohol use frequency for adolescents (Baer et al., 1987; Wills et al., 2001). Importantly, prospective studies have shown that stress leading to increased use is a more likely causal path than use leading to increased stress (D'Elio, O'Brien, Iannotti, Bush, & Galper, 1996; Newcomb & Bentler, 1986; Wills, 1986), though these constructs likely have a reciprocal relationship.

The link between stress and alcohol has also been demonstrated experimentally. Male undergraduates informed that they would be giving an evaluated speech consumed more alcohol than they did during an earlier non-stressful session (Kidorf & Lang, 1999). Similarly, male undergraduates led to believe that they would be evaluated on their attractiveness by a group of female peers consumed significantly more alcohol than participants led to believe that they would not be evaluated (Higgins & Marlatt, 1975). An experimental test using the Prototype / Willingness (prototype) model (Gibbons & Gerrard, 1995, 1997; Gibbons, Gerrard, & Lane, 2003) showed that male and female undergraduates asked to write about their feelings when under stress (preparing for a speech) were more willing (but not more intending) to use alcohol than controls (Houlihan et al., 2008). These studies provided further evidence that stress can induce alcohol use, and also showed that *acutely* stressful events can impact college students' alcohol use, regardless of generalized anxiety or life stressors. The effect of acute states of stress *and* perceived control on alcohol use, however, has not been studied concurrently, and it is not yet known how these psychological states influence one another and, ultimately, binge drinking.

The Effect of Perceived Control on Alcohol Use: Mediated or Direct?

Earlier cross-sectional and longitudinal studies have not attempted to establish the mechanisms through which a lack of perceived control may encourage alcohol use. Many researchers have proposed that stress mediates the relationship between perceived control and alcohol use (McMahon & Jason, 1998; Penny & Robinson, 1986). In this perspective, low perceived control leads to increased stress, which, in turn, leads to increased alcohol use. Alcohol use, in this case, represents a means of stress reduction or coping. An alternative temporal order of these two constructs has also been proposed (Newcomb & Harlow, 1986). In this perspective, stress leads to a reduction in perceived control, which, in turn, leads to increased alcohol use. Using alcohol is still considered a means of coping with stress, which, when alleviated, will increase perceptions of control. But alcohol use, in the latter theory, could be construed as a direct attempt to increase perceived control (Clarke, MacPherson, & Holmes, 1982; Newman, 1970). In neither model is perceived control or stress considered a sufficient condition for alcohol use; additionally, only the respective proximal psychological antecedent is considered a necessary condition. Importantly, though, both models construe perceived control and stress as having a reciprocal relationship with one another en route to explaining alcohol use.

Although not empirically tested, researchers have hypothesized that perceived control may directly impact alcohol use, with alcohol use representing a reassertion of psychological control (Clarke et al., 1982; Newman, 1970). It has been suggested that controlling one's environment is an integral human drive (Hui & Bateson, 1991) and that using alcohol may reaffirm control without mediation by stress. Individuals that perceive low control over a significant part of their lives (e.g., school, work) may compensate by increasing control over

another facet, such as the decision to use alcohol. Even though the use of alcohol often results in losing control (i.e., inebriation), it can still be psychologically reaffirming because this loss of control was self-afflicted and volitional.

This direct causal link could be especially true for adolescents, for whom autonomy is still in development (Erikson, 1959). According to a perspective from the learned helplessness literature, adolescents tend to feel a loss of control over their life and decisions, thus developing a need to increase perceived control (Clarke et al., 1982). Further evidence for this hypothesis is that adolescents tend to have an external locus of control, peaking in mid-adolescence (Bearinger & Blum, 1997; Chubb, Fertman, & Ross, 1997; Knoop, 1981), demonstrating that they tend to perceive their lives as controlled by outside forces (i.e., out of personal control). For adolescents, substance use may represent an assertion of control because it is perceived as an adult activity, and adults are perceived as possessing autonomy. "[Substance use] is an activity of young people who are seeking ways to demonstrate control over some limited realm of action with a guaranteed prospect of some limited reward" (Clarke et al., p. 255). Adolescent substance use (including alcohol use), therefore, may be psychologically beneficial in that it increases adolescents' perceived control, a change likely to produce some short-term positive outcomes such as reduced stress. Extended substance use, however, will likely lead to long-term deleterious effects. The main objective of the current study, therefore, was to examine via an experimental design how perceived control and stress influence binge drinking among a sample of college undergraduates.

Perceived Control and Alcohol Use: A Physiological Hypothesis

Volpicelli (1987) advanced a psychophysiological hypothesis for how loss of control may lead to increased alcohol use. This argument stated that events perceived as

uncontrollable lead to a neurophysiological reduction in endorphin production as neurological resources are routed to systems adept at problem-solving in an effort to regain control. After the uncontrollable event ceases, one is left depleted of endorphins and resources are rerouted back to endorphin production. Because motivation to increase endorphin levels is high, and alcohol has been shown to hyper-stimulate endorphin production, alcohol use becomes more likely. Drinking alcohol, therefore, will boost endorphin production following an uncontrollable event and compensate for the decreased endorphin activity experienced during the event. For example, Pihl and Yankofsky (1979) found that following an uncontrollable problem task, participants informed that they performed well on the task exhibited higher alcohol consumption (in a supposedly unrelated taste-testing study) than those told they performed poorly. The authors concluded that those told they performed well experienced a state of relief that induced alcohol use (i.e., using alcohol to relax), whereas those told they performed poorly remained occupied with the task and did not want to consume alcohol. Volpicelli, therefore, concluded that alcohol use is more likely following an uncontrollable event than during it because an individual will not be motivated to increase endorphin levels until the aversive event is finished.

Of course, participants in Pihl and Yankofsky (1979) did not have the opportunity to drink while performing the uncontrollable task, so it could not be concluded that alcohol use would increase only following the task. But research in which undergraduates expected to deliver a speech on an embarrassing topic showed that alcohol use did not increase while the stressor was present; in fact, a non-significant trend emerged that stressed participants consumed less alcohol than non-stressed controls (Corcoran & Parker, 1991). Likewise, college-aged males expecting painful electric shock during a taste-testing study did not

consume more alcohol than participants expecting mild electrical stimulation (Higgins & Marlatt, 1973). It was also found that alcohol consumption (real or placebo) failed to reduce anxiety levels for male undergraduates before delivering a speech, suggesting that alcohol use may be unlikely to occur during a stressful event as it appeared to be maladaptive (Corcoran, 1994).

These studies lend further support to Volpicelli's (1987) psychophysiological hypothesis linking control and alcohol use. Although this hypothesis regards the perceived controllability of an event as the proximal psychological cause of alcohol use, it does not adequately explain the effect of stress on the relation between perceived control and alcohol use. Even if alcohol use will only increase following an uncontrollable event, one would expect the stressfulness of that event to have some impact on use.

Stress as a Moderator of the Perceived Control - Alcohol Use Relation

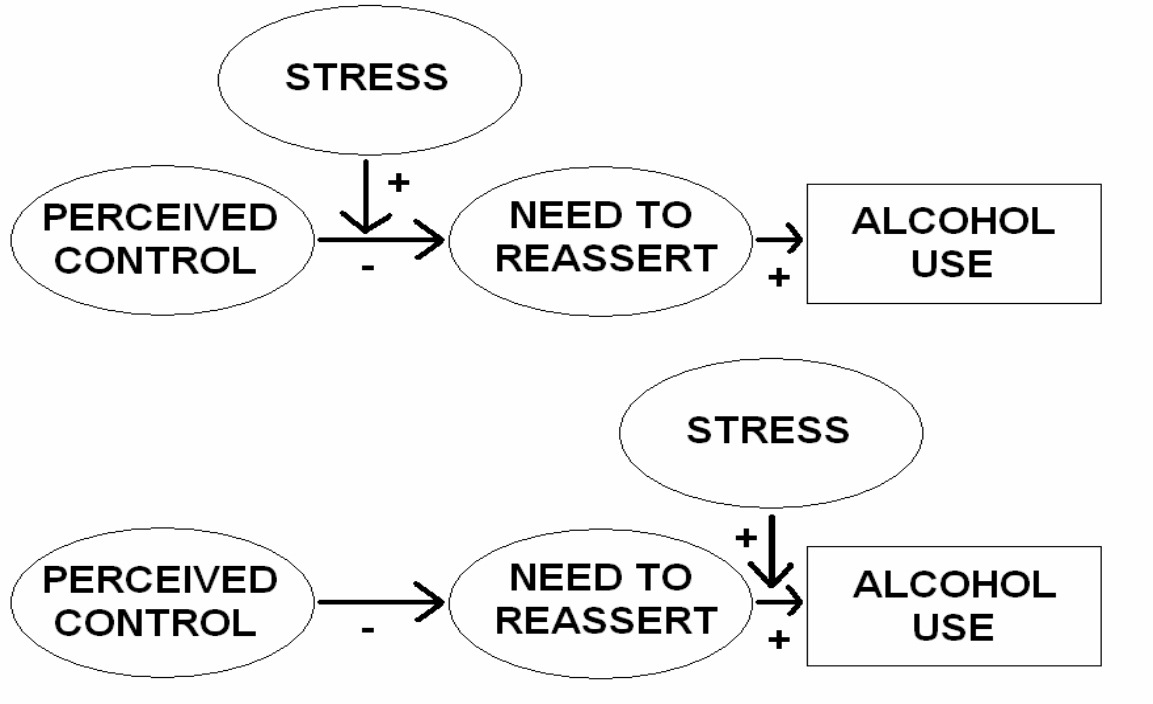
It is well established that stress can elicit alcohol use and is related to perceived control, so it seems unlikely that stress would not somehow impact the link between perceived control and alcohol use. It is proposed here that stress may moderate the relationship between perceived control and alcohol use. It is assumed that low perceived control stimulates a drive to reassert control (Hui & Bateson, 1991) and that alcohol use can act as a means of reasserting control (Clarke et al., 1982; Newman, 1970). In this model, an uncontrollable event would affect both perceived control and stress in unique, yet likely correlated, ways. The effect of perceived control on alcohol use, therefore, would vary dependent on the stress induced by the uncontrollable event.

Stress could moderate this relationship such that only under high levels of stress does one experience an increase in one's need to reassert control (see top of Figure 1). For

example, if an individual perceived low control in a situation, but it was not a stressful situation (e.g., not being allowed to leave a boring lecture), one's need to reassert control in the situation may not change, leading to no effect on alcohol use. However, if perceived control was low and stress was high (e.g., having to take a difficult exam), one's need to reassert control may spike, resulting in a higher likelihood of alcohol use. In this configuration, only under conditions of low perceived control and high stress is an individual compelled toward reasserting control and, potentially, alcohol use.

Another possible moderation model is that stress moderates the relation between the need to reassert control and alcohol use (see bottom of Figure 1). Perhaps perceived control and the need to reassert control have a linear, negative, and non-moderated relationship with one another. Under conditions of low stress, however, this need to reassert control may be alleviated using less extreme means than alcohol use. Or, perhaps, the interaction of high need to reassert control and low stress would allow for or induce reasoned processing, such that the lack of stress allows one to think rationally about their situation, resulting in a higher likelihood of reasserting control through non-risky behaviors. Only under elevated stress, when one may perceive the need for more extreme measures to reassert control, or perhaps when one is depleted of cognitive resources and, therefore, more likely to engage in risk-conducive reactive processing, would one resort to alcohol use in order to regain control. Stress, therefore, may have no effect on perceived control or the need to reassert control, only on how one chooses to reassert control once the need is activated. It is the potential moderating effect of stress on the relation between perceived control and substance use that was investigated in this study, though exactly where the stress moderation influences this relation (before or after the need to reassert control is activated) was not tested.

Figure 1. Two potential models of the relation between perceived control and alcohol use as moderated by stress.



Prototype / Willingness (Prototype) Model

In the current study, the effect of perceived control and stress on alcohol use was measured via participants' willingness and intention to binge drink. Willingness and intention are the two proximal antecedents to risk behavior in the dual-process prototype model (Gibbons & Gerrard, 1995, 1997; Gibbons et al., 2003). According to the prototype model, there are two routes to behavior. The reasoned path describes behavior that is preceded by deliberate thought and intention. This path is based on earlier models of reasoned decision making, such as the Theory of Reasoned Action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). The reactive path accounts for unintended behavior, acts performed with little forethought and without preconceived intention, characteristics of most adolescent risk behaviors. Adolescent risk behavior, such as alcohol use, is often a reaction to risk

opportunities, usually in social settings (i.e., involving peers), and is often predicated on reactive thinking. Adolescents commonly have no intention or plans to use alcohol, but still do so given the opportunity. Previous research has shown that for adolescents, willingness tends to be a stronger predictor of risk behavior than intention (Gibbons & Gerrard, 1997; Gibbons, Gerrard, Blanton, & Russell, 1998). Willingness also tends to be a stronger predictor than intention of behavior with which a person has little-to-no previous experience (Pomery, Gibbons, Reis-Bergan, & Gerrard, 2008).

Intention is the proximal antecedent of behavior in the reasoned path, representing actions that are preceded by deliberate thought. Intention is typically measured by asking one's intentions to engage in a specific behavior within a given time frame or in a specific situation. Willingness is the proximal antecedent of behavior in the reactive path, and is a measure of how willing an adolescent would be to engage in a risky behavior provided the opportunity. It is typically measured by asking how willing one would be to perform a specific behavior with a given time frame or in a specific situation. Willingness represents an openness to engage in a behavior that is acknowledged by the adolescent to be risky. Even though an adolescent may not intend to engage in risky behavior, they may be willing when given the chance. This construct is considered less reasoned than intention; it is driven by reactive processing (Gerrard, Gibbons, Vande Lune, Pexa, & Gano, 2002) and may facilitate alcohol use given the right risk-conducive circumstances.

For adolescents, alcohol initiation and use tends to be a contextually-defined event, making acute psychological states especially relevant in their decisions whether to use alcohol. Previous research on perceived control and alcohol use would lead one to conclude that an adolescent with high perceived control over their environment may not intend to use

alcohol, but may still binge drink when experiencing a short-term reduction in perceived control. These adolescents would be particularly at risk for the consequences of binge drinking because they would consume alcohol despite no plans to do so, and thus would likely not be prepared to deal with heavy alcohol use (e.g., having a ride home from a party). In the current study, both willingness and intention to binge drink were measured, and the differing effects of perceived control and stress on both constructs were examined.

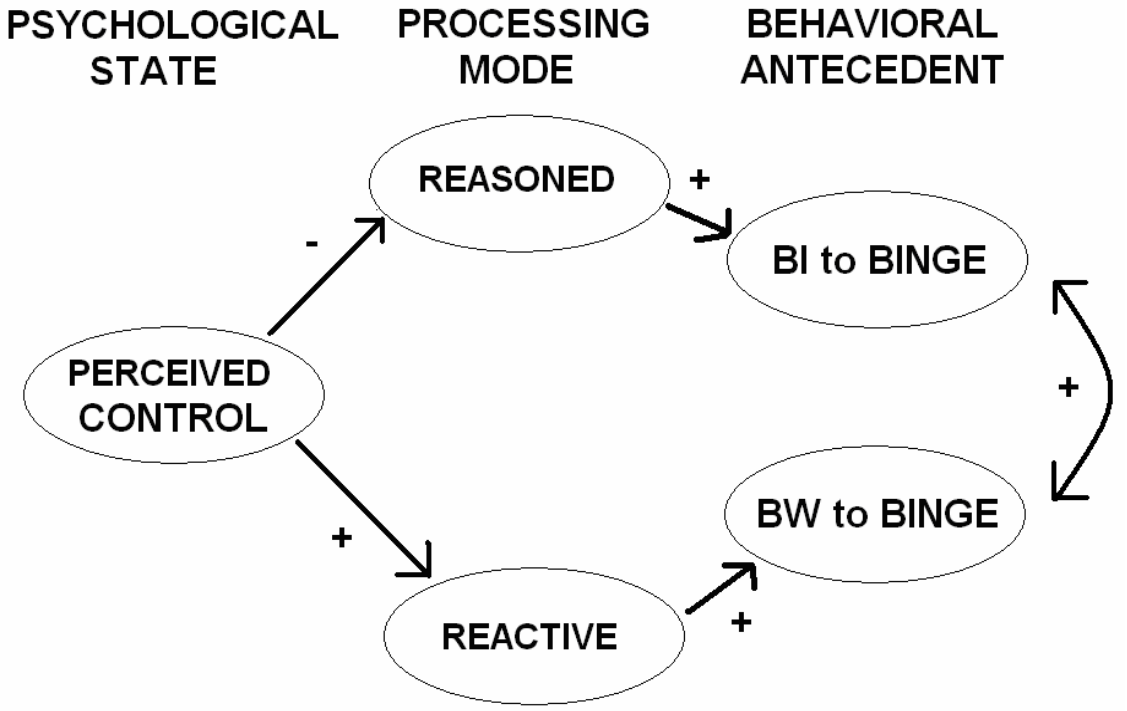
Perceived Control and Processing Style

Because willingness and intention result from two distinct modes of processing (reactive and reasoned, respectively), perceived control may differentially affect binge drinking via the activation of reactive versus reasoned processing styles. A loss of perceived control has been shown to induce deliberative processing (akin to reasoned processing from the prototype model) as a means of increasing control (Jewell & Kidwell, 2005). Under conditions of low control, people may use deliberative processing in order to accurately assess the situation and successfully regain control. According to Jewell and Kidwell, deliberative processing is perceived by most people as more likely to produce desired outcomes than heuristic (reactive) processing, and therefore will be strategically employed in order to increase perceived control. On the contrary, when people feel in control, their motivation to expend the cognitive resources necessary for deliberative processing is low; therefore, they are more likely to use heuristic processing to efficiently navigate the social world. In a series of studies (Jewell & Kidwell) it was shown that low perceived control over obtaining a credit card, whether perceived control was self-reported or experimentally manipulated, encouraged deliberative processing and increased intention to acquire a credit card. In contrast, when perceived control was high, participants were more likely to employ

heuristic processing, using cues such as previous attitudes toward credit cards and past credit card behavior, to determine their intention to obtain a credit card.

These findings suggested that low perceived control may increase intention to binge drink more so than willingness to binge drink, given that alcohol use is perceived as a means of reasserting control (see Figure 2). Because low perceived control promotes reasoned (deliberative) processing (Jewell & Kidwell, 2005), adolescents experiencing an acute deprivation of control would be less likely to use reactive (heuristic) processing than reasoned processing. They may form an intention to binge drink as a means of reasserting control via reasoned processing, but they would be unlikely to exhibit high willingness to binge drink, because willingness is influenced by reactive processing. Likewise, high perceived control may show the opposite pattern (higher willingness to binge drink than intention) because feeling in control would inhibit motivation to expend cognitive resources on reasoned thought, increasing the likelihood that adolescents would use the reactive path and rely on social cues (heuristics) to determine their alcohol use. It is likely these relationships would only be found when adolescents are stressed (Higgins & Marlatt, 1975; Houlihan et al., 2008; Kidorf & Lang, 1999), as the interaction between perceived control and stress would encourage the need to reassert control via alcohol use (see Figure 2).

Figure 2. Dual process model relating perceived control to willingness (BW) and intention (BI) to binge drink via processing mode when under high stress.



STUDY OVERVIEW AND HYPOTHESES

Overview. In the current study, perceived control and stress were manipulated in a laboratory setting to test their effect on binge drinking. Participants were told that the study was about college students' performance on common academic tasks while experiencing varied auditory stimulation; thus, perceived control was manipulated by subjecting all participants to an aversive stimulus (loud heavy metal music) but giving only one group the ability to turn it off (high perceived control). Stress was manipulated by asking participants to give an evaluated impromptu speech (high stress) or write an unevaluated essay (low stress) as their final academic task. Undergraduate college students experienced these manipulations and subsequently reported willingness and intention to binge drink (order counter-balanced between participants), presumably as one of many questionnaires.

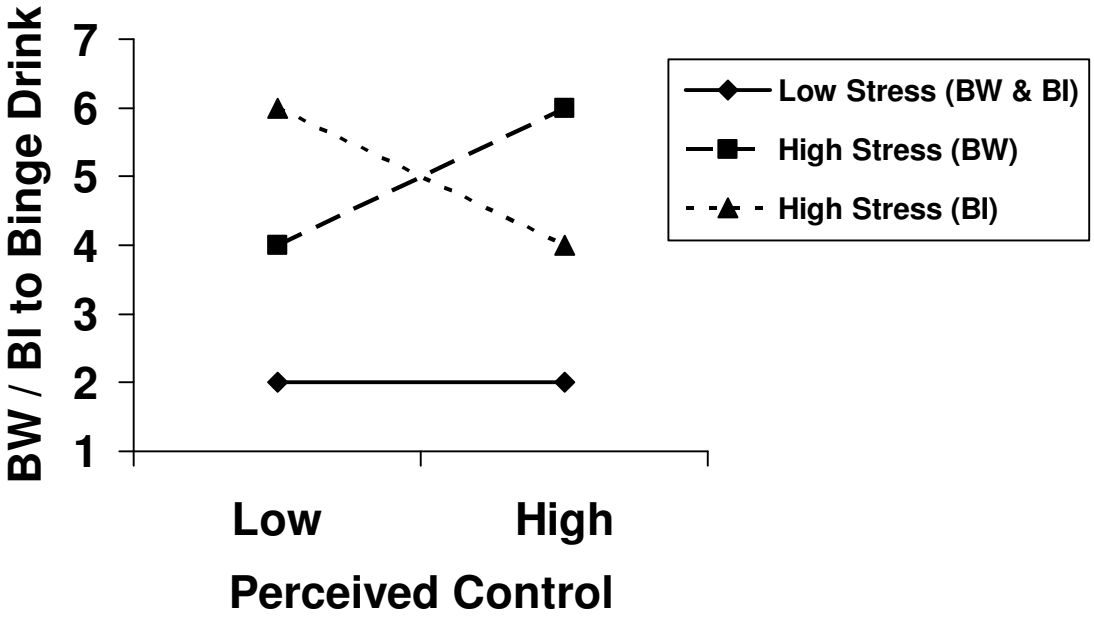
Control x Stress. It was hypothesized that manipulated control and stress would interact to predict willingness and intention to binge drink (see Figure 3), controlling for previous binge drinking cognitions (willingness or intention, respectively). Because stress was believed to moderate the relationship between perceived control and alcohol use, it was hypothesized that when stress was low, both willingness and intention would be low and that perceived control would have no impact. Without the stress necessary to elicit a cognitive reaction, willingness and intention would likely remain stable. Only when stress was high would participants react to the situation, and the nature of that reaction would be predicated on their level of perceived control.

Participants experiencing high perceived control and high stress would exhibit the highest willingness to binge drink of all groups, due to their use of reactive processing. Because their perceived control would be high, it would allow these participants to rely on

heuristic cues when assessing their willingness to binge drink. Their intention to binge drink, however, would be lower than that of the high stress/low control group, because participants with high perceived control would not be motivated to use reasoned processing to reassert control. Participants in the high control/high stress condition, therefore, would report some intention to binge drink, but because they would be relying on reactive thinking would report much higher willingness to binge drink.

Willingness to binge drink for participants in the low control/high stress condition would be lower than that for participants in the high control/high stress condition, because their low perceived control would activate reasoned processing in an attempt to regain control. Because the willingness items do not suggest being in control of the social environment, participants would be less likely to endorse binge drinking in these hypothetical situations. Intention, however, would be highest for these participants, because intending to binge drink in these situations would represent an active reassertion of control by engaging in volitional, adult-like behavior. By using reasoned processing induced by the loss of perceived control, participants may report that they intend to binge drink, with this intention psychologically reestablishing some sense of control, but not be as willing to binge drink as participants with high perceived control.

Figure 3. Predictions regarding differential interactions of perceived control condition and stress condition on willingness (BW) and intention (BI) to binge drink.



Moderation by question order. Because willingness and intention are correlated, answering one tends to influence how one responds to the other (Gibbons, Gerrard, Ouellette, & Burzette, 2000). It was expected that the above two-way interactions would be evident more so when the associated dependent variable (willingness or intention) was the first construct reported by participants. When the associated dependent variable was reported second, the effect of the perceived control and stress manipulations on binge drinking cognitions would have been reduced by answering the first set of items. This effect is more pronounced for willingness, which tends to be reduced after answering intention items because reasoned processing has been activated, and it is difficult to quickly switch from reasoned to reactive processing. The effect may present for intention, but it is easier to switch from reactive to reasoned processing so intention tends to be less affected by coming second.

Moderation by locus of control. Lastly, it was hypothesized that participants' locus of control would moderate the Perceived Control x Stress interaction. It has been found that the impact of perceived control may be strongest when it is incongruent with one's generalized control expectancies, i.e., locus of control (Houston, 1972). This study indicated that people are not necessarily negatively affected by a lack of control; rather, that low perceived control may more negatively affect someone who expects or desires control (i.e., internal locus of control) than someone who does not (i.e., external locus of control). On the contrary, an individual may be negatively affected by high perceived control if they do not expect or desire control (i.e., external locus of control). In fact, there is evidence that people with an external locus of control generally do not desire control and, therefore, may exhibit negative reactions to high control situations (Burger & Cooper, 1979). Therefore, locus of control was hypothesized to moderate the two-way interactions on willingness and intention to binge drink, such that the effects would be stronger when the perceived control manipulation was incongruent with participants' locus of control (i.e., high control condition with an external locus of control or low control condition with an internal locus of control). It was believed that these situations would be the most aversive to participants (Houston) and thus more strongly influence their willingness and intention to binge drink.

METHOD

Participants

College students (N = 158) were recruited from the psychology participant pool at a large Midwestern public university in exchange for class credit. Participants were selected based upon completion of pre-test measures and indicating that they had at least minimal willingness to binge drink. Adolescents reporting no willingness to binge drink are not likely to produce noticeable change in their binge drinking cognitions in a laboratory situation, thus masking the effect of the manipulations. Eligible students were recruited via e-mail, telephone, and through an online psychology research sign-up system.

Pre-test Measures

The following measures were collected in a pre-test session conducted several weeks prior to the experimental session. The pre-test was an in-person mass-testing that occurred in a large lecture hall. Items were presented to participants in the orders described below, though not necessarily immediately, as they were intermixed with items pertaining to other studies.

Willingness to binge drink (Appendix A). Participants were asked to imagine themselves in a hypothetical scenario in which they had consumed multiple alcoholic beverages at a party and felt they had enough when a friend offered them another drink. Participants indicated how willing they would be to have one more drink and more than one drink, using a Likert-type scale from 1 (*not at all willing*) to 7 (*very willing*). Using the same scale, participants also indicated how willing they would be to have four or more drinks (for females) or five or more drinks (for males) in a single sitting. Participants then indicated the maximum number of drinks they would be willing to consume in a single sitting with friends

in the next month, using a 10-point Likert-type scale (*None*, *1-2*, *3-4*, *5-6*, *7-8*, *9-10*, *11-12*, *13-14*, *15-16*, *17 or more*).[1] Lastly, participants were asked to imagine a very stressful day which concluded with them attending a party at which alcohol was available. They had already consumed enough alcohol that they felt they had enough but their friend wanted them to continue drinking. Participants indicated how willing they would be to consume one more drink, two more drinks, or three or more additional drinks, using the above described 7-point scale. These willingness items were standardized and averaged into a composite measure of willingness to binge drink, $\alpha = .84$, providing baseline willingness used as a covariate in hypothesis testing.

Intention/expectation to binge drink (Appendix B). Also while imagining being at a party following a stressful day (described above), participants were asked how much they intended (i.e., planned) to have one more drink, two more drinks, or three or more additional drinks using a Likert-type scale from 1 (*not at all*) to 7 (*definitely*). Using the same scale, participants were also asked their intention to have four or more (for females) or five or more (for males) drinks in a single sitting in the next month and to get drunk in the next month. They were then asked the likelihood (expectation) that they would have four or more (for females) or five or more (for males) drinks in a single sitting, to drink this much regularly (i.e., every weekend), and to get drunk, all in the next month. These three items used a Likert-type scale from 1 (*not at all likely*) to 7 (*very likely*). Lastly, participants were asked how many drinks they intended to consume during their next drinking experience, using a 10-point scale (*None*, *1-2*, *3-4*, *5-6*, *7-8*, *9-10*, *11-12*, *13-14*, *15-16*, *17 or more*). These items were standardized and averaged to provide a baseline for participants' intention/expectation to binge drink, used as a covariate in data analysis, $\alpha = .94$.

Past binge drinking behavior (Appendix C). Participants reported the number of times in the past three months that they had consumed 5 or more drinks in a single drinking episode using a 7-point Likert-type scale (*never*; *once*; *twice*; *3-5*; *6-7*; *8-11*; *12 or more*). This item was reported within descriptive statistics as evidence that binge drinking was prevalent among the sampled population.

Perceived life stress (Appendix D). Participants' recent life stress was assessed using six items such as, "In the last month, how often have you been upset because of something that happened unexpectedly?" (Cohen, Karmarck, & Mermelstein, 1983). They responded using a 5-point Likert-type scale (*never*; *almost never*; *sometimes*; *fairly often*; *very often*). This measure was used to control for baseline stress caused by events outside of the experimental manipulation, $\alpha = .81$.

Internal-external locus of control (Appendix E). Participants' internal-external locus of control was assessed using the abbreviated 11-item measure developed by Valecha and Ostrom (1974), an adaptation of Rotter's (1966) original scale. Participants were presented with a forced choice between two options, one of which represented an internal locus of control and one of which represented an external locus of control. An example is "People's misfortunes result from the mistakes they make" (internal) versus "Many of the unhappy things in people's lives are partly due to bad luck" (external). Internal responses were coded as 0 and external responses as 1; responses were then averaged with high scores representing a more external locus of control and low scores representing a more internal locus of control. Reliability for this scale was low, $\alpha = .57$, although that figure was comparable to the .62 originally reported by Valecha and Ostrom. Locus of control was included as a covariate in

hypothesis testing (due to the results of the randomization check) and analyzed as a potential moderator of the Control x Stress interactions for willingness and intention to binge drink.

Propensity to cope using alcohol (Appendix F). Participants were asked to respond to an abbreviated (9-item) version of the Coping Orientation for Problem Experiences scale (COPE; Carver, Scheier, & Weintraub, 1989). This scale asked participants to evaluate how they typically respond to very stressful situations. Of particular interest were three items related to coping using substances (e.g., "[I] use alcohol or other drugs to make myself feel better"). Participants responded to each statement using a Likert-type scale from 1 (*I don't do this at all*) to 4 (*I do this a lot*). Participants were also asked three items regarding the extent to which they believed that drinking regulated affect (i.e., improved their mood, relieved stress, and gave them a sense of control) using a Likert-type scale from 1 (*not at all*) to 7 (*very much*). This affect regulation scale was positively correlated with propensity to cope using alcohol ($r = .37$, $p < .01$), and a factor analysis revealed that the alcohol COPE and affect regulation scales held together as one scale when the item "In general, to what extent do you think drinking gives you a sense of control?" was removed. The remaining five items were standardized and averaged, $\alpha = .77$. This coping scale was analyzed as a potential moderator of the hypothesized effects.

Self-control (Appendix G). Participants completed the brief (13-item) self-control scale developed by Tangney, Baumeister, and Boone (2004). Participants responded to statements such as "I often act without thinking through all the alternatives" and "I am good at resisting temptation" using a Likert-type scale from 1 (*not at all*) to 5 (*very much*). This measure was used as a covariate in analysis, $\alpha = .82$.

Perceived stress of experimental conditions (Appendix H). Participants were asked two items regarding how stressful they found public speaking and essay writing. Both items were answered using a Likert-type scale with anchors at 1 (*not at all stressed*), 4 (*somewhat stressed*), and 7 (*extremely stressed*). These items were compared to justify the use of a speech and an essay as effective stress manipulations for the target population.

Experimental Measures

All measures were presented via computer using MediaLab (*Empirisoft,* 2004). The order of items was fixed as described below, with the exception that the willingness and intention measures were counterbalanced between subjects.

Willingness to binge drink (Appendix I). Participants were asked to imagine themselves in a hypothetical scenario in which they were stressed from a day in which they slept through a class, completed a difficult exam on which they believed they performed poorly, and had an argument with a significant other. That evening, they were at a friend's apartment and had already consumed enough alcohol that they felt they had enough when another friend that they had not seen in a while arrived, began a conversation with them, and offered to get them another drink. Participants indicated how willing they would be to have one more drink, two more drinks, or three or more additional drinks, using a Likert-type scale from 1 (*not at all willing*) to 7 (*very willing*). The average of these three items served as one of the dependent measures, $\alpha = .91$.

Intention to binge drink (Appendix J). Participants were asked to imagine the same scenario described above in which they had a stressful day and now found themselves drinking alcohol at a friend's apartment. Participants reported whether they would intend (i.e., plan) to have one more drink, two more drinks, or three or more additional drinks in that

situation, using a Likert-type scale from 1 (*not at all*) to 7 (*definitely*). The average of the three items served as the other dependent measure, α = .86.

Affect (Appendix K). Participants rated their affective state during the experiment using a list of nine adjectives: happy, panicked, sad, confident, irritated, anxious, relaxed, stressed, and enthusiastic. Participants responded to each adjective using a Likert-type scale ranging from 1 (*not at all*) to 7 (*very*). The overall mood scale showed good reliability, α = .80. This measure was assessed following the alcohol-related items while the participants still believed that more academic tasks were coming, including a speech or essay. This scale acted as a manipulation check, revealing whether the speech task effectively elevated stress beyond that of the essay task. This measure was also used in an internal analysis, estimating willingness and intention to binge drink to the extent that the stress manipulation worked.

Perceived control (Appendix L). Participants were asked how much control they felt they had over stopping the aversive auditory stimulus, using a Likert-type scale from 1 (*no control*) to 7 (*complete control*). This item acted as a manipulation check, revealing whether the presence or absence of the mute button for the aversive auditory stimulus influenced perceived control over the stimulus. This item also served as an independent variable in an internal analysis, measuring the differences between willingness and intention to binge drink to the extent that the perceived control manipulation worked.

Design

Participants were randomly assigned to one of eight cells in a 2 x 2 x 2 factorial design: a stressful (speech) or non-stressful (essay) academic task; high perceived control (having the ability to mute the aversive auditory stimulus) or low perceived control (no

ability to mute the aversive auditory stimulus); and a willingness-intention or intention-willingness question order.

Stress manipulation. Participants in the high stress condition were informed that later in the study they would be required to give a speech on a randomly chosen topic (the specific wording used for these directions is included in Appendix M). They were told that they would have three minutes to prepare the speech after being given the topic, and that they would be observed and evaluated by two graduate students. Specific evaluation criteria were provided, including the clarity and organization of the speech, articulation of their argument, and ability to defend their position. Participants were also informed that following the speech they would be orally critiqued on their performance by the graduate students and told how their performance compared to previous participants. Additionally, in order to raise credibility, a fake phone call was placed in the middle of the study to inform one of the bogus graduate students that the participants had arrived for the study and would be soon ready for the speech (Houlihan et al., 2008).

In the low stress condition, participants were informed that they would be writing a short essay on a randomly chosen topic (the specific wording used for these directions is included in Appendix N). They were told that they would have three minutes to prepare the essay after learning the topic but that it would not be evaluated for style or content; only their opinion on the topic was important. They were also informed that no auditory stimulation would play while they wrote the essay, which they would be given five minutes to complete. In both stress conditions, participants were read an identical list of topics similar to the one they would supposedly be given. Previous research has shown that the speech task effectively

produced higher stress levels among undergraduate college students compared to the essay task (Corcoran & Parker, 1991; Houlihan et al., 2008).

Auditory stimulation. Participants were informed that during the experiment they would listen to an auditory stimulus representative of what college students commonly experience while trying to perform common academic tasks. For all participants, the stimulus was heavy metal music played at approximately 85 decibels, a volume at which music is uncomfortable to listen to but does not cross the threshold of causing pain or hearing damage; this volume level is comparable to a busy metropolitan street (Mayo Clinic, 2005). The auditory stimulus was a mix of the songs "Live from the Russian Compound" and "Practiced Hatred" from the album *Plague Soundscapes* by The Locust (2003). The auditory stimulus was presented to participants via headphones that they wore throughout answering the questionnaire items. All participants were instructed not to remove the headphones until prompted to do so by the computer. Although perceptions of the aversiveness of the stimulus were not explicitly measured, most participants reported in debriefing that the stimulus was unpleasant and detracted from their ability to perform the academic tasks.

Control manipulation. Participants in the high control condition were informed that if they found the auditory stimulus too loud or bothersome that they could mute the stimulus by pressing CTRL+ALT+M on the keyboard. They were told, however, that it would be appreciated that they not mute the stimulus, but that the decision was entirely up to them (the specific wording used for these directions is included in Appendixes M and N). Participants in the low control condition received no instructions regarding muting the auditory stimulus. This technique has been found to be an effective manipulation of control: participants given the option of muting the auditory stimulus, even if they chose not to, perceived significantly

higher control over the situation than participants given no option (e.g., Glass et al., 1969). Additionally, the auditory stimulus presented was constant across participants, as almost all participants asked not to mute the auditory stimulus complied.[2] Written directions on how to mute the stimulus were attached to the computer monitor to ensure that participants did not forget what was said and to keep the directions salient.

Question order. The order in which willingness and intention measures are asked can have an impact on how participants answer those items. Willingness and intention are related constructs that share some variance and answering one tends to influence answers to the other questions (Gibbons et al., 2000). Previous research has found that willingness tends to be higher when reported before, as opposed to after, intention (Pomery, 2004; Reimer, 2006) because the activation of reasoned processing inhibits the reactive path. Intention is less affected by answering willingness first because it is easier to transition from reactive to reasoned processing, but there is still an influence. Thus, the order of willingness and intention items was counterbalanced as a between-subjects factor. Participants, therefore, answered one of two questionnaires with either willingness or intention questions presented first, the other presented second.

Procedure

Scenario. Rather than disclose the true purpose of the experiment, participants signed up for a study titled "Auditory Stimulation and Verbal versus Written Expression," presumably regarding how college students performed academic tasks under varying auditory conditions. Participants completed the experiment either individually or in a pair; for pairs, both participants were assigned to the same perceived control and stress conditions to avoid cross-contamination (the question order condition was still randomly assigned within a

session). Additionally, the room in which participants completed the experiment was randomly assigned. Pilot testing revealed a Partner (alone v. pair) x Participant Gender effect on stress, such that men were more stressed when in a pair and women were more stressed when alone. Therefore, those who participated alone were led to believe another participant was coming but was running late and would start the experiment a few minutes after the real participant.

Manipulations. After providing informed consent, participants were given the cover story and experienced the stress manipulation via oral directions. In all conditions, participants were informed that they would complete a series of academic tasks familiar to most college students, which may have included reading comprehension, answering questions, reporting their own attitudes and opinions, or math problems. To promote participants taking these tasks seriously, they were erroneously informed that the tasks to be performed were good predictors of future college and professional success, and that at the study's conclusion they would be shown how well they performed on these tasks and how their performance compared to a general college population. After hearing these directions, participants were led into individual rooms each containing a computer equipped with headphones (through which the auditory stimulus played) and a mouse.

Participants were told that what they would hear would be randomly chosen but was meant to simulate auditory stimulation that college students may experience while performing academic tasks. They were told that the volume of the stimulus may be unpleasant but would not cause any pain or hearing damage. At this point, the control manipulation was delivered via oral instructions to those participants randomly assigned to the high control condition. While reading all instructions, passages, and answering questions

on the computer, all participants wore headphones and were presented with the aversive auditory stimulus.

Academic tasks and questionnaires. Participants were told that the computer would randomly select tasks for them to complete from a larger database; in actuality, all participants received identical tasks. The first section (Appendix O) gave participants two minutes to read a GRE-practice passage (adapted from "Teach Yourself the GRE") on the invasion of non-indigenous species in the United States. After completion, they were asked three questions, derived from the passage, that were written by the experimenter. Their second task (Appendix P) was to read another GRE-practice passage ("Teach Yourself the GRE") in two minutes, this one regarding the philosophy and criticisms of Ralph Waldo Emerson. For this task, however, they were asked to report the number of spelling and grammatical errors (10) inserted into the passage by the experimenter. In the third section (entitled "College Student Attitudes") the variables of interest regarding binge drinking (willingness and intention) and current affective state were assessed.[3] The final item asked was the perceived control manipulation check.

Debriefing. After completing the academic tasks, the computer prompted participants to remove the headphones and contact the experimenter to move on to the next part of the study. At this point, a debriefing interview began in which participants were probed for suspicion about the purpose of the study. After questioning was over, participants were informed that they would not be delivering a speech or writing an essay. The experimenter then conducted a thorough debriefing to reveal the true purpose of the study and asked participants for their cooperation in keeping the true purpose of the study confidential from other potential participants.

RESULTS

Overview of analyses. Descriptive statistics about the sample are first provided, including participants omitted from data analysis. A correlation matrix is then presented to show how the pre-test, dependent, and manipulation check variables related, and also to designate covariates in hypothesis testing. Manipulation and randomization checks are then described. For hypothesis testing, separate analyses of covariance (ANCOVAs) were conducted for willingness and intention to binge drink, using the experimental manipulations as independent variables. A subsequent hypothesis test analyzing only the dependent variable measured first was also conducted.

Due to a significant minority of participants reporting perceived control and stress incongruent with their assigned conditions, the hypothesis tests were recast as an internal analysis, using self-reported perceived control and stress to create experimental groups. The internal analysis better showed how the manipulated psychological states influenced binge drinking. The internal analysis was also redone using only the dependent measure assessed first in the experiment. Lastly, two potential moderators of these effects were explored: participants' locus of control and propensity to cope using alcohol.

Descriptive Statistics

One non-native English speaker was omitted from data analysis due to self-report of not fully understanding the instructions, and two participants were omitted for suspecting that they would not have to give a speech, leaving $N = 155$ for data analysis (for a breakdown by condition, see Table 1). The sample was 53.5% female ($n = 83$), 94.2% White ($n = 146$), and ranged in age from 18 to 35 with a mean age of 19.67 years ($SD = 2.20$).

Table 1: Cell counts by stress condition, control condition, and question order.

	Willingness Items First		Intention Items First	
	Control Condition			
	Low	High	Low	High
Low Stress Condition	20	19	21	20
High Stress Condition	20	18	19	18

Note. $N = 155$.

As expected, participants rated giving a speech as more stressful ($M = 4.33$, $SD = 1.68$ on a seven-point scale) than writing an essay ($M = 3.11$, $SD = 1.56$), paired-samples $t(154) = 7.80$, $p < .001$. Participants' willingness and intention to binge drink were below the midpoint both at pre-test (Ms = 3.35 and 3.02, respectively, SDs = 1.48 and 1.46, on a seven-point scale) and during the lab session (Ms = 3.39 & 2.94, SDs = 1.48 & 1.40). For the entire sample, willingness and intention did not change significantly between pre-test and experiment, repeated measures ts (154) = 0.40 & -0.74, ps > .05. These results suggested that participants answered the drinking items consistently regardless of situation (large mass testing session versus private room). At pre-test, 70.4% ($n = 109$) of participants reported binge drinking within the past three months, with a median of 3-5 binge drinking experiences. This rate was comparable to that for the sampled population (62.3%), but far exceeded national estimates of 44.0% (CASA, 2007; O'Malley & Johnston, 2002; Wechsler et al., 2002). Despite reporting low willingness and intention to binge drink, many participants were, in fact, engaging in the behavior. Given that binge drinking experience was *not* an inclusion criterion, these results showed the relevance of this study to the population at hand.

Correlations

Experimental measures of willingness and intention to binge drink were strongly correlated, $r = .84$, $p < .001$. Additionally, these measures were significantly correlated with previous willingness and intention to binge drink (both selected *a priori* as covariates), self-control, and propensity to cope using alcohol (see Table 2 for complete correlation matrix). Due to this covariance, self-control was added as a covariate in hypothesis testing; propensity to cope using alcohol was explored separately as a potential moderator. Also, perceived control and self-reported stress during the experiment were negatively correlated ($r = -.16$), but this coefficient failed to reach significance. As expected from earlier research, locus of control and perceived life stress were significantly correlated, $r = .36$, $p < .001$, such that participants reporting an external locus of control also reported higher levels of stress at pre-test than participants reporting an internal locus of control. However, neither locus of control nor perceived life stress significantly correlated with binge drinking willingness, intention, or behavior at pre-test, an unexpected finding given the strong associations established between these variables in earlier studies (e.g., Adalbjarnardottir & Rafnsson, 2001; Bearinger & Blum, 1997; Wills, 1986, 1990, 1994)

Table 2: Correlations between dependent, pre-test, and manipulation check variables.

	1	2	3	4	5	6	7	8	9
1. T1 BW	-----								
2. T2 BW	**.64**	-----							
3. T1 BIBE	**.80**	**.48**	-----						
4. T2 BI	**.58**	**.84**	**.50**	-----					
5. SC	**-.28**	*-.22*	*-.22*	*-.23*	-----				
6. LOC	-.08	-.01	-.04	-.05	-.17	-----			
7. PLS	-.07	.02	-.10	-.12	*-.25*	**.36**	-----		
8. COPE	**.50**	**.45**	**.57**	**.60**	**-.35**	.14	.15	-----	
9. SI	.01	.01	.08	.10	.03	.06	.20	.10	-----
10. PC	.02	.06	.02	.03	-.07	.04	.03	.09	-.16

Note. Bolded correlations significant at $p < .001$; italicized correlations significant at $p < .01$; underlined correlations significant at $p < .05$.
T1 BW = Willingness to binge drink at pre-test; T2 BW = willingness to binge drink post-manipulation; T1 BIBE = Intention/Expectation to binge drink at pre-test; T2 BI = intention to binge drink post-manipulation; SC = self-control (higher values = better self-control); LOC = locus of control (higher values = external LOC); PLS = perceived life stress; COPE = propensity to cope using alcohol; SI = stress index; PC = perceived control

Manipulation Checks

Control manipulation. The effectiveness of the control manipulation was tested with an analysis of variance (ANOVA), using control condition (0 = low control; 1 = high control) and stress condition (0 = essay/low stress; 1 = speech/high stress) as the independent variables and the perceived control item as the dependent variable. The main effect for control condition was significant, F (1, 151) = 39.21, $p < .001$. As expected, participants informed that they could mute the stimulus perceived they had more control over the stimulus (M = 5.03, SE = 0.23) than those not given those instructions (M = 2.98, SE = 0.23). Importantly, the main effect of the stress manipulation, F (1, 151) = 2.32, p = .13, and the Control x Stress interaction, F (1, 151) = 0.46, p = .50, both proved non-significant. These results indicated that the control manipulation worked effectively: the presence/absence of

the mute button influenced participants' perceived control over the aversive stimulus, but the stress manipulation did not influence this perception.

Stress manipulation. A factor analysis was performed on the overall mood scale, revealing a negative affect index composed of the items 'stressed,' 'anxious,' 'panicked,' 'sad,' and 'irritated.' This index displayed good reliability, $\alpha = .73$; removal of the items 'sad' and 'irritated' created a more reliable (and more conceptually consistent) stress index, $\alpha = .75$. To test whether the stress manipulation worked as planned, an ANCOVA was conducted on the stress index with control and stress conditions as the independent variables, and perceived life stress (from pre-test) as a covariate (this variable significantly correlated with the stress index, $r = .20$, $p < .05$). The effect of stress condition on the stress index was significant, $F\ (1, 148) = 4.93$, $p < .05$, and in the anticipated direction (high stress $M = 3.61$, $SE = 0.19$; low stress $M = 3.03$, $SE = 0.18$). The main effect for control condition was not significant, $F\ (1, 148) = 0.60$, $p = .44$, nor was the Control x Stress interaction, $F\ (1, 148) = 0.17$, $p = .68$. These findings supported the assertion that the stress manipulation operated as designed, with the speech eliciting more stress than the essay. Importantly, the control manipulation exhibited no main or interactive effect on the stress index, thus not confounding stress condition with control condition (as occurred in Higgins & Marlatt, 1975).

Gender effects. An ANCOVA was performed with participants' gender (0 = female; 1 = male), presence of another participant (0 = absent; 1 = present), and stress condition as the independent variables, the stress index as the dependent variable, and perceived life stress as a covariate. There was no significant main effect or interactions for presence of another participant, demonstrating that the change in protocol from pilot testing (making those who participated alone believe they would be joined later by another participant) was effective. A

marginally significant Gender x Stress interaction emerged, F (1, 144) = 3.30, $p < .08$. Females did not show a significant difference between stress conditions, t (81) = 0.44, p = .67 (high stress M = 2.93, SE = 0.19; low stress M = 2.87, SE = 0.20), but males did, t (70) = 2.41, $p < .05$ (high stress M = 3.48, SE = 0.26; low stress M = 2.64, SE = 0.20). The means for both genders, however, were in the anticipated direction, with the speech eliciting more stress than the essay. An ANOVA was conducted with participant gender, presence of another participant, and control condition as independent variables, and perceived control as the dependent variable: only the significant main effect for control condition was found. Due to the different reactions to the stress manipulations exhibited by males and females, participant gender was controlled for in hypothesis testing.

Experimenter effects. Three different experimenters conducted the study: one male graduate student, one male undergraduate, and one female undergraduate. Participants' self-reported stress was in the anticipated direction for the two male experimenters, t (84) = 2.82, $p < .05$ and t (25) = 1.87, $p < .08$, respectively; stress was in the opposite direction as expected for the female experimenter, but the difference was not significant, t (40) = -1.41, p = .17 (Ms = 3.13 & 2.58, SDs = 1.28 & 1.10, respectively). An ANCOVA was conducted on the stress index with participant gender, experimenter gender (0 = male experimenters; 1 = female experimenter) and stress condition as independent variables. A significant Experimenter x Stress interaction emerged (controlling for perceived life stress), F (1, 144) = 6.92, $p < .01$. No significant experimenter effects were found for perceived control. Due to the impact of experimenter gender on participants' self-reported stress, experimenter gender was controlled for in further analyses.

Randomization Checks

To test whether randomization worked to minimize pre-existing differences between groups, multiple ANOVAs were conducted on measures collected at pre-test with control condition, stress condition, and question order (0 = willingness first; 1 = intention first) as independent variables. No significant differences emerged between groups on measures of previous binge drinking willingness or intention/expectation; perceived life stress; self-control; or propensity to cope using alcohol. A significant Control x Stress x Order interaction emerged for locus of control, F (1, 143) = 4.17, $p < .05$; therefore, locus of control was added as a covariate to hypothesis testing to account for the failure of randomization.[4]

Hypothesis Tests

Hypotheses. It was hypothesized that manipulated control, stress, and question order would interact to predict willingness and intention to binge drink. For each dependent variable, it was predicted that a main effect of stress would be found such that high stress would elicit more willingness/intention to binge drink. For willingness, specifically, it was predicted that no differences would be found when stress was low, but that willingness would be highest when control was high and stress was high. For intention it was predicted, again, that no differences would be found when stress was low, but that intention would be highest when control was low and stress was high. It was also hypothesized that the Control x Stress interactions would be stronger when the respective dependent variable (willingness or intention) was answered first among the questionnaire items.

Willingness. To test whether the manipulations affected the reactive path to binge drinking (via willingness), an ANCOVA was conducted on willingness to binge drink, with control condition, stress condition, and question order as the independent variables and

participant gender, experimenter gender, locus of control, self-control, perceived life stress, and previous willingness to binge drink as covariates. No significant main effects or interactions were found, failing to support the hypothesis that manipulated control, stress, and order would interact to affect willingness to binge drink.

Intention. A similar ANCOVA with intention to binge drink as the dependent variable and previous intention/expectation (instead of previous willingness) as a covariate was performed to test whether the manipulations affected the reasoned path to binge drinking. A marginally significant main effect of order emerged, F (1, 133) = 3.71, $p < .06$. As expected, intention to binge drink was higher when participants answered the intention items before (M = 3.10, SE = 0.14) rather than after (M = 2.72, SE = 0.14) the willingness items (Pomery 2004; Reimer, 2006). No other significant main effects or interactions were found, again showing no evidence of control, stress, and order interacting to influence binge drinking.

Question order. As earlier explained, answering willingness or intention items tends to influence how one answers the other (Gibbons et al., 2000); thus, hypothesis testing was redone analyzing as the dependent variable only whichever measure (willingness or intention to binge drink) was answered first, with question order acting as a proxy for measure. An ANCOVA was performed on the binge drinking cognition answered first (willingness or intention) on control condition, stress condition, and question order, controlling for participant gender, experimenter gender, locus of control, self-control, perceived life stress, and previous willingness or intention/expectation to binge drink (respective to which measure was answered first). No significant main effects or interactions were found.[5]

Internal Analysis

A further analysis was conducted of how effectively the experimental manipulations induced in participants the anticipated feelings of perceived control and stress. In both instances (but more so for stress) it was found that a significant minority of participants experienced perceived control and stress incongruent with their assigned conditions. Because of this discrepancy, an internal analysis was performed using median-splits for both perceived control (*Mdn* = 4.0) and the stress index (*Mdn* = 3.0) to create high/low groups for each variable. For perceived control, the high group had *n* = 91, including 29 participants who experienced the low control manipulation, and the low group had *n* = 64, including 13 participants who experienced the high control manipulation. For stress, the high group had *n* = 79, including 33 participants who experienced the low stress manipulation, and the low group had *n* = 76, including 33 participants who experienced the high stress manipulation (see Table 3).

Table 3: Internal analysis cell counts by stress index (median-split), perceived control (median-split), and question order.

	Willingness Items First		Intention Items First	
	Perceived Control			
	Low	High	Low	High
Low Stress	12	21	14	29
High Stress	23	21	15	20

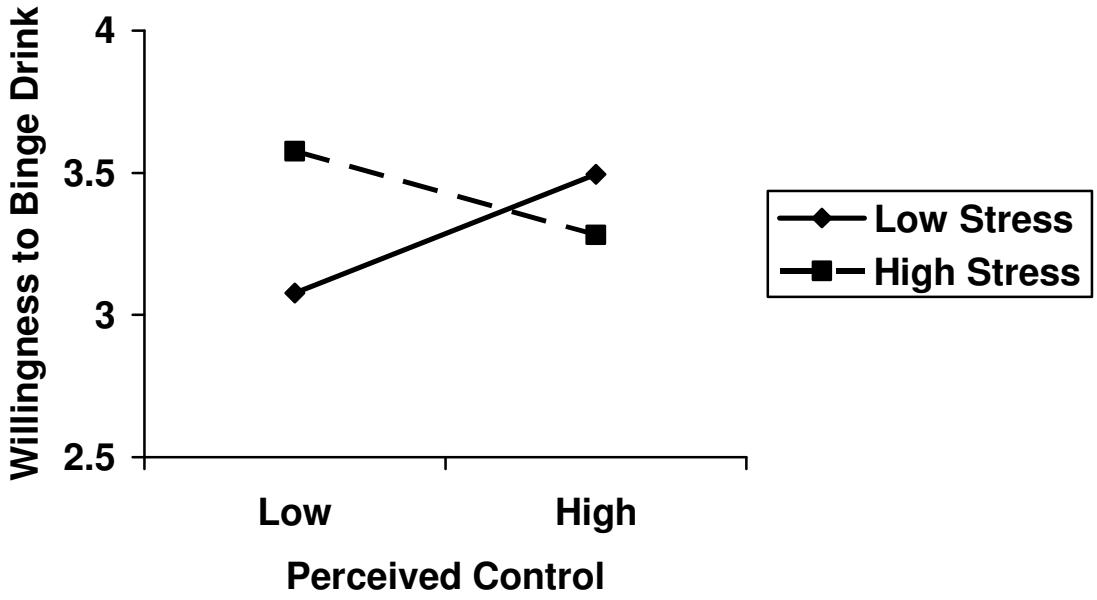
Note. *N* = 155.

Self-selection bias. Checks were conducted to determine whether any pre-test variables influenced the group to which participants belonged for the internal analysis. ANOVAs for previous willingness to binge drink, intention to binge drink, self-control, perceived life stress, locus of control, and propensity to cope using alcohol all showed no

significant effects, indicating that no self-selection bias occurred in creating new groups for the internal analysis. Because locus of control was now statistically equivalent between groups, it was omitted as a covariate. Additionally, because the experimental conditions were defined by the individual effectiveness of the manipulations, covariates previously found to influence stress (participant gender, experimenter gender, and perceived life stress) were removed from the internal analysis ANCOVAs so as to avoid redundancy (i.e., the median-split of the stress index should already account for all sources of variation influencing stress).

Willingness. An ANCOVA was conducted on willingness to binge drink with median-splits of perceived control and the stress index, as well as question order, as independent variables, and previous willingness to binge drink and self-control as covariates. A marginally significant Perceived Control x Stress Index interaction emerged, F (1, 144) = 3.34, p = .07. As seen in Figure 4, willingness to binge drink was, as expected, highest when perceived control was low and stress was high (M = 3.58, SE = 0.19), but unexpectedly was also high when perceived control was high and stress was low (M = 3.50, SE = 0.17). Willingness was lowest when perceived control and stress were both low (M = 3.08, SE = 0.23) or both high (M = 3.28, SE = 0.18). A series of one-way ANCOVAs (controlling for previous willingness and self-control) were performed to explore which group means were significantly different from one another: the low perceived control / low stress group was marginally different from the low perceived control / high stress group, F (1, 59) = 3.14, p < .09.

Figure 4. Willingness to binge drink by perceived control and stress index.



Intention. A second ANCOVA was performed with intention to binge drink as the dependent variable, perceived control (median-split), stress (median-split), and question order as independent variables, and previous intention/expectation to binge drink and self-control as covariates. Only a significant main effect for order was found, F (1, 144) = 5.48, p < .05. As discovered in hypothesis testing, intention was higher when it preceded willingness (M = 3.15, SE = 0.14) rather than followed it (M = 2.67, SE = 0.14). These findings did not support the hypothesis that stress and control would interact to affect binge drinking via the reasoned path; it appears that the more contextually stable intention (compared to willingness) was robust against the experimental situation.

Question order. Due to the unexpected findings with the question order manipulation, and the high correlation between experimental willingness and intention to binge drink (r = .84, p < .001), the internal analysis was conducted again analyzing only the item that was

answered first (described in hypothesis testing). An ANCOVA was performed on the binge drinking cognition answered first (willingness or intention) with perceived control (median-split), stress (median-split), and question order (a proxy for measure) as independent variables and previous willingness or intention/expectation and self-control as covariates. A marginally significant Perceived Control x Stress Index interaction was found, F (1, 144) = 3.07, $p < .09$. The pattern was similar to the one depicted in Figure 4, with the highest binge drinking cognitions (willingness or intention) reported by those that experienced low perceived control and high stress ($M = 3.58$, $SE = .20$) and the lowest reported by those that experienced low perceived control and low stress ($M = 3.10$, $SE = .24$).

Moderation analyses

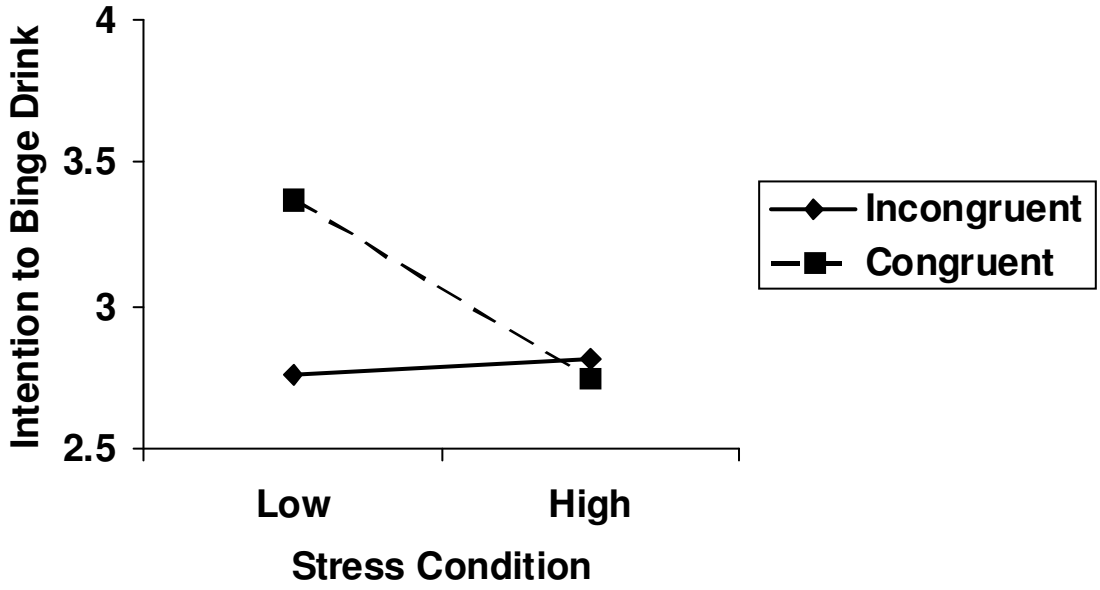
Locus of control. Based on the findings of Houston (1972), it was hypothesized that the Control x Stress interaction would be moderated by locus of control, such that willingness and intention to binge drink would be more influenced when participants' locus of control was incongruent with the control condition to which they were assigned. Participants were classified as external or internal based on whether they answered above or below the midpoint (5.5), respectively, on the locus of control scale. In general, the sample reported a predominantly internal locus of control ($n = 109$), with only 41 participants classified as external. Because participants' locus of control likely determined their self-reports of perceived control and, perhaps, stress in the experimental session, these analyses were conducted with the randomly assigned control and stress conditions as independent variables, not the median splits from the internal analysis. Also, participant gender, experimenter gender, and perceived life stress were once again used as covariates because these variables affected participants' stress during the experiment. Because hypothesis testing

and the internal analysis revealed inconsistent effects for question order on willingness to binge drink, analyses were collapsed across order.

An ANCOVA was performed on willingness to binge drink with control condition, stress condition, and locus of control (0 = internal and 1 = external) as independent variables and participant gender, experimenter gender, previous willingness to binge drink, perceived life stress, and self-control as covariates. No significant main effects or interactions emerged.

A similar ANCOVA was performed with intention to binge drink as the dependent variable and previous intention/expectation to binge drink as a covariate (in place of previous willingness). The three-way Control Condition x Stress Condition x Locus of Control interaction was significant, F (1, 134) = 5.22, $p < .05$ (depicted in Figure 5 with Control Condition and Locus of Control collapsed). Intention was highest when participants' locus of control and their assigned control condition were congruent (i.e., participants had internal locus of control and were in the high control condition, or had external locus of control in the low control condition), but only when stress was low (internal/high control M = 3.25, SE = 0.25; external/low control M = 3.91, SE = 0.40). For all other conditions, intention to binge drink was relatively low, Ms < 3.06. A series of one-way ANCOVAs showed that the mean for the congruent/low stress group was significantly different from the mean for the incongruent/low stress condition group, F (1, 68) = 5.84, $p < .05$, and marginally different from the mean for the congruent/high stress group, F (1, 59) = 3.60, $p < .07$. For intention, therefore, the highest likelihood of binge drinking was unexpectedly for people feeling the most comfortable: degree of personal control was as they desired and stress was low.[6]

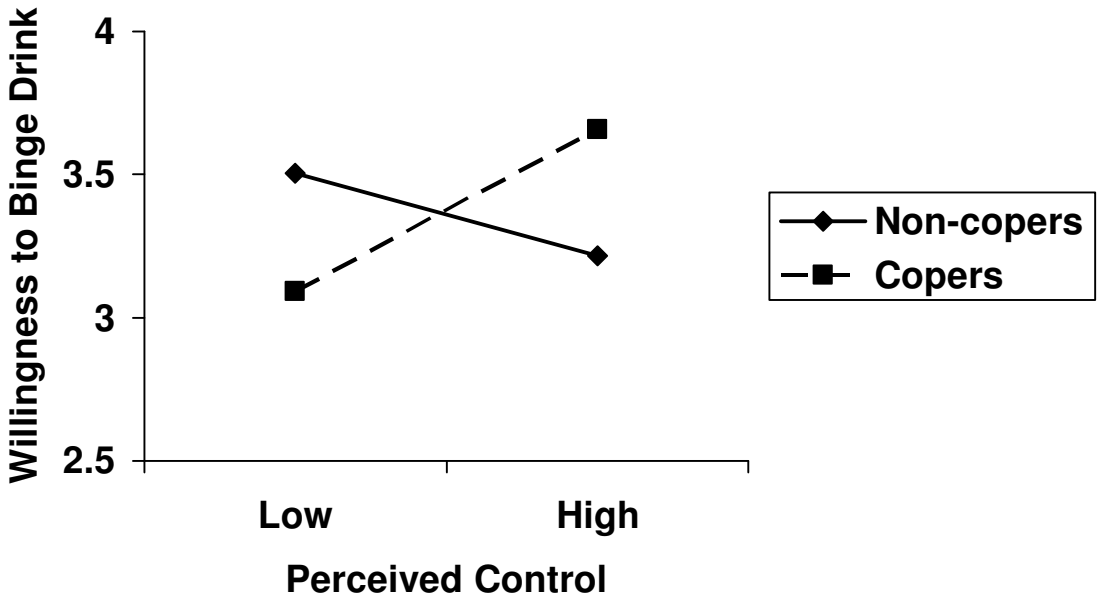
Figure 5. Intention to binge drink by stress condition and control condition/locus of control congruency.



Propensity to cope using alcohol. Propensity to cope using alcohol was explored as a moderator of the Perceived Control x Stress Index interaction found in the internal analysis. In Houlihan et al. (2008), participants under stress were more likely to exhibit increased willingness to use alcohol if they endorsed coping using alcohol. For the current sample, self-reported coping using alcohol (from the COPE; Carver et al., 1989) was extremely low, with an average score of 1.60 (SD = 0.79) on a five-point scale, modal score of one (i.e., no tendency to cope with alcohol), and only 20 participants reporting on the upper half of the scale. The coping scale, comprised of the three alcohol-related items from the COPE and two items from the affect regulation scale, was split at the median (Mdn = -0.21) to create groups of participants who reported a low tendency to cope using alcohol (non-copers; n = 79) and those that reported a high tendency to cope using alcohol (copers; n = 75).

An ANCOVA was performed (again, collapsed across question order) on willingness to binge drink with perceived control (median-split), stress index (median-split), and coping using alcohol (median-split; non-copers = 0; copers = 1) as independent variables and previous willingness to binge drink and self-control as covariates (because the internal analysis independent variables were used, participant gender, experimenter gender, locus of control, and perceived life stress were again no longer necessary as covariates). No significant main effects were found. A significant Perceived Control x Coping interaction was found, F (1, 143) = 4.97, $p < .05$ (additionally, a marginally significant Perceived Control x Stress Index interaction was still present, F [1, 143] = 2.99, $p < .09$). As depicted in Figure 6, willingness to binge drink was highest for copers with high perceived control (M = 3.66, SE = 0.18) and non-copers with low perceived control (M = 3.50, SE = 0.21), and lowest for copers with low perceived control (M = 3.22, SE = 0.21) and non-copers with high perceived control (M = 3.09, SE = 0.17). A series of one-way ANCOVAs (controlling for previous willingness and self-control) revealed a significant difference between non-copers and copers who experienced high perceived control, F (1, 74) = 3.76, $p < .05$, and a marginally significant difference between non-copers and copers who experienced low perceived control, F (1, 58) = 2.94, $p < .10$. Also, a marginally significant difference emerged between copers who experienced low perceived control and copers who experienced high perceived control, F (1, 74) = 3.67, $p < .06$. These results indicated that copers were more likely to binge drink when they had a sense of control over their situation, whereas non-copers were more likely to binge drink when they felt out of control.

Figure 6. Willingness to binge drink by perceived control and propensity to cope using alcohol.



A similar ANCOVA was performed on intention to binge drink using the same independent variables, substituting previous intention/expectation as a covariate for previous willingness and still collapsing across order. The Perceived Control x Coping interaction was marginally significant, F (1, 143) = 3.78, $p < .06$, and the same pattern emerged as with willingness but with lower adjusted means (copers with high control: $M = 3.32$, $SE = .19$; non-copers with high control: $M = 2.91$, $SE = .23$). No other significant main effects or interactions emerged.[7]

DISCUSSION

In this study, participants experienced a stress manipulation (giving a speech versus writing an essay) and a perceived control manipulation (ability to avert an aversive auditory stimulus). While experiencing these manipulations, they answered items regarding their willingness and intention to binge drink. It was hypothesized that these psychological states (perceived control and stress) would interact to influence binge drinking cognitions, such that high stress would increase the likelihood of alcohol use, and perceived control would influence whether that increase was reflected via willingness or intention to binge drink, with high control activating the reactive path (willingness) and low control activating the reasoned path (intention). It was also hypothesized that an order effect would emerge such that the Control x Stress interaction would be more evident when the respective dependent variable was the first one answered by participants during the experiment.

Perceived Control x Stress Interaction

Despite encouraging results from the manipulation checks, the hypotheses were not supported when using the experimental conditions as independent variables in data analyses. Further exploration showed that a significant minority of participants experienced perceived control and stress during the experiment incongruent with their randomly assigned conditions. An internal analysis, in which self-reported perceived control and stress were median-split to create new conditions, did support the hypothesis that perceived control and stress would interact to influence binge drinking cognitions, but the pattern of this interaction was unexpected. No variables from hypothesis testing, the internal analysis, or moderation analyses were found to significantly interact with question order.

It is not surprising that the manipulations influenced the reactive and more malleable willingness more so than intention. As expected, the highest willingness to binge drink was found among participants who experienced low perceived control and high stress. These participants were, in a sense, in the most unsettling condition in the experiment, experiencing both low perceived control over an aversive stimulus and high stress from the experimental situation. This combination of both aversive factors one would expect to prompt alcohol use.

The most surprising group was those who experienced high perceived control and low stress, as their willingness was nearly as high as those in the low perceived control/high stress group. The high perceived control/low stress group approximated a control condition: they were not under stress and felt they had control over the aversive stimulus, thus the situation was not very unsettling to them. Comparing willingness to binge drink for this group and the low perceived control/high stress group (*M*s = 3.50 & 3.58, respectively) to overall willingness from pre-test (*M* = 3.35), these groups experienced a slight increase in their willingness. This finding makes sense for the low perceived control/high stress group, as they experienced a highly aversive situation and would be expected to react in a maladaptive fashion. This finding is unexpected for the high perceived control/low stress group, as they should have been in a state of ease; however, their reactions may be better explained via the reactions of the two groups yet mentioned.

The lowest willingness was exhibited by the groups who experienced high perceived control and high stress (*M* = 3.28) or low perceived control and low stress (*M* = 3.08). In each of these conditions, participants experienced one aversive state (low perceived control or high stress) and one non-aversive state (high perceived control or low stress). In either case, it appeared that the situation elicited a reduction (compared to pre-test, *M* = 3.35) in

willingness to binge drink. All groups were encouraged to perform well on the academic tasks presented: these groups, having experienced a substantial handicap (either the low perceived control or the high stress), may have been more focused on overcoming the disadvantage and performing well compared to the other two groups. Participants in the high perceived control/high stress group may have felt that the situation was challenging but that they had control enough to perform well on the tasks; those in the low perceived control/low stress group may have been more bothered by the aversive noise, but because they were not stressed they were able to focus on the academic tasks. These participants also may have been in an academic mindset induced by the types of tasks presented (e.g., a speech or an essay), one that is not conducive to binge drinking. Such an explanation is supported by the findings of Corcoran and Parker (1991): no differences in alcohol consumption were found between groups asked to give an embarrassing speech versus write an essay. Perhaps in that situation, as well, participants were focused on the academic tasks and using alcohol, despite being stressed, was still perceived as a hindrance to success.

This explanation illuminates what may have occurred with the other two groups. The low perceived control/high stress group, despite trying to perform well on the tasks, may have "given up" by the time they reached the binge drinking questionnaire, as they perceived they had no control over the aversive stimulus *and* were stressed about the upcoming tasks. Also, many participants reported in debriefing that they found the reading tasks quite difficult, so given low perceived control and high stress, these participants may have had cause to accept poor performance and endorse binge drinking. For the high perceived control/low stress group, they may have experienced a sense of relaxation that induced higher willingness to drink. These participants may have entered the laboratory expecting to be

academically challenged, only to experience a low stress situation in which they had control over the aversive stimulus. Thus, their anxiety may have decreased from before the experiment, prompting alcohol use (Pihl & Yankofsky, 1979; Volpicelli, 1987). Also, the situation may have produced such low stress as to fail to induce an academic mindset (i.e., they "blew it off"), thus not inhibiting beliefs about the utility of alcohol use, as may have occurred among those groups exhibiting low willingness to binge drink (i.e., high perceived control/high stress, low perceived control/low stress).

This explanation is supported by findings from a recent study of African-Americans' willingness to use substances (Gibbons et al., 2008). In this study, young adult African-Americans were asked to imagine a situation at work that was either stressful due to racial discrimination; stressful, but not due to racial discrimination; or non-stressful. As expected, imagining racial discrimination at the workplace elicited willingness significantly above the non-stressful condition; however, imagining a stressful non-discriminatory situation elicited willingness that was not significantly different from the non-stressful condition. The authors argued that thinking about work while under stress was not conducive to considering substance use unless the additional stressor of racial discrimination was involved. In this same sense, the results of the present study suggested that attempting academic tasks while experiencing low perceived control or high stress retarded willingness to binge drink if there was a buffering element (high perceived control or low stress) present. In these situations, participants may have been trying to do well on the tasks as instructed and alcohol use may have been perceived to be contradictory to their present goal.

Moderation by Locus of Control

It was hypothesized that locus of control would moderate the Control x Stress interaction such that effects would be stronger when the control manipulation was contrary to one's generalized sense of control (Houston, 1972). Willingness was not influenced by locus of control, but a significant Control x Stress x Locus of Control interaction emerged for intention. The pattern, however, was opposite from hypothesized: the highest intention was found when the control condition and participants' locus of control were congruent. Internals (i.e., people who generally believe they control their environment) had high intention when given control, whereas externals (i.e., people who generally believe that outside forces control their environment) had high intention when lacking control; however, both effects only emerged when stress was low.

Similar to willingness to binge drink for the high perceived control/low stress group, intention was highest when people felt most at ease. According to Burger and Cooper (1979), internals have a tendency to prefer control whereas externals have a tendency to prefer a lack of control; therefore, internals (as expected) would be more at ease when given control over the aversive stimulus, but externals may have been more at ease when given no control. These participants may have been experiencing relief over the situation matching their preferred level of control. This finding may explain why Higgins and Marlatt (1975) failed to find an effect of perceived control on alcohol use; they assumed that control is beneficial, but by failing to account for locus of control, the effect may have been washed out by participants who experienced incongruent situations.

When the control condition was incongruent with participants' locus of control, intention appeared to decrease. These conditions may have elicited participants' desire to

change their situation, and binge drinking may not have been perceived as a way to accomplish such a goal. These findings appear to question the assumption that need for control is a universal human drive (Hui & Bateson, 1991), supporting the idea that people with an external locus of control may generally desire to lack control (Burger & Cooper, 1979). Still, intention to binge drink was lower for the congruent/low stress internals (M = 3.28) than the congruent/low stress externals (M = 3.89), suggesting that people with an internal locus of control may still be less apt to use alcohol than those with an external locus of control (Adalbjarnardottir & Rafnsson, 2001; Bearinger & Blum, 1997; Cox & Luhrs, 1978; Hussong & Chassin, 1997; Newcomb & Harlow, 1986; Wills, 1994).

Moderation by Propensity to Cope with Alcohol

Propensity to cope using alcohol also emerged as a moderator of how perceived control influenced binge drinking. Because propensity to cope using alcohol and affect regulation were strongly and positively correlated, $r = .37$, $p < .01$, these measures were combined; thus, copers tended to hold positive beliefs about alcohol's ability to regulate affect, whereas non-copers tended to hold negative beliefs. A Perceived Control x Coping interaction emerged for both willingness and intention to binge drink with similar patterns, although the means for intention were lower than those for willingness. The highest willingness and intention were exhibited by copers who experienced high perceived control and non-copers who experienced low perceived control.

These results suggested that people with a propensity to cope using alcohol may tend to do so when they feel in control of the situation. For copers, using alcohol when feeling in control may be a dominant response, a behavior that has become practiced. Perhaps alcohol use is proactive for copers, an attempt to regulate affect before it can be negatively

influenced by the situation. People who reported low propensity to cope using alcohol may be more apt to binge drink when feeling out of control, a more reactive response. Perhaps non-copers are more likely to use alcohol to remedy an aversive situation only after it is perceived as beyond control. Because the behavior is uncommon for non-copers, they may have to reach a breaking point before binge drinking occurs. This pattern of results, though, warrants further exploration as it is not altogether clear why these groups are reacting to perceived control in these unique ways.

Limitations

There were several limitations to the study that should be addressed. The reliability for the locus of control scale was low ($\alpha = .57$), although low reliability has been reported for this scale in other research (Valecha & Ostrom, 1974). This finding indicated that this scale may not have been the optimal measure of locus of control and future research may need to use an updated scale, as the scale currently used was written over 30 years ago.

Although most participants reported in debriefing that the auditory stimulus was unpleasant and distracting, it may not have been unpleasant enough to elicit a negative reaction conducive to binge drinking. At only 85 decibels, this volume level or the time of exposure (approximately five minutes before answering the dependent measures) may not have been sufficient to induce in participants a desire to avoid the stimulus. The control manipulation would have been irrelevant without such a desire, as participants given control would not experience relief and those lacking control would not experience distress. Additionally, the manipulation check for perceived control over the auditory stimulus may not have effectively captured the psychological experience of the control manipulation. The single item used was worded to measure whether participants' acknowledged their control (or

lack thereof) over the aversive stimulus. However, when conducting the internal analysis, it may have been more beneficial to have a measure of perceived *environmental* control, not an item specifically indicating control over the aversive auditory stimulation. Such a measure may have shown more clearly how participants were reacting to the experimental situation and may have more strongly influenced binge drinking cognitions.

The academic, laboratory environment was not one conducive to binge drinking cognitions. Although interesting results were found suggesting that proclivity to binge drink may be reduced by performing cognitive tasks or activating an academic mindset, such an environment is rarely one in which binge drinking would occur in real life. By not using academic tasks in the laboratory, or, better yet, by studying perceived control and stress in a bar or party setting where binge drinking might actually occur, willingness and intention to binge drink may be more affected by psychosocial variables because the social environment would allow these cognitions to be more malleable.

Related to this limitation, only one type of stressor, academic (a speech), was used to arouse participants. Other types of stressors may elicit responses that encourage alcohol use while the stressor is present. Both physical stressors (electric shock: Levenson, Sher, Grossman, Newman, & Newlin, 1980) and interpersonal stressors (fear of opposite-sex peer evaluation: Higgins & Marlatt, 1975) have been shown to increase alcohol use while the stressor was being experienced. In both cases, the source of the stress was not associated with a goal state such as academic performance (the current study) or work (Gibbons et al., 2008). Perhaps the nature of the stressor partly determines whether alcohol use may increase (or decrease) as a coping response and whether that change occurs during (Levenson et al., Higgins & Marlatt) or following (Pihl & Yankofsky, 1979) the stressor.

Because willingness and intention to binge drink at pre-test were entered as covariates into the hypothesis tests, change in these cognitions due to the manipulations was, effectively, being measured. Change in these measures from psychosocial influences, especially for the more contextually-stable intention, can be very small in laboratory settings; therefore, it can prove difficult to find significant results when using pre-test measures as covariates. Despite this limitation, significant changes in willingness and intention to binge drink were discovered, although more significant findings may have been found without controlling for pre-test binge drinking cognitions.

A final important limitation is that the significant findings were discovered when conducting an internal analysis using participant self-reports of perceived control and stress. There was enough variance to how participants reacted to the situation to necessitate the use of self-reports of perceived control and stress, as opposed to participants' randomly assigned conditions. Although not ideal, participants' perceptions of perceived control and stress reflected their psychological reality, and such an approach should not harm the validity of the findings.

Future Directions

These results could be expanded upon in several different ways. As mentioned before, it would be beneficial (although difficult) to manipulate perceived control and stress in an environment more conducive to binge drinking, such as a bar or party. It is important to understand how stress and perceived control influence willingness and intention to binge drink within environments in which the behavior might occur. Further study is also needed of people who report a propensity to cope using alcohol because these results suggested that

perceived control (specifically, low perceived control) may be able to buffer that maladaptive response to stress.

In line with findings from the non-discriminatory stress scenario in Gibbons et al. (2008), the current study found that aversive scenarios involving academic work appeared to decrease willingness to binge drink. Future research should attempt to tap into whether participants exposed to these conditions utilized an academic mindset. These measures could be direct, such as asking participants to report how much effort they expended on the academic tasks or how much importance they placed on good performance on these tasks, or indirectly, perhaps through an implicit association test using academic and non-academic words. Such an approach could also explore directly whether reasoned or reactive processing was being used by participants exposed to the perceived control manipulations, rather than assuming processing style from the effects on willingness and intention. Such research could indicate that engaging college students in an academic mindset could be a useful intervention against binge drinking.

The current findings are illuminated by Volpicelli's (1987) insights on stress and alcohol use, which asserted that alcohol consumption decreases during a stressful event because the person is attempting to alleviate the situation and alcohol typically does not facilitate that goal, but increases immediately following the stressful event as a way to induce endorphin production. Such a result has been found in an academic setting (Pihl & Yankofsky, 1979) and using a stressful speech paradigm (Corcoran & Parker, 1991). In the current study, participants who experienced academic stress may not have been willing to binge drink because they were task-focused and attempting to perform well despite considerable obstacles. Had they been asked about binge drinking after the experiment was

completed instead of during the experiment, the pattern may have been closer to what was hypothesized, with those who experienced high stress showing the highest willingness and/or intention to binge drink because they experienced the strongest endorphin depletion. A follow-up study could include a condition in which participants actually deliver the impromptu speech (to an audience or via videotape) and are presented with the binge drinking scenarios immediately following to see how their reactions to the situation differ once the stressor has ceased. Again, perceived control could be manipulated to explore whether it interacts with stress to determine how participants react to the cessation of the stressor (via reactive or reasoned processing). Likewise, the effect of perceived control and stress on binge drinking is most likely dependent on whether the stressor is goal-oriented (e.g., academic tasks) or not (e.g., physical pain, interpersonal); type of stressor could be explored as an independent variable in future research.

An interesting finding from pilot testing was that male and female participants reacted differently to the perceived control and stress manipulations dependent on whether or not there was a concurrent participant. For the sake of the current study, the protocol was changed in order to make all participants believe a second participant was coming, whether one was or not, and this change eliminated those effects. How perceived control is influenced by social comparison, however, is a worthwhile question to answer. Glass et al. (1971) found that stress due to uncontrollable noise was highest when another participant (a confederate, in reality) had the ability to avert the noise. The authors conjectured that the detrimental effects of an uncontrollable aversive stimulus on a target were made worse by the target's knowledge that another person was arbitrarily granted control while they were denied it. For some pilot participants in the current study, perceived control may have been influenced by

having another participant present because then their situation was equivalent to someone else's. By openly giving concurrent participants different levels of control over an aversive stimulus, it could be explored whether an absolute or relative level of perceived control is more influential in how one responds to a stressful situation. As with a great deal of other psychological phenomena, it may be the case that relative perceived control is more influential than absolute level of control.

Lastly, desire for control (Burger & Cooper, 1979) is a potential moderator of the effects of perceived control on alcohol use. As evidenced by the Perceived Control x Locus of Control interaction on intention to binge drink, it may be that high perceived control is preferred by internals more so than externals. Previous research has shown that people do vary independently on their locus of control and desire for control (although there is a strong tendency for internals to desire control and externals to not) and different combinations of these traits can produce much different behavioral tendencies (Burger, 1989). Additionally, Burger offered three reasons (self-presentation, probability of obtaining desired outcomes, and predictability) that may prompt an individual to strategically reject control; measuring participants' reactions to the perceived control manipulation and reasons for wanting or not wanting control could further explain how acute states of perceived control can influence adolescents' binge drinking.

Conclusions

The current study provided new evidence as to how perceived control and stress interact to influence binge drinking, especially within a short-term context. The results appeared curvilinear: binge drinking was most likely when perceived control was low and stress high (aversive situation) or when perceived control was high and stress low (relaxed

situation). These results suggested that college students are most likely to binge drink when overwhelmed or when at ease. When perceived control and stress were both high or when perceived control and stress were both low (mixed situations), binge drinking was less likely, possibly because these participants were task-focused and not prone to consider binge drinking. These results suggested that binge drinking may be reduced by engaging college students in challenging (yet not overwhelming) academic situations.

Additionally, an individual difference measure, locus of control, was found to moderate the effect of control condition and stress on binge drinking. Participants were most likely to binge drink when the control condition was congruent with their locus of control and they were under low stress. These results again suggested that college students may be prone to binge drink when most at ease. Additionally, these results contradicted the assumption that high perceived control is psychologically beneficial, suggesting that people have individual preferences for control and are most content when those preferences are met. These results help explain individual reactions to short-term reductions in perceived control and acute stressors, and how such situations may encourage or discourage maladaptive alcohol use.

REFERENCES

Adalbjarnardottir, S., & Rafnsson, F.D. (2001). Perceived control in adolescent substance use: Concurrent and longitudinal analyses. *Psychology of Addictive Behaviors, 15*, 25-32.

Ajzen, I., & Fishbein, M. (Eds.). (1980). *Understanding attitudes and predicting social behavior.* Englewood Cliffs, NJ: Prentice-Hall.

Averill, J.R. (1973). Personal control over aversive stimuli and its relationship to stress. *Psychological Bulletin, 80*, 286-303.

Baer, P.E., Garmezy, L.B., McLaughlin, R.J., Pokorny, A.D., & Wernick, M.J. (1987). Stress, coping, family conflict, and adolescent alcohol use. *Journal of Behavioral Medicine, 10*, 449-466.

Barnes, G.M., & Farrell, M.P. (1992). Parental support and control as predictors of adolescent drinking, delinquency, and related problem behaviors. *Journal of Marriage and the Family, 54*, 763-776.

Bearinger, L.H., & Blum, R.W. (1997). The utility of locus of control for predicting adolescent substance use. *Research in Nursing & Health, 20*, 229-245.

Burger, J.M. (1989). Negative reactions to increases in perceived personal control. *Journal of Personality and Social Psychology, 56*, 246-256.

Burger, J.M., & Cooper, H.M. (1979). The desirability of control. *Motivation and Emotion, 3*, 381-393.

Carver, C.S., Scheier, M.F., & Weintraub, J.K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology, 56*, 267-283.

CASA: The National Center on Addiction and Substance Abuse at Columbia University. (2007, March). Wasting the best and brightest. Retrieved April 17, 2007, from http://www.casacolumbia.org/absolutenm/templates/PressReleases.aspx?articleid=47&zoneid=65.

Chubb, N.H., Fertman, C.I., & Ross, J.L. (1997). Adolescent self-esteem and locus of control: A longitudinal study of gender and age differeneces. *Adolescence, 32*, 113-129.

Clarke, J.H., MacPherson, B.V., & Holmes, D.R. (1982). Cigarette smoking and external locus of control among young adolescents. *Journal of Health and Social Behavior, 23*, 253-259.

Cohen, S., Karmarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*, 385-396.

Corcoran, K.J. (1994). Predicting reduction in tension following alcohol consumption in a stressful situation with the alcohol expectancy questionnaire. *Addictive Behaviors, 19*, 57-62.

Corcoran, K.J., & Parker, P.S. (1991). Alcohol expectancy questionnaire tension reduction scale as a predictor of alcohol consumption in a stressful situation. *Addictive Behaviors, 16*, 129-137.

Cox, W.F., & Luhrs, J.A. (1978). Relationship between locus of control and alcohol and drug-related behaviors in teenagers. *Social Behavior and Personality, 6*, 191-194.

D'Elio, M.A., O'Brien, R.W., Iannotti, R.J., Bush, P.J., & Galper, D.I. (1996). Early adolescents' substance use and life stress: Concurrent and prospective relationships. *Substance Use & Misuse, 31*, 873-894.

Empirisoft. (2004). MediaLab (Version 2004) [Computer software]. New York: Empirsoft Corporation.

Erikson, E.H. (1959). Identity and the life cycle. *Psychological Issues, 1*, Monograph 1.

Evans, G.W., & Carrère, S. (1991). Traffic congestion, peceived control, and psychophysiological stress among urban bus drivers. *Journal of Applied Psychology, 76*, 658-663.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research.* Reading, MA: Addison-Wesley.

Gerrard, M., Gibbons, F.X., Vande Lune, L.S., Pexa, N.A., & Gano, M.L. (2002). Adolescents' substance-related risk perceptions: Antecedents, mediators and consequences. *Risk Decision & Policy, 7*, 175-191.

Gibbons, F.X., Etcheverry, P.E., Stock, M.L., Gerrard, M., Weng, C., Kivinimi, M.T., & O'Hara, R.E. (2008). Exploring the relationship between racial discrimination and substance use: What mediates, what buffers? Manuscript under review.

Gibbons, F.X., & Gerrard, M. (1995). Predicting young adults' health risk behavior. *Journal of Personality and Social Psychology, 69*, 505-517.

Gibbons, F.X., & Gerrard, M. (1997). Health images and their effects on health behavior. In B.P. Buunk & F.X. Gibbons (Eds.), *Health, coping, and well-being: Perspectives from social comparison theory* (pp. 63-94). Hillsdale, NJ: Erlbaum.

Gibbons, F.X., Gerrard, M., Blanton, H., & Russell, D.W. (1998). Reasoned action and social reaction: Willingness and intention as independent predictors of health risk. *Journal of Personality and Social Psychology, 74*, 1164-1180.

Gibbons, F.X., Gerrard, M., & Lane, D.J. (2003). A social-reaction model of adolescent health risk. In J.M. Suls & K.A. Wallston (Eds.), *Social psychological foundations of health and illness* (pp. 107-136). Oxford, England: Blackwell.

Gibbons, F.X., Gerrard, M., Ouellette, J.A., & Burzette, R. (2000). Discriminating between behavioural intention and behavioural willingness: Cognitive antecedents to adolescent health risk. In P. Norman, C. Abraham, & M. Connor (Eds.), *Understanding and changing health behaviour: From health beliefs to self-regulation* (pp. 137-161). Amsterdam: Harwood Academic Publishers.

Glass, D.C., Reim, B., & Singer, J.E. (1971). Behavioral consequences of adaptation to controllable and uncontrollable noise. *Journal of Experimental Social Psychology, 7*, 244-257.

Glass, D.C., & Singer, J.E. (1973). Experimental studies of uncontrollable and unpredictable noise. *Representative Research in Psychology, 4*, 165-183.

Glass, D.C., Singer, J.E., & Friedman, L.N. (1969). Psychic cost of adaptation to an environmental stressor. *Journal of Personality and Social Psychology, 12*, 200-210.

Ham, L.S., & Hope, D.A. (2003). College students and problematic drinking: A review of the literature. *Clinical Psychology Review, 23*, 719-759.

Higgins, R.L., & Marlatt, G.A. (1973). Effects of anxiety arousal on the consumption of alcohol by alcoholics and social drinkers. *Journal of Consulting and Clinical Psychology, 41*, 426-433.

Higgins, R.L., & Marlatt, G.A. (1975). Fear of interpersonal evaluation as a determinant of alcohol consumption in male social drinkers. *Journal of Abnormal Psychology, 84*, 644-651.

Hingson, R.W., Heeren, T., Zakocs, R.C., Kopstein, A., & Wechsler, H. (2002). Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18-24. *Journal of Studies on Alcohol, 63*, 136-140.

Houlihan, A.E., Gibbons, F. X., & Gerrard, M. (2008). Stress and behavioral willingness to drink alcohol: An experimental test. Manuscript in preparation.

Houston, B.K. (1972). Control over stress, locus of control, and response to stress. *Journal of Personality and Social Psychology, 21*, 249-255.

Hui, M.K., & Bateson, J.E. (1991). Perceived control and the effects of crowding and consumer choice on the service experience. *Journal of Consumer Research, 18*, 174-184.

Hussong, A.M., & Chassin, L. (1997). Substance use initiation among adolescent children of alcoholics: Testing protective factors. *Journal of Studies on Alcohol, 58*, 272-279.

Jewell, R.D., & Kidwell, B. (2005). The moderating effect of perceived control on motivation to engage in deliberative processing. *Psychology & Marketing, 22*, 751-769.

Kidorf, M. & Lang, A.R. (1999). Effects of social anxiety and alcohol expectancies on stress induced drinking. *Psychology of Addictive Behaviors, 13*, 134-142.

Knoop, R. (1981). Age and correlates of locus of control. *The Journal of Psychology, 108*, 103-106.

Levenson, R.W., Sher, K.J., Grossman, L.M., Newman, J., & Newlin, D.B. (1980). Alcohol and stress response dampening: Pharmacological effects, expectancy, and tension reduction. *Journal of Abnormal Psychology, 89*, 528-538.

Locust, The. (2003). Live from the Russian compound. On *Plague Soundscapes* [CD]. Epitaph.

Locust, The. (2003). Practiced hatred. On *Plague Soundscapes* [CD]. Epitaph.

Mayo Clinic, The. (2005, March 4). Noise in the workplace: Safeguard your hearing. Retrieved December 4, 2007, from http://www.cnn.com/HEALTH/library/WL/00032.html.

McMahon, S.D., & Jason, L.A. (1998). Stress and coping in smoking cessation: A longitudinal examination. *Anxiety, Stress, and Coping, 11*, 327-343.

Michinov, N. (2005). Social comparison, perceived control, and occupational burnout. *Applied Psychology: An International Review, 54*, 99-118.

National Institute on Alcohol Abuse and Alcoholism. (2000). Health risks and benefits of alcohol consumption. *Alcohol Research & Health, 24*, 5-11.

Newcomb, M.D., & Bentler, P.M. (1986). Frequency and sequence of drug use: A longitudinal study from early adolescence to young adulthood. *Journal of Drug Education, 16*, 101-120.

Newcomb, M.D., & Harlow, L.L. (1986). Life events and substance use among adolescents: Mediating effects of perceived loss of control and meaninglessness in life. *Journal of Personality and Social Psychology, 51*, 564-577.

Newman, I.M. (1970). Adolescent smoking as compensatory behavior. *Journal of School Health,40*, 316-320.

O'Malley, P.M., & Johnston, L.D. (2002). Epidemiology of alcohol and other drug use among American college students. *Journal of Studies on Alcohol, 63*, 23-39.

Penny, G.N., & Robinson, J.O. (1986). Psychological resources and cigarette smoking in adolescents. *British Journal of Psychology, 77*, 351-357.

Pihl, R.O., & Yankofsky, L. (1979). Alcohol consumption in male social drinkers as a function of situationally induced depressive affect and anxiety. *Psychopharmacology, 65*, 251-257.

Pomery, E.A. (2004). The influence of positive and negative affect on willingness and intentions to engage in risky health behaviors. Unpublished Master's thesis, Iowa State University.

Pomery, E.A., Gibbons, F.X., Reis-Bergan, M., & Gerrard, M. (2008). From willingness to intention: Experience moderates the shift from reactive to reasoned behavior. Manuscript in preparation.

Reim, B., Glass, D.C., & Singer, J.E. (1971). Behavior consequences of exposure to uncontrollable and unpredictable noise. *Journal of Applied Social Psychology, 1*, 44-56.

Reimer, R. A. (2006). Semantic priming and health risk: A dual-process approach. Unpublished Master's thesis, Iowa State University.

Rotter, J.B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs: General and Applied, 80*, 1-28.

Schwarz, N. (1999). Self-reports: How the questions shape the answers. *American Psychologist, 54*, 93-105.

Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality, 72*, 271-322.

Tate, S.R., Patterson, K.A., Nagel, B.J., Anderson, K.G., & Brown, S.A. (2007). Addiction and stress in adolescents. In M. al'Absi (Ed.), *Stress and addiction: Biological and psychological mechanisms* (pp. 249-262). Burlington, MA: Academic Press.

Teach Yourself the GRE. (n.d.). Retrieved December 15, 2007, from http://www.west.net/~stewart/gre/qr_read.htm.

Thompson, S.C. (1981). Will it hurt less if I can control it? A complex answer to a simple question. *Psychological Bulletin, 90*, 89-101.

Valecha, G.K., & Ostrom, T.M. (1974). An abbreviated measure of internal-external locus of control. *Journal of Personality Assessment, 38*, 369-376.

Volpicelli, J.R. (1987). Uncontrollable events and alcohol drinking. *British Journal of Addiction, 82*, 381-392.

Wechsler, H., Lee, J.E., Kuo, M., Seibring, M., Nelson, T.F., & Lee, H. (2002). Trends in college binge drinking during a period of increased prevention efforts: Findings from 4 Harvard School of Public Health college alcohol study surveys: 1993- 2001. *Journal of American College Health, 50*, 203-217.

Wechsler, H., & Wuethrich, B. (2002). *Dying to drink: Confronting binge drinking on college campuses*. Emmaus, PA: Rodale Press.

Wills, T.A. (1986). Stress and coping in early adolescence: Relationships to substance use in urban school samples. *Health Psychology, 5*, 503-529.

Wills, T.A. (1990). Stress and coping factors in the epidemiology of substance use. In *Research advances in alcohol and drug problems, vol. 10*. New York, NY: Plenum Press.

Wills, T.A. (1994). Self-esteem and perceived control in adolescent substance use: Comparative tests in concurrent and prospective analyses. *Psychology of Addictive Behaviors, 8*, 223-234.

Wills, T.A., Sandy, J.M., Yaeger, A.M., Cleary, S.D., & Shinar, O. (2001). Coping dimensions, life stress, and adolescent substance use: A latent growth analysis. *Journal of Abnormal Psychology, 110*, 309-323.

APPENDIX A

Pre-test Willingness to Binge Drink

Suppose that you are at a party with friends on a Saturday night. After a few drinks you are beginning to feel that you may have had enough, and you are getting ready to leave. Then a friend you haven't seen for a while starts talking to you and offers to get you another drink. How willing would you be to do each of the following?

A	**B**	**C**	**D**	**E**	**F**	**G**
Not at all willing			**Maybe**			**Very willing**

1. Stay and have one more drink.
2. Stay and continue to drink (more than one drink).

3. Suppose within the next month, you are out drinking with some old friends having a great time. What is the maximum number of drinks you would be willing to have over the course of the evening?

A	B	C	D	E	F	G	H	I	J
None	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17 or more

4. In one sitting, how willing would you be to have 4 or more drinks (for females) or 5 or more drinks (for males)?

A	B	C	D	E	F	G
Not at all willing			Maybe			Very willing

Suppose you've had a very stressful day and that night you are drinking at a party. After a while you have had enough to drink, but your friend wants you to keep drinking with him or her. In this situation, how ***willing*** would you be to…?

A	**B**	**C**	**D**	**E**	**F**	**G**
Not at all willing			**Maybe**			**Very willing**

5. Have one more drink with your friend.
6. Have two more drinks with your friend.
7. Have three or more additional drinks with your friend.

APPENDIX B

Pre-test Intention/Expectation to Binge Drink

Suppose you've had a very stressful day and that night you are drinking at a party. After a while you have had enough to drink, but your friend wants you to keep drinking with him or her. In this situation, how much would you intend (i.e. plan) to…?

A	**B**	**C**	**D**	**E**	**F**	**G**
Not at all			**Maybe**			**Definitely**

8. Have one more drink with your friend.
9. Have two more drinks with your friend.
10. Have three or more additional drinks with your friend.
11. In the next month, do you intend to have 4 or more drinks (for females) or 5 or more drinks (for males) in a single drinking episode?

A	B	C	D	E	F	G
Definitely Not			Maybe			Definitely

12. In the next month, how likely is it that you will have 4 or more drinks (for females) or 5 or more drinks (for males) in a single drinking episode?

A	B	C	D	E	F	G
Not at all likely			Maybe			Very likely

13. How likely is it that you will go out and get drunk in the next month?

A	B	C	D	E	F	G
Not at all likely			Maybe			Very likely

14. Do you intend to go out and get drunk in the next month?

A	B	C	D	E	F	G
Not at all likely			Maybe			Very likely

15. How many drinks do you **intend** to consume the next time you do drink?

A	B	C	D	E	F	G	H	I	J
None	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17 or more

APPENDIX C

Pre-test Binge Drinking Behavior

16. Please indicate how many times you have had 5 or more drinks in a single drinking episode during **the last 3 months:**

A	B	C	D	E	F	G
Never	Once	Twice	3-5	6-8	9-11	12 or more

APPENDIX D

Perceived Life Stress

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate *how often* you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate. For each question choose from the following alternatives:

1	2	3	4	5
Never	Almost never	Sometimes	Fairly often	Very often

In the last month…

17. how often have you felt that you were unable to control the important things in your life?
18. how often have you felt confident about your ability to handle your personal problems?
19. how often have you felt that things were going your way?
20. how often have you found that you could not cope with all the things you had to do?
21. how often have you felt that you were on top of things?
22. how often have you felt difficulties were piling up so high that you could not overcome them?

APPENDIX E

Locus of Control

This is a questionnaire to find out the way in which certain important events in our society affect different people. Each item consists of a pair of alternatives lettered a or b. Please select the one statement of each pair (and only one) which you more strongly believe to be the case as far as you're concerned. Be sure to select the one you actually believe to be more true rather than the one you think you should choose or the one you would like to be true. This is a measure of personal belief; there are no right or wrong answers. Please answer these items carefully but do not spend too much time on any one item. In some instances you may discover that you believe both statements or neither one. In such cases, be sure to select the one you more strongly believe to be the case as far as you're concerned. Also try to respond to each item independently when making your choice; do not be influenced by your previous choices.

23. a. Many of the unhappy things in people's lives are partly due to bad luck.
    b. People's misfortunes result from the mistakes they make.
24. a. In the long run people get the respect they deserve in this world.
    b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he or she tries.
25. a. Without the right breaks one cannot be an effective leader.
    b. Capable people who fail to become leaders have not taken advantage of their opportunities.
26. a. Becoming a success is a matter of hard work; luck has little or nothing to do with it.
    b. Getting a good job depends mainly on being in the right place at the right time.
27. a. When I make plans, I am almost certain that I can make them work.
    b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.
28. a. In my case getting what I want has little or nothing to do with luck.
    b. Many times we might just as well decide what to do by flipping a coin.
29. a. Who gets to be the boss often depends upon who was lucky enough to be in the right place first.
    b. Getting people to do the right thing depends upon ability; luck has little or nothing to do with it.
30. a. Most people don't realize the extent to which their lives are controlled by accidental happenings.
    b. There really is no such thing as "luck."
31. a. In the long run the bad things that happen to us are balanced by the good ones.
    b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.
32. a. Many times I feel that I have little influence over the things that happen to me.
    b. It is impossible for me to believe that chance or luck plays an important role in my life.
33. a. What happens to me is my own doing.
    b. Sometimes I feel that I don't have enough control over the direction my life is taking.

APPENDIX F

Propensity to Cope Using Alcohol

This questionnaire asks you to indicate what you generally do and feel when you experience stressful events. Obviously, different events bring out somewhat different responses, but think about what you usually do when you are under a lot of stress. Then respond to each of the following items by using the response choices listed below. Please try to respond to each item separately in your mind from each other item. There are no "right" or "wrong" answers, so choose your answers thoughtfully and make your choices as true for YOU as possible.

1	2	3	4
I don't do this at all	I do this a little bit	I do this a medium amount	I do this a lot

34. Turn to work or other activities to take my mind off things.
35. Use alcohol or other drugs to make myself feel better.*
36. Get emotional support from others.
37. Give up trying to deal with it.
38. Use alcohol or other drugs to help me get through it.*
39. Try to see it in a different light, to make it seem more positive.
40. I refuse to believe that it happened.
41. I act as though it hasn't even happened.
42. I drink alcohol or take drugs, in order to think about it less.*

* = items of interest (coping with alcohol or other substances)

43. In general, to what extent do you think drinking improves your mood?

A	B	C	D	E	F	G
Not at all						Very much

44. In general, to what extent do you think drinking relieves your stress?

A	B	C	D	E	F	G
Not at all						Very much

45. In general, to what extent do you think drinking gives you a sense of control?

A	B	C	D	E	F	G
Not at all						Very much

APPENDIX G
Self-Control

Using the scale provided, indicate how much each of the following statements reflects how you typically are.

A	B	C	D	E
Not at all				**Very much**

46. I am good at resisting temptation.
47. I have a hard time breaking bad habits.
48. I am lazy.
49. I say inappropriate things.
50. I do certain things that are bad for me, if they are fun.
51. I refuse things that are bad for me.
52. I wish I had more self-discipline.
53. People would say that I have iron self-discipline.
54. Pleasure and fun sometimes keep me from getting work done.
55. I have trouble concentrating.
56. I am able to work effectively toward long-term goals.
57. Sometimes I can't stop myself from doing something, even if I know it is wrong.
58. I often act without thinking through all the alternatives.

APPENDIX H

Perceived Stress of Experimental Manipulations

59. In general, how stressed do you feel when you do any type of public speaking?

1	2	3	4	5	6	7
Not at all stressed			Somewhat stressed			Extremely stressed

60. In general, how stressed do you feel when you do any type of essay writing?

1	2	3	4	5	6	7
Not at all stressed			Somewhat stressed			Extremely stressed

APPENDIX I

Post-Test Willingness and Intention to Binge Drink (Willingness First)

Please think carefully about the following situations. We are not implying that you would ever be in these situations, but try to think about how you would respond if you were.

Suppose you've had a really hard, stressful day. You overslept and missed your early class; in your next class, you had a very difficult exam on which you believed you performed poorly; later you had an argument with your significant other. That evening, you are drinking at a friend's apartment. After an hour or so, you feel you have had enough to drink for the night and are ready to go home. Then a friend you have not seen for a while arrives, begins to talk to you, and offers to get you another drink.

Scale: 1 (*not at all willing*) – 4 (*maybe*) – 7 (*very willing*)

In this situation, how willing would you be to have one more drink with your friend?
In this situation, how willing would you be to have two more drinks with your friend?
In this situation, how willing would you be to have three or more additional drinks with your friend?

Now we want to ask you a different question about this scenario. Please think carefully about the wording before you answer.

Scale: 1 (*not at all*) – 4 (*maybe*) – 7 (*definitely*)

In this situation, how much would you intend (i.e. plan) to have one more drink with your friend?
In this situation, how much would you intend (i.e. plan) to have two more drinks with your friend?
In this situation, how much would you intend (i.e. plan) to have three or more additional drinks with your friend?

APPENDIX J

Post-Test Willingness and Intention to Binge Drink (Intention First)

Please think carefully about the following situations. We are not implying that you would ever be in these situations, but try to think about how you would respond if you were.

Suppose you've had a really hard, stressful day. You overslept and missed your early class; in your next class, you had a very difficult exam on which you believed you performed poorly; later you had an argument with your significant other. That evening, you are drinking at a friend's apartment. After an hour or so, you feel you have had enough to drink for the night and are ready to go home. Then a friend you have not seen for a while arrives, begins to talk to you, and offers to get you another drink.

Scale: 1 (*not at all*) – 4 (*maybe*) – 7 (*definitely*)

In this situation, how much would you intend (i.e. plan) to have one more drink with your friend?
In this situation, how much would you intend (i.e. plan) to have two more drinks with your friend?
In this situation, how much would you intend (i.e. plan) to have three or more additional drinks with your friend?

Now we want to ask you a different question about this scenario. Please think carefully about the wording before you answer.

Scale: 1 (*not at all willing*) – 4 (*maybe*) – 7 (*very willing*)

In this situation, how willing would you be to have one more drink with your friend?
In this situation, how willing would you be to have two more drinks with your friend?
In this situation, how willing would you be to have three or more additional drinks with your friend?

APPENDIX K

Affect

Please describe your mood RIGHT NOW using the following adjectives:
Happy
Panicked
Sad
Confident
Irritated
Anxious
Relaxed
Stressed
Enthusiastic

APPENDIX L

Perceived Control

Scale: 1 (*no control*) – 4 (*some control*) – 7 (*complete control*)

How much control do you feel you have over stopping the auditory stimulus to which you are listening?

APPENDIX M

Experimental Directions (Speech Condition)

As you read on the consent form, we are interested in how college students perform academic tasks in varying auditory environments. That is, we want to know how students are affected by the noises they may hear when performing cognitive tasks. There are two parts to this study: first you will complete a series of tasks by yourself using a computer, and then you will give a speech on a randomly chosen topic that will be observed and critiqued by two graduate students. For the computer portion, because we're interested in many different abilities but we do not have a lot of time, the computer will randomly select a handful of tasks from a larger database. These may include answering questions, doing math problems, reporting your own attitudes and opinions, or reading comprehension. These tasks may appear to be unrelated to one another, but they all have been shown to be good predictors of future success in college and professionally. We want you to try to do your best on them. At the end of the study, you will be told how well you performed on these tasks and how you compare to more than 600 other college students who have completed the same tasks. Do you have any questions about the tasks you will complete on the computer?

For the second part of the study, I will take you down the hall to Room 497 where we'll meet two graduate students who will listen to and critique your speech. Public speaking is a vital skill for succeeding in college and at any future career, so we are particularly interested in your performance on this task. Specifically, the graduate students will evaluate you on how clear and well-organized your speech is, how well you articulate your argument, and how well you defend your position. You won't be given much time to prepare the speech because we're interested in how well you think on your feet. Your speech is expected to last from three and five minutes. After you are finished, you will receive critical feedback from the graduate students on how well you performed, and we will show you how your performance compared with our previous participants. Examples of speech topics include whether different colleges at Iowa State University should be able to charge different tuition rates, whether Iowa should always have the first presidential caucuses in the United States, or whether the U.S. should create tougher regulations to curb global warming. The topic you will speak on, however, will be randomly chosen for you by the computer and will be unique from these examples. Do you have any questions about the speech?

Also, while completing the tasks on the computer and preparing for your speech, you will be wearing a set of headphones through which will play a randomly selected audio stimulus. What you will hear is meant to simulate noise a college student may hear while trying to complete cognitive tasks, such as people talking, music, or television. Are there any questions at this time? I just need to make a call to let the grad students know that you showed up and are ready to go…

After I get you started, you will be asked to complete the academic tasks using the computer. When you are done with these tasks, the computer will randomly select a speech topic for you, and you'll have three minutes to prepare. You can use this paper and pencil if you want

to make any notes. When the preparation time is over, the computer will prompt you to inform the experimenter – that's me - that you are done.
There are just a couple of things to remember when using this program. All instructions will be presented on the screen, so please read them carefully. Many sections are timed, and the computer will let you know how long you have to complete each part, but the time remaining will not be displayed. Keep in mind when you are answering questions that when you click on a response the computer will automatically move on to the next question, so be sure that you are selecting the response that you want the first time. You can not move backwards through the tasks.

Also, while completing these tasks you will be wearing these headphones. Once you have placed the headphones on, please do not remove them until prompted to do so by the computer. When you begin the first task, a randomly selected audio stimulus will begin to play through the headphones. What you hear you may or may not find pleasant, but none of the potential stimuli will be played loud enough to cause you pain or any hearing damage.

Perceived Control Condition Only:
Should the audio stimulus become too unpleasant for you, you can mute by holding down the Control and Alt keys and pressing 'M'. We would appreciate it, however, if you do no mute the stimulus, but the decision is entirely up to you. If you forget how to mute the stimulus, it is listed on the note attached to the computer screen.

APPENDIX N

Experimental Directions (Essay Condition)

As you read on the consent form, we are interested in how college students perform academic tasks in varying auditory environments. That is, we want to know how students are affected by the noises they may hear when performing cognitive tasks. There are two parts to this study: first you will complete a series of tasks by yourself using a computer, and then you will write a short anonymous essay. For the computer portion, because we're interested in many different abilities but we do not have a lot of time, the computer will randomly select a handful of tasks from a larger database. These may include answering questions, doing math problems, reporting your own attitudes and opinions, or reading comprehension. These tasks may appear to be unrelated to one another, but they all have been shown to be good predictors of future success in college and professionally. We want you to try to do your best on them. This section of the study may take up to 20 minutes. At the end of the study, you will be told how well you performed on these tasks and how you compare to more than 600 other college students who have completed the same tasks. Do you have any questions about the tasks you will complete on the computer?

For the second part of the study, you will be asked to write an essay that will remain anonymous and won't be critiqued in any way. We're only interested in your opinion, not your writing. You won't be given much time to prepare the essay because we're interested in your initial thoughts. You will only have four or five minutes to write this essay, so do not worry about spelling or grammar; we are not interested in that, only your thoughts. Examples of essay topics include whether different colleges at Iowa State University should be able to charge different tuition rates, whether Iowa should always have the first presidential caucuses in the United States, or whether the U.S. should create tougher regulations to curb global warming. The topic you will write on, however, will be randomly chosen for you by the computer and will be unique from these examples.

Also, while completing these tasks and preparing for the essay, you will be wearing a set of headphones through which will play a randomly selected audio stimulus. What you will hear is meant to simulate noise a college student may hear while trying to complete cognitive tasks, such as people talking, music, or television. The stimulus will not play, however, while you are writing your essay.

After I get you started, you will be asked to complete the academic tasks using the computer. When you are done with these tasks, the computer will randomly select an essay topic for you, and you'll have three minutes to prepare. You can use this paper and pencil if you want to make any notes. When the preparation time is over, the auditory stimulus will stop and the computer will prompt you to begin your essay, which you will type on the computer. When you are done with the essay, the computer will prompt you to inform the experimenter – that's me - that you are done.

There are just a couple of things to remember when using this program. All instructions will be presented on the screen, so please read them carefully. Many sections are timed, and the

computer will let you know how long you have to complete each part, but the time remaining will not be displayed. Keep in mind when you are answering questions that when you click on a response the computer will automatically move on to the next question, so be sure that you are selecting the response that you want the first time. You can not move backwards through the tasks.

Also, while completing these tasks you will be wearing these headphones. Once you have placed the headphones on, please do not remove them until prompted to do so by the computer. When you begin the first task, a randomly selected audio stimulus will begin to play through the headphones. What you hear you may or may not find pleasant, but none of the potential stimuli will be played loud enough to cause you pain or any hearing damage.

Perceived Control Condition Only:
Should the audio stimulus become too unpleasant for you, you can mute by holding down the Control and Alt keys and pressing 'M'. We would appreciate it, however, if you do no mute the stimulus, but the decision is entirely up to you. If you forget how to mute the stimulus, it is listed on the note attached to the computer screen.

APPENDIX O

Reading Comprehension Task

On the next screen, you will be asked to read a passage on a randomly chosen topic. After you have finished, you will be asked a few questions about what you have read. You will have 2 minutes to read the passage; after time has elapsed, the computer will automatically progress to the questions.

The arrival in a new location of a non-indigenous plant or animal species may be either intentional or unintentional. Rates of species movement driven by human transformations of natural environments as well as by human mobility – through commerce, tourism, and travel – dwarf natural rates by comparison. While geographic distributions of species naturally expand or contract over historical time intervals (tens to hundreds of years), species' ranges rarely expand thousands of miles or across physical barriers such as oceans or mountains.

A number of factors confound quantitative evaluation of the relative importance of various entry pathways. Time lags often occur between establishment of non-indigenous species and their detection, and tracing the pathway for a long-established species is difficult. Experts estimate that non-indigenous weeds are usually detected only after having been in a country for thirty years or having spread to at least ten thousand acres. In addition, federal port inspection, although a major source of information on non-indigenous species pathways, especially for agricultural pests, provides data only when such species enter via scrutinized routes. Finally, some comparisons between pathways defy quantitative analysis. For example, which is more "important": the entry pathway of one very harmful species or one by which many but less harmful species enter the country?

According to the article, which of these factors of human mobility is not primarily responsible for the unnatural rates of species movement?
A. Tourism B. Travel C. Commerce D. E-mail

According to the article, experts estimate that it takes how long for non-indigenous species of weeds to be discovered?
A. 1 year B. 3 years C. 10 years D. 30 years

According to the article, why doesn't federal port inspection account for all non-indigenous species?

A. Port inspectors only inspect a random sample of vessels.
B. Port inspectors do poorly at inspecting vessels for non-indigenous species.
C. Port inspectors are not concerned about non-indigenous species.
D. Some vessels dock illegally and evade port inspection.

Note. All correct answers are choice 'D'.

APPENDIX P

Proofreading Task

On the next screen, you will be asked to read a passage on a randomly chosen topic. This passage contains numerous spelling and grammatical errors. After you have finished, you will be asked how many total errors were present in the passage. You will have 2 minutes to read the passage; after the time has elapsed, the computer will automatically progress. You will have 15 seconds in which to report how many errors were present; after time has elapsed, the computer will automatically progress, regardless of whether you have answered.

When Ralph Waldo Emerson pronounced America's declaration of cultural **independance** from Europe in his "American Scholar" address, he was actually articulating the transcendental **asumptions** of Jefferson's political independence. In the **idea** new world envisioned by Emerson, America's becoming a perfect democracy of free and self-reliant individuals **were** within reach. Bringing Emerson's metaphysics down to earth, Thoreau's "Walden" (1854) asserted that one can **life** without **encumberances**. Emerson wanted to visualize Thoreau as the ideal scholar in action that he had called for in the "American Scholar," but in the end Emerson regretted Thoreau's **to**-private individualism which failed to signal the vibrant revolution in national consciousness that Emerson had prophesied.

For Emerson, what Thoreau lacked, Walt Whitman **emobdied of** full. On reading "Leaves of Grass" (1855), Emerson saw in Whitman the "prophet of democracy" whom he had sought. Other American Renaissance writers were less sanguine than Emerson and Whitman about the fulfillment of the democratic ideal. In "The Scarlet Letter" (1850), Hawthorne concluded that antinomianism such as the "heroics" displayed by Hester Prynne leads to moral anarchy; and Melville, who saw in his story of "Pierre" (1852) a metaphor for the misguided assumptions of democratic idealism, declared the **transendentalist** dream unrealizable. Ironically, the literary vigor with which they both explored the ideal showed **there** deep sympathy with it even as they dramatized its delusions.

How many total errors (spelling and grammatical) were in the passage?

APPENDIX Q

Math Task

You are at an amusement park and have decided to spend your last dollar to try to win a prize. Two games are available to you, both of which cost a dollar and have the same prizes available. In each game, the attendant randomly selects a numbered chip from a hat; to win a prize, you must guess what number will be pulled. In Game A, you guess two numbers for a dollar, and the hat contains chips numbered sequentially from 1 to 50. In Game B, you guess five numbers for a dollar, and the hat contains chips numbered sequentially from 1 to 125.

Which game will you play?
A. Game A B. Game B C. No preference

Which game has the higher probability of you winning a prize?
A. Game A B. Game B C. Neither – they are equal

FOOTNOTES

1. This scale attempted to capture a wide range of alcohol use habits, but may have artificially inflated participants' drinking estimates. The range of a scale can influence how an item is answered, especially when estimating the frequency of a future behavior (for which there is no objective truth) or the frequency of a past behavior for which specific instances are difficult to recollect (Schwarz, 1999). Methodologically, the results of the reliability tests for pre-test willingness and intention/expectation to binge drink indicated that the scale was not problematic; however, it may have influenced participants' prevalence estimates of binge drinking on campus, and in future work the scale should be abbreviated.

2. Of the 76 participants in the high control condition, three muted the stimulus (1.9%); analyses showed no notable differences in pre-test or experimental measures for these participants, thus they were not removed from data analysis.

3. In the fourth and final section (Appendix Q), participants received a mathematical word problem in which they chose between two lotteries, one with a 1-in-25 chance of winning or one with a 5-in-125 chance of winning (with a "no preference" option). They were also asked to report which lottery had better odds of winning (with a "neither" option). This question was intended as a post hoc measure of type of processing (reasoned v. reactive) employed, in order to explain how willingness and intention to binge drink were influenced by the experimental manipulations. Both lotteries had equal probabilities; therefore, choosing either one (as opposed to "no preference") indicated that a heuristic cue influenced that decision. These data will be analyzed in the future.

4. The means for the failed randomization check (Locus of control on Stress x Control x Order) were as follows (on a seven-point scale where higher values indicate a more external

locus of control): Willingness items first, low stress/low control $M = 4.10$, low stress/high control $M = 4.50$, high stress/low control $M = 4.90$, high stress/high control $M = 4.11$; intention items first, low stress/low control $M = 5.00$, low stress/high control $M = 4.16$, high stress/low control $M = 3.16$, high stress/high control $M = 4.00$.

5. Because the experimental situation induced stress differently for each gender, hypothesis tests were conducted separately by gender. For females, ANCOVAs on both willingness and intention to binge drink, as well as looking only at which measure was answered first, showed no significant main effects or interactions. For males, only a marginally significant main effect of question order emerged for willingness, F (1, 56) = 3.39, $p < .08$. The finding that willingness was higher when answered before ($M = 3.91$, $SE = 0.22$) rather than after intention ($M = 3.34$, $SE = 0.21$) was as anticipated (Pomery, 2004; Reimer, 2006).

6. This moderation analysis was redone analyzing only the binge drinking measure that was answered first. An ANCOVA was performed on the first measure presented with control condition, locus of control (scale-split), and question order (as a proxy for measure) as the independent variables, and previous willingness or intention/expectation to binge drink, self-control, perceived life stress, participant gender, and experimenter gender as covariates. No significant main effects or interactions were found.

7. This moderation analysis was conducted again analyzing only the binge drinking measure that was answered first. An ANCOVA was performed on the first measure presented using perceived control, propensity to cope using alcohol (median-split), and question order (as a proxy for measure) as independent variables, controlling for previous willingness or intention/expectation to binge drink, as well as self-control. Order did not significantly interact with the other independent variables; the Perceived Control x Coping interaction was

still present, F (1, 143) = 6.23, $p < .05$, and exhibited the same pattern of results as seen in Figure 6.