

THESIS

REVISITING MOTIVES FOR COLLEGE STUDENT ALCOHOL CONSUMPTION

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ABSTRACT

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College students consume alcohol more frequently than the general population. Further, exercise participation is frequently positively associated with alcohol use among college students. While exercise has been consistently demonstrated to be protective in several domains, findings from the alcohol use literature suggest there may be exercise-specific reasons for alcohol use. Our aim was to develop and add a subscale proposed to be measuring the desire to drink to simulate the natural high achieved through exercise to the existing Drinking motives Questionnaire (DMQ). We hypothesized that exercisers drink to simulate more than low exerciser and non-exercisers. This study surveyed college students (N = 1,040) assessing several facets of alcohol use, including the DMQ and 10 proposed simulation motive items. Factor analysis was used to discern the number of latent constructs in the model. Invariance testing was used to assess differences in the simulation factor across no exercise per week (non-exerciser group), below 150 minutes (low exerciser group), and at least 150 minutes (exerciser group). Results indicated a four-factor model best fit the data. The four factors that emerged were enhancement, coping, and social motives, in addition to the added simulation motive. Invariance testing suggested configural invariance, indicating the structure of the simulation construct is the same across exercise groups. Further invariance testing and post-hoc analyses revealed metric and scalar noninvariance indicating differences in levels of endorsement of the simulation motive items. Findings provide preliminary evidence that college students drink for exercise-specific

reasons and that the endorsement of these reasons varies across exercise. A new exercise-specific alcohol use motive could help inform more targeted intervention and prevention efforts.

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INTRODUCTION

Exercise and sport participation are prevalent across college campuses (American College Health Association [ACHA], 2019; National Collegiate Athletic Association [NCAA], 2018). The American College Health Association (ACHA) reported that in Spring 2019, over half of undergraduate students engaged in at least 30 minutes of moderate exercise twice per week or more (ACHA, 2019). Further, the National Collegiate Athletic Association (NCAA) reported that more than 500,000 students in the United States compete in championship and non-championship level sports each year (NCAA, 2018). Research suggests that exercise is protective against and may be an effective treatment for substance use disorders (Buchowski et al., 2011; Lynch et al., 2013). However, compared to non-exercisers/athletes, exercisers and student-athletes on college campuses are at greater risk for engaging in alcohol use and heavy episodic drinking, defined by the Centers for Disease Control and Prevention (CDC) as consuming more than five drinks for men and more than four for women in one sitting (Barry & Piazza-Gardner, 2012; Centers for Disease Control and Prevention [CDC], 2016; Dunn & Wang, 2003; Ford, 2009; French et al., 2009; Hingson et al., 2009; Leasure et al., 2015; Leichliter et al., 1998; Lisha & Sussman, 2010; Martens et al., 2008a; Martens et al., 2005; Musselman & Rutledge, 2010; Pate et al., 1996; Piazza-Gardner & Barry, 2012; Rexroat, 2014; Rockafellow & Saules, 2006; Weitzman et al., 2003; Yusko et al., 2008). This suggests that exercise- and sport-related factors may explain the greater risk for engaging in alcohol use and misuse.

Alcohol consumption and heavy episodic drinking is a relatively common behavior among college students and student-athletes (Clarke et al., 2017; Hingson et al., 2009; Miech et al., 2016; Wechsler et al., 1994; Wechsler et al., 2000). Research has shown that heavy episodic

drinking is predictive of engagement in risk behaviors such as: driving under the influence, death from alcohol-related unintentional injuries, physical assault, and increased risk of sexual assault (Hingson et al., 2009; National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2015; Rexroat, 2014). Additionally, college students will often report cognitive impairments such as making regrettable decisions and experiencing memory loss as a result of their drinking (Rexroat, 2014).

While sport and exercise participation, particularly in college, increases risk of alcohol use (Dunn & Wang, 2003; Ford, 2009; French et al., 2009; Martens et al., 2008a; Musselman & Rutledge, 2010; Piazza-Gardner & Barry, 2012; Rexroat, 2014), reasons for this difference are unclear. The reasons (motives) these exercisers drink alcohol may be different than non-exercisers, or there may be motives that have yet to be assessed that can help explain the relation between sport/exercise and alcohol use. Research suggests that the neurobiological mechanisms of intense exercise are similar to those of alcohol intoxication (Boecker et al., 2008; Julien et al., 2011; Sparling et al., 2003). Exercise-specific motives for alcohol use, such as the desire to simulate the high felt from exercise, are areas that lack research support and may help to explain the reasons for the differences in use.

Theoretical Perspectives

Exercise groups. Lynch et al. (2013) suggest that exercise may be an effective treatment for substance-use disorders. This runs contrary to findings that student-athletes, a group that engages in frequent exercise daily, are consistently found to be more at risk for alcohol use than nonathletes (Ford, 2009; Martens et al., 2008a; Rexroat, 2014). Additionally, Karoly et al. (2013) reported infrequent exercisers were more likely to report loss of control with alcohol consumption than frequent exercisers, suggesting that regular exercise may prevent high-risk

drinking. This research suggests that exercisers' drinking behaviors vary across different levels of exercise, and therefore their motives for drinking will likely be different. These findings highlight the importance of defining exercise groups to explore the potential differences in drinking motives.

Motivation theory. Researchers have presented multiple theories to answer the question of, "what makes a human motivated to perform a particular behavior?" Outlined below are two major theories in the field of human motivation: Maslow's (1943) theory of human motivation, and Deci and Ryan's (1980) self-determination theory.

Human motivation was first conceptualized through Maslow's (1943) theory of human motivation. He posited that humans were motivated to perform a behavior in order to satisfy five basic needs: physiological, safety, love, esteem, and self-actualizing needs. The five needs were conceptualized in a hierarchy such that physiological needs must be at least partially satisfied before a person can address a safety need, and so on through to self-actualizing needs. Maslow (1943) argues that needs are largely unconscious, and that behavior may often be determined by the unconscious desire to satisfy multiple needs at once. A behavior that appears to be exclusively physiologically or socially driven may in fact be both. Therefore, he points out, it is theoretically and practically possible to examine any behavior as a means to satisfy any of the five needs. This theoretical perspective addresses the importance to consider multiple influences that may motivate a behavior, instead of as a single trait or influence guiding that behavior.

Deci and Ryan (1980) proposed that behaviors are motivated by conscious decisions (self-determined behavior) and decisions that are unconscious or automated (automatic behavior). They stated that a self-determined behavior is guided by the internal reward (intrinsic motivation) or the external reward (extrinsic motivation) that the behavior results in. For

example, an individual may be consuming alcohol to feel good and get high (intrinsic motivation) or they might be consuming alcohol to satisfy a group of people and be looked at more favorably (extrinsic motivation). Additionally, Deci and Ryan (1980) suggest that behaviors can become automatic when the behavior becomes well practiced and conditioned. These automatic behaviors are harder to control since they are not conscious decisions. Alcohol use and exercise can become automatic when the person learns not to attend to the need they are addressing through the behavior and can lead to a lack of control. The theory addresses the need to make conscious decisions to address needs, but also introduces the idea that unconscious motives can determine behavior.

Both theories address the importance of considering multiple factors when addressing motivations to engage in a behavior. A behavior may be motivated by unconscious or conscious desires to satisfy a need, highlighting the importance of assessing many motives when considering a behavior.

Drinking motives theory. Research on what motivates consumption of alcohol has focused on the conscious decisions a person makes. Cooper et al. (1992) reported that people generally report drinking for three reasons: to enhance positive feelings, to cope with negative feelings, and to be social/affiliate with others. An important distinction is that each motive to drink is associated with different alcohol-related outcomes. Cahalan and Cisin (1968) reported that those who drink primarily to cope are more likely to drink heavily and engage in drinking behaviors indicative of alcohol misuse than those who drink for social reasons. Wills and Shiffman (1985) proposed that individuals drink to regulate positive affect by increasing arousal and regulate negative affect by depressing arousal. These models suggest that a person will drink to satisfy a particular need (e.g. enhance positive affect, cope with negative affect, engage

socially). These motives are typically assessed through self-report measures detailed below, however, the degree to which these three primary motives explain a person's alcohol use and alcohol-related consequences suggests that additional motives not currently being assessed may reveal more about a person's desire to drink and engage in heavy episodic drinking. Further, these motives are notably conscious reasons for a person to consume alcohol. These motives may be easier to measure as a person may have greater awareness into their reasons for drinking. This present study proposed a motive that may be a less conscious reason to drink, and therefore may be more difficult to measure. Potentially, a person may be attempting to satisfy a need to achieve a high similar to that from intense exercise and will drink to meet that need, yet Maslow (1943) stated that a need such as this might occur in the unconscious. The measurement of drinking motives, in addition to the proposed simulation motive, is explored in the following sections.

Measurement of Drinking Motives

The Drinking Motives Questionnaire (DMQ) assesses drinking motives in the general population (Cooper et al., 1992; Cooper, 1994; Martens et al., 2003; Martens et al., 2008b). Cooper et al. (1992) reported that three factors provided a strong model fit for the assessment of drinking motives: social, coping, and enhancement motives. Cooper (1994) stated that a four-factor model including a conformity factor provided excellent model fit; however, Martens et al. (2003) found that a three-factor model provided better fit with college-aged participants and athletes than the four-factor model. Further, Martens et al. (2008b) reported that including conformity in the model did not provide a significantly better overall model fit when compared to the three-factor model. Therefore, this study focused on the original three-factor model for college-aged participants' drinking motives.

Martens et al. (2005) hypothesized that student-athletes consume alcohol and engage in heavy episodic drinking for sport-specific reasons, which led to the development of the Athlete Drinking Scale (ADS; Martens et al., 2005). The ADS established a three-factor model for predicting student-athlete drinking by modifying DMQ factors to be sport specific: positive reinforcement, coping with sport-specific stress, and team/group norms. Below are the following three motives assessed in the DMQ and ADS, along with how they relate to increased frequency and duration of drinking: enhancement and positive reinforcement, social and team/group norms, and coping and coping with sport specific stress. The ADS provided preliminary evidence for the importance of identifying and measuring exercise/sport-specific motives for alcohol use.

Enhancement and reinforcement. Drinking to enhance positive affect or as a reward is strongly related to heavy drinking and substance use (Cooper et al., 1992; Kuntsche et al., 2005; Martens et al., 2005). However, Cooper et al. (1992) reported that those who drink to enhance are less likely to report problems associated with heavy drinking than those that drink to cope or for social reasons. Cooper (1994) found that enhancement was particularly associated with heavy drinking in a setting where heavy drinking was encouraged or tolerated. Similarly, positive reinforcement, a modified-for-sport version of the enhancement motive in the DMQ, has most frequently yielded significant results compared to both team/group and coping factors in the ADS three-factor model (Herring et al., 2016; Martens et al., 2005; Martens et al., 2008a; O'Brien et al., 2007). Athletes that reported drinking as a reward tended to display more dangerous drinking behaviors such as: quantity consumed, dependence on alcohol, and negative events resulting from consumption of alcohol (O'Brien et al., 2007).

Social and team/group norms. Social norms have been shown to increase college student drinking by making the consumption of alcohol appear more common and acceptable to

students (Borsari & Carey, 2001). Wechsler et al. (1997) found that the strongest predictor of heavy episodic drinking among all students was involvement in social organizations, suggesting that a student's social environment helps predict alcohol consumption. The social norms approach was established through Perkins and Berkowitz's (1986) exploration into the peer influences of drinking. They hypothesized that students who perceived the norm of drinking on campus to be similar to their own drank more heavily than those students whose beliefs and perceptions differed. Cialdini et al. (1990) suggested that there are two types of norms: injunctive (perceptions of what behaviors are typically approved of or disapproved of) and descriptive (perceptions of which behaviors are typically performed) norms. This section details the social environment on college campuses and explores descriptive, injunctive, and masculine drinking norms of college students and student-athletes.

The social environment on college campuses has been largely centered on the consumption of alcohol (Dams-O'Connor et al., 2007; Ford, 2009; Leichter et al., 1998; Lisha & Sussman, 2010; Martens et al., 2005; Martens et al., 2008a; Rockafellow & Saules, 2006; Watson, 2002; Weitzman et al., 2003; Yusko et al., 2008). For example, Watson (2002) suggested that because student-athletes are exposed to more social settings than typical college students they may consume alcohol more frequently. Exercisers and student-athletes interact with peers and teammates socially while in the gym, in practices, and in other exercise-/sport-specific domains. For example, Division III athletes were shown to be engaged in significantly more group activity than other extracurricular groups on campus, providing more time to develop social relationships with peers (Richards & Aries, 1999). Notably, frequent exercisers like student-athletes report that about four out of five of their close friends are also athletes, further highlighting the closeness of their community (Dams-O'Connor et al., 2007). The social

environment on college campuses subsequently informs norms for drinking behavior in the group.

The social environment in college is often centered around alcohol consumption, which may impact a person's motives for consuming alcohol. Cooper (1994) indicated that social motivation is related to more frequent and heavier drinking compared to enhancement and coping motivations. Additionally, it was reported that social motives may increase frequency and quantity but did not increase problem drinking. Cooper et al. (1992) reported that socially motivated drinkers were not more likely to use drugs or engage in problematic alcohol use. This further highlights the importance of examining the social influences on alcohol use.

Descriptive norms. Hustad et al. (2014) reported that college student descriptive norms about drinking helped to predict greater alcohol use. Dams-O'Connor et al. (2007) established that perceived norms about a typical athlete's drinking was the strongest predictor of personal alcohol use. Furthermore, Hummer et al. (2009) showed that student-athletes estimated that their teammates consumed more alcohol (i.e., descriptive norms) than their teammates actual reported use, a finding that has been supported and reported as the most salient normative predictor of alcohol use and heavy episodic drinking of student-athletes (Lewis et al., 2017; Massengale et al., 2017). While there are no studies examining the role of descriptive norms around drinking for exercisers, student-athletes are frequent exercisers and it is necessary to explore the role that these norms play for exercisers that do not identify as athletes. Assessing descriptive drinking norms among exercisers is essential when considering motives for use.

Injunctive norms. Several studies have reported that perceived approval of drinking (i.e., injunctive norms) predicts both alcohol use and heavy episodic drinking (Hummer et al., 2009; Lewis et al., 2017; Massengale et al., 2017; Seitz et al., 2014). Research has found that injunctive

norms and drinking behavior change following normative interventions (Prince & Carey, 2010; Prince et al., 2015), but Prince and Carey (2010) reported that injunctive norms held by college students about their close friends did not change. Seitz et al. (2014) highlighted the importance of considering teammate and coach injunctive norm reference groups, finding that both groups were independently associated with student-athlete alcohol use. In addition to descriptive norms it is necessary to evaluate injunctive norms of college students and exercisers in order to more adequately evaluate the normative influences on alcohol use.

Masculine norms. Prince and Carey (2010) report that males drink more and have higher descriptive norms about peer drinking than females. While they report that this finding is consistent with previous work, Courtenay (2009) argues that studies fail to address specific reasons that males drink more than females. Lisha and Sussman (2010) reported that masculinity might lead to higher substance use and heavy episodic drinking in male student-athletes. Higher conformity to typical masculine roles relates to increased engagement in drinking games and heavy episodic drinking for white male participants (Zamboanga et al., 2015), suggesting that it may be masculine norms that explain the discrepancy between male and female drinking. Additionally, Wells et al. (2014) reported that masculinity is directly related to heavy episodic drinking and negative drinking consequences. While much of the literature is devoted to the role of masculinity for males, Iwamoto and Smiler (2013) reported that masculine norms were associated with peer pressure and conformity for male and female adolescent participants. The above results suggest that masculinity and masculine norms may predict heavy alcohol use and drinking consequences for both males and females. Descriptive and injunctive norms have received the most attention when considering the normative influences on alcohol consumption, but masculinity and masculine norms should also be considered.

Coping with stress. Problematic drinking is most commonly associated with coping motives (Cooper et al., 1992; Cooper, 1994). Researchers reported that coping with and regulating negative affect is associated with alcohol-related problems and increased drug use. Additionally, Cooper (1994) reported that drinking to cope was positively related to drinking alone and drinking problems. It was hypothesized that the internal drive to cope with stress and negative affect may lead to more consistency in drinking behavior. Research suggests that alcohol use may be considered an acceptable alternative to coping with general and specific stressors, such as: general stress, pressure of competition, busier schedule, and pressure to perform at high levels (Lisha & Sussman, 2010; Martens et al., 2005; Martens et al., 2011; Zhou & Heim, 2014). This suggests that additional stressors, such as those exercise- and sport-specific stressors may also help to explain the positive relation between exercise and alcohol use.

Exercisers and student-athletes engage in intense exercise daily while both in and out of season, yet they drink more and more frequently than the rest of the college student population. Everly and Lating (2013) report that exercising can reduce blood pressure, reduce resting muscle tension, increase steroid reserves to counter stress, reduce trait anxiety, and improve sense of self and control. It may be that stress is resulting from exercise/sport-specific reasons in addition to other sources like college coursework or adjusting to college. These student-athletes and exercisers may engage in behaviors other than exercise to regulate stress. Athletes and exercisers report frequently consuming alcohol following exercise which suggests that they are looking to reduce the stress they just put their bodies under (El-Sayed, Ali, & El-Sayed-Ali, 2005). These findings underscore the importance of considering coping motives for alcohol use in addition to enhancement and social motives.

Possible Biological Underpinnings.

Finally, research examining the neurobiological mechanisms of alcohol intoxication and exercise high indicate the possibility of a functional link between the two states. Alcohol is a chemical depressant activates the gamma-Aminobutyric acid (GABA) and opioid receptors in the brain (Julien et al., 2011). This activation helps to reduce stress and release dopamine (a neurotransmitter commonly associated with pleasure) and serotonin (a neurotransmitter which increases likelihood of extra dopamine binding with neurons), which can reinforce alcohol intoxication neurologically (Julien et al., 2011). Further research suggests a link between the endocannabinoid and the opioidergic systems (Colombo et al., 2005). Anandamide is the primary neurotransmitter in the endocannabinoid system and when binding with neurons, is reported to elicit effects similar to tetrahydrocannabinol, which are described as relaxing and euphoric (Julien et al., 2011).

Two hypotheses currently exist in order to explain the natural high state achieved through exercise: the opioid hypothesis explored by Boecker et al. (2008) and the endocannabinoid hypothesis explored by Sparling et al. (2003). Runners refer to a euphoric state achieved during exercise as a “runner’s high.” Positron emission tomography (PET) scan’s results indicated that intense aerobic activity decreased availability of opioid receptors in the prefrontal, orbitofrontal, anterior cingulate, and insular cortices (Boecker et al., 2008). Participants also reported subjective euphoric effects as a result of the exercise. These results suggest that intense aerobic exercise elicits euphoria by increasing activity in the opioidergic areas of the brain, reinforcing the action and leading to the “high” commonly reported by runners. Sparling et al. (2003) found that post-exercise levels of anandamide in the blood of both runners and cyclists significantly increased after exercise. There was no significant increase in anandamide for those in the

sedentary control condition. The results suggest that the increased anandamide may play a role in the relaxed, slightly euphoric state following the completion of moderate-to-intense exercise.

The current measure used to assess general or athlete-specific drinking motives only accounts for a small-to-moderate amount of the variance in alcohol consumption and alcohol related problems (Cooper et al., 1992; Cooper, 1994; Martens et al., 2005). This suggests that existing measures do not fully capture all that motivates people to consume alcohol. Drawing from the above research and lack of empirical attention, it was proposed that college exercisers may consume alcohol in order to elicit the euphoric effects felt through exercise. No studies to date have explored the hypothetical motive to simulate and mimic the activation of the opioidergic and endocannabinoid systems in the brain experienced through exercise by consuming alcohol.

Study Aim and Hypotheses

The primary aim of this study was to develop and assess a new subscale, referred to as the simulation subscale, to be added to the Drinking Motives Questionnaire (Cooper et al., 1992; Cooper, 1994). It was hypothesized that people are motivated to drink to satisfy a biological need and simulate the natural high that they receive through exercise. The secondary aim of this study was to assess differences in subscale between exercisers, low-exercisers, and non-exerciser control group. It was hypothesized that this simulation motive would vary by group, such that the exerciser group would endorse the simulation motive items more than the low-exercise and non-exerciser groups.

METHOD

Participants

Item review sample. For initial item review, a sample of professors familiar with basic measurement principles and topics on health-related behaviors were recruited to rate items based on representativeness, content, and clarity. Similar types of experts have been recruited in the past to conduct initial item review (e.g. Little et al., 2012).

Recruitment. Participants were recruited from the Colorado State University (CSU) Research Subject Pool. In total, 1,496 students participated in the survey. Of that total, 1,053 participants were used in the analyses as these participants endorsed consuming alcohol at least once in the last month. Other participants were removed from the analyses because they did not endorse motives for recent alcohol use. The sample was made up of approximately 71% female participants. About 81% of the sample identified as White, and about 17% identified as Hispanic or Latinx. In the present sample, 10% reported that they participated in varsity or club sports at CSU. See Table 1 for further demographic information. Participants generated a personal identification code, free of identifying information, to prevent duplicate responses and participated voluntarily. Identification numbers were kept separate from the data to ensure that the dataset had no identifying information. Participation in this study abided by the ethical guidelines laid out by the American Psychological Association, and the Colorado State University Human Subjects Review Board approved this study.

Exercise group definitions. For the purposes of this study it was necessary to establish appropriate comparison groups and to establish operational definitions for a non-exerciser, an infrequent exerciser, and an exerciser. In general, an exerciser could be defined as an individual

who engages in any level of physical activity/exercise, but this definition would not attend to the goal of exploring the biological effects of exercise across varying levels of participation. The World Health Organization (World Health Organization [WHO], 2011) recommends 150 minutes per week of exercise to promote physical and mental health. Therefore, the exerciser group in this study was defined as college students that engaged in at least 150 minutes per week of exercise in a typical week. The appropriate comparison group for this exercise group was students that engage in at least one minute per week of exercise and less than 150 minutes per week because these students may still be experiencing some of the biological outcomes of exercise but may be less likely to be experiencing the whole range of exercise outcomes, such as an exercise high, as those in the exerciser group. Finally, college students that reported engaging in zero minutes per week of exercise served as the non-exerciser control group in the present study. While differences in alcohol use between these three varying exercise groups could also be attributed to factors such as greater competitiveness and masculine norms in more frequent exercisers, comparisons between groups identified whether there were exercise specific reasons for alcohol consumption that may also explain the differences. In the present sample, about 13% ($n = 134$) made up the non-exerciser group, about 36% ($n = 379$) made up the low exerciser group, and about 51% ($n = 529$) made up the exerciser group.

Development and invariance samples. The sample was split into two groups: an exploratory factor analysis (EFA) group and a confirmatory factor analysis (CFA) group. The literature recommends that to have adequate power, the sample size should be greater than 200 or at least 5-10 participants per item (Floyd and Widaman, 1995; Hoelter, 1983). These recommendations are consistent with ability to appropriately assess measurement invariance as there are no formal rules for sample size (Meade & Bauer, 2007; Meade & Lautenshlager, 2004).

The stratified random samples were used to ensure that an equal number of non-exercisers, low-exercisers, and exercisers were represented in each sample group and that the two groups (i.e., EFA, CFA) were not significantly different across important demographic variables such as age and sex. The overall sample was split into the two groups using code in R software (R Core Team, 2017) to ensure the sample would be split into two groups that represented each exercise group and were not different across age and sex. In the EFA group there were 512 participants (62 non-exercisers, 183 low-exercisers, and 268 exercisers) and in the CFA group there were 487 participants (58 non-exercisers, 177 low-exercisers, and 252 exercisers) included for the analyses. Non-parametric Mann-Whitney U tests were conducted in IBM SPSS 25.0 (IBM Corp., 2017) to assess whether there were any differences by sex and age between the EFA and CFA groups because these variables were relatively non-symmetrical (range of skewness = -0.85 – 4.02, range of kurtosis = -1.01 – 27.52). Results indicated there were no significant differences by sex and age between the groups.

Procedure

Purpose of the subscale. The purpose of the simulation subscale was to measure whether exercisers consume alcohol to simulate the high they feel through intense exercise. This construct was based on the biological underpinnings of exercise high outlined by Boecker et al. (2008) and Sparling et al. (2003), along with the knowledge of areas of the brain affected by alcohol when intoxicated (Colombo et al., 2005; Julien et al., 2011). For the purposes of this study, this scale measured college students' motivations to drink alcohol at the time they completed the scale to limit measurement error due to recall and decreased salience (Eisenhower et al., 2011).

Generate the item pool. Murphy and Davidshofer (1991) state that a good set of items in a scale will capture the full domain of the construct being measured. DeVellis (2012) reports that generating three to four times the number of items that the final scale will have is appropriate for initial item generation. Others recommend that, at the very least, each dimension or scale should have at least three items (Raykov & Marcoulides, 2011). DeVellis (2012) recommends that initial item generation should contain items with some redundancy and should appear to be relatively related to the construct. Following these recommendations and through consulting with colleagues familiar with the content (several professors with expertise in substance use, addictions, and student-athlete research), 25 items were generated to capture as much of the domain of the construct of simulation of an exercise high as possible. These colleagues evaluated the 25 items and rated them on clarity and perceived relevancy to the construct. They rated each item on the following: “to what degree is this item clear” (1 = “not clear,” 10 = “clear”) and, “to what degree is this item relevant to the construct” (1 = “not relevant,” 10 = “relevant”). Following this step, 15 items were removed from the scale as they were evaluated as either not clear or not relevant to the proposed simulation construct. The 10 items that remained in the scale were added to the existing DMQ measure to be further evaluated with the EFA and CFA samples.

Format for measurement. DeVellis (2012) recommends that researchers consider what type of scale they need to best measure their construct. This step helped inform the appropriate way to ask and generate items for the final scale. The DMQ (Cooper et al., 1992; Cooper, 1994) is a Likert-type scale. Thus, the items generated to measure the proposed construct were asked in Likert-type with anchors of “almost never/never” to “almost always” for the DMQ.

Validation items. An important step prior to testing the structure of a scale is to consider including constructs that can be used to assess the validity of the scale (DeVellis, 2012). The *Standards for Educational and Psychological Testing* (1999) state that evidence of validity can come from many sources, like test content or internal structure of the measure, among others. This current study focused on the test content and internal structure of the DMQ, as well as from several measures introduced to assess the validity of the scale. Convergent validity was assessed using the Perceived Stress Scale (PSS; Cohen et al., 1983), the Drinking Norms Rating Form (DNRF; Baer et al., 1991), injunctive norm scales recommended by Prince (2015), the Conformity to Masculine Norms – 29 (CMNI-29; Hsu & Iwamoto, 2014), the Satisfaction With Life Scale (SWLS; Diener et al., 1985), the revised Behavioral Activation Scales of the revised Behavioral Inhibition, Behavioral Activation Scales (BIS/BAS; Carver & White, 1994; Demianczyk et al., 2014), the Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993), and questions assessing family history of alcohol misuse. The PSS (Cohen et al., 1983) should theoretically be similar to the coping factor such that high stress individuals would be more likely to endorse coping with the negative emotion through drinking (Cooper et al., 1992; Cooper, 1994). DNRF (Baer et al., 1991) and injunctive norm scales responses along with responses to the CMNI-29 (Hsu & Iwamoto, 2014) should theoretically be similar to the social factor because social norms have been shown to influence drinking frequency and duration (Dams-O'Connor et al., 2007; Ford, 2009; Hummer et al., 2009; Leichliter et al., 1998; Lewis et al., 2017; Lisha & Sussman, 2010; Martens et al., 2005; Martens et al., 2008a; Massengale et al., 2017; Rockafellow & Saules, 2006; Seitz et al., 2014; Watson, 2002; Weitzman et al., 2003; Yusko et al., 2008). The SWLS (Diener et al., 1985) should be assessing a construct similar to enhancement such that those who report great life satisfaction will be more likely to drink to

enhance the positive emotions (Cooper et al., 1992; Cooper, 1994). Gray (1978, 1981, 1987, 1990) stated that the behavioral activation system (BAS) encourages an individual to engage in behaviors that are positive and rewarding. The BAS Scales should theoretically be measuring constructs similar to the simulation factor because both theoretically assess a motive to engage in behavior and seek positive outcomes. Additionally, the AUDIT (Saunders et al., 1993) and questions assessing family history of alcohol misuse were used to further assess convergent validity of the simulation subscale. These measures should theoretically be assessing similar constructs such that those who have an alcohol use disorder or have a family history of alcohol misuse will score high on the simulation scale because of the biological component of alcohol use and misuse (Gilbertson et al., 2008). Discriminant validity was assessed using the PSS, the SWLS, and the Behavioral Inhibition Scale of the BIS/BAS (Demianczyk et al., 2014). The PSS should be assessing a construct different than enhancement such that low stress scores will relate to high enhancement scores. The SWLS should be assessing a construct different than coping such that low SWLS scores should relate to high coping scores. Gray (1978, 1981, 1987, 1990) stated that the behavioral inhibition system (BIS) encourages an individual to engage in behaviors to avoid negative outcomes. The BIS Scale should theoretically be measuring a construct that is different than the simulation factor, as it is primarily assessing avoidant behaviors.

Test items with a development sample. The survey was administered online to college students enrolled in the introductory psychology course via Colorado State University Qualtrics. In addition to the motive measure surveys, all participants were asked to respond to the validation measures and general demographic information such as date of birth, sex, ethnicity, sport/exercise involvement, and family history of alcohol misuse.

Participants were told that the purpose of the study was to understand drinking patterns of college students and were not told that the purpose was to evaluate and revise a drinking motives measure. This was intended to create psychological distance from the constructs being measured and address the issue of common method bias affecting the relation between items or dimensions of the scale (Lindell & Whitney, 2001). Additionally, common issues with self-report measures such as social desirability, demand characteristics, and ambiguity were addressed in the item generation step (Podsakoff et al., 2003). These steps help to reduce the likelihood of common method bias influencing respondents' responses, but Likert-type response scale issues such as anchors and common scale formats cannot be addressed in the current study (Podsakoff et al., 2003).

Analysis Plan

The next steps of scale development were the analysis of the item responses. To address the primary aim of the present study, an EFA was conducted to reveal the initial structure of the scale, a CFA was conducted to confirm findings from the EFA and examine the reliability estimates for the scale dimensions, and correlations were computed to explore the validity of the simulation subscale. To address the secondary aim of the study, invariance testing and post-hoc analyses were conducted to explore differences in the subscale across exercise groups. The analysis plan below explores the steps taken to conduct the evaluation of the simulation motive items.

Item Difficulty and Discrimination. First, the difficulty of the items in the scale were assessed to explore the range of the construct that is being measured. Difficulty is the level of the construct associated with passing versus failing an item, or responding correctly versus incorrectly (DeVellis, 2012). In cases with continuous items, higher item means indicate easier

items because an average participant would be likely to score highly on that item. A difficult item would be one with a lower mean relative to other items because an average participant would be likely to score lower on that item compared to easier items. Next, item-total correlations were computed in order to assess the degree to which an item discriminates. A highly discriminating item is an item that unambiguously identifies a person as either answering the item correctly or incorrectly (DeVellis, 2012). In the case with continuous items, this means that a highly discriminating item clearly shows where a person is on the construct. The literature does not agree on a general cut-off point for difficulty, particularly for continuous items measured with a Likert-scale, and discrimination. Therefore, these values were used to assess the overall quality of the items and flag items that may be likely to be removed later.

EFA. For the EFA, the maximum likelihood (ML) method for extraction in MPlus (Muthén & Muthén, 1998-2017) was used to provide model fit statistics. Ford et al. (1986) state that only factors that account for a particular amount of additional variance should be included in the scale. They recommend that this decision be made using eigenvalues, the scree plot test, and parallel analysis. Kaiser (1960) and Guttman (1954) recommend that any factor with an eigenvalue less than one should not be considered because that additional factor is not explaining enough additional variance. Similarly, a scree plot graphically represents the eigenvalues for all possible factors. When the plot begins to level off, additional factors should not be retained (DeVellis, 2012). Parallel analysis generates a random matrix of the same size as the actual data, conducts an EFA on both data sets, and compares the two matrices. Only factors that have eigenvalues greater than those in the randomly generated data should be considered (Humphreys & Montanelli, 1975). Additionally, model fit statistics were interpreted to determine what model best fits the data. The root mean square error of approximation (RMSEA), the comparative fit

index (CFI), and the standard root mean square residual (SRMSR) were used as model fit indices (Brown, 2015; Hu & Bentler, 1999). The χ^2 statistic is the original model fit statistic but is highly sensitive to sample size and was not interpreted in this study (Brown, 2015; Ullman & Bentler, 2009). The RMSEA corrects for issues with sample size as it is used to explore the difference between a hypothesized model and the population covariance matrix. Hu and Bentler (1999) report that values below .06 suggest relatively good model fit. The CFI indicates if the hypothesized model is an improvement in fit over a model of complete independence among measured variables. The value ranges from 0 to 1, with values above .90 indicating adequate model fit, and values .95 and above indicating excellent model fit (Hu & Bentler, 1999). The SRMR is an average of residual correlations, and Hu and Bentler (1999) recommend a value below .08 indicating good model fit. The interpretation of these model fit indices along with eigenvalues, the scree plot, and parallel analysis results were used to eliminate items and establish the initial factor structure that was tested in the CFA analysis.

To further evaluate item quality and determine the best fitting model, factor loadings were interpreted to determine what factor each item more strongly loads on to. First, an oblique rotation method (GEOMIN) was used instead of an orthogonal method because all possible factors were anticipated to correlate with each other. An item is considered a bad quality item if its factor loading is below .30 or .40 (Ford et al., 1986). Additionally, when factor loadings are .32 or higher on two or more factors, this indicates a cross-loaded item which should be revised or dropped from the model (Costello & Osborne, 2005; Tabachnick & Fidell, 2001). The EFA was re-run after removing items due to low factor loadings, relative difficulty, and poor discrimination to determine if the removal of items altered the factor structure.

There is no single best way to determine the selection of the final items in a scale. This study used theory and understanding of the latent constructs, and the recommended interpretations of the data to determine the best-fitting model. The revised scale was then tested using the CFA group sample.

CFA. Confirmatory factor analysis is used to confirm a factor model that is predicted by existing theory (DeVellis, 2012). A CFA using the CFA group sample was conducted to meet the goal of confirming or disconfirming a four-factor model including the simulation motive factor. The maximum likelihood (ML) method for extraction was used to confirm or disconfirm the proposed underlying dimensions (factors). Fabrigar et al. (1999) stated that maximum likelihood is the preferred method for extraction because it allows for calculation of model fit statistics and tests statistical significance of factor loadings and inter-factor correlations. A four-factor model was specified, and the items were constrained to load on their respective factors based on the theory. Model fit statistics were interpreted to evaluate whether the four-factor model best fit the data. The fit statistics interpreted were the RMSEA, the SRMR, and the CFI. Considering the χ^2 statistic is sensitive to large sample sizes, model fit statistics that correct for sample size (e.g. RMSEA, CFI) were primarily interpreted. Additionally, the standardized factor loadings were also interpreted to further confirm the items load on the factor they were forced to load onto.

Reliability. Internal consistency reliability tests were conducted using the whole sample to assess if all items on the scale related to each other and measured the same construct (DeVellis, 2012). Internal consistency was measured by the alpha and omega coefficients. The alpha coefficient is a measure commonly used to assess the degree to which items in a scale interrelate, or are similar to each other (Cronbach, 1951; Raykov & Marcoulides, 2011). Nunnally and Bernstein (1994) suggest that values above .90 are strong and preferred, but any

value above .70 is minimally acceptable. Further, alpha is impacted by the number of items in the scale and larger values are preferred for scales with fewer items (Cortina, 1993). IBM SPSS 25.0 (IBM Corp., 2017) was used to calculate the alpha coefficient. McDonald (1999) reports that omega is a statistic that better measures the unidimensionality of a scale, and therefore should be evaluated when assessing reliability. Similar to the alpha coefficient, values from .80 to .90 are acceptable and preferred values for omega (Raykov & Marcoulides, 2011). Mplus version 8 (Muthén & Muthén, 1998-2017) was used to calculate the omega statistic.

Invariance Testing. Once the simulation motive items were evaluated and shown to be a unique motive for alcohol use, invariance testing of the simulation factor only was conducted using the whole study sample. Invariance testing was used to test differences in the simulation motive between the exerciser, low exerciser, and non-exerciser groups. Invariance testing was conducted along with the CFA. Measurement invariance (MI) is the degree to which a measurement yields equivalent results under different conditions (Drasgow, 1984, 1987; Horn & McArdle, 1992). Meade and Bauer (2007) report that the most common method of MI is through CFA methods. Measurement invariance has three levels: configural, metric, and scalar. A model has configural invariance if the overall factor structure is the same across groups. Metric invariance is achieved when the factor loadings of the items are the same across groups. Scalar invariance is achieved when items have the same intercepts and means across groups. Configural invariance testing shows if the simulation motive exists for one group and not for the others. If the factor does not exist for the non-exerciser or low exerciser groups, then a configural model where the factor structure is the same across groups will be a poorer fitting model as compared to one where the factor structure is allowed to vary across groups. Meade et al. (2008) report that interpreting the changes in the χ^2 statistic may be problematic due to its sensitivity to sample

size, therefore changes in RMSEA, CFI, and SRMR were interpreted as a way to test for MI. Collaboratively, a change of about -.005 or -.010 in the CFI, approximately .010 to .015 for RMSEA, and a change of .15-.30 (depending on type of invariance) in the SRMR suggests noninvariance between groups. For RMSEA, a change of greater than or equal to .010 or .015 suggests noninvariance between groups (Chen, 2007). Configural invariance was tested in Mplus version 8 (Muthén & Muthén, 1998-2017) by comparing a constrained model to an unconstrained model where the factor structure is allowed to vary across groups.

As is recommended in the literature, if there is evidence of configural invariance then metric and scalar invariance will also be tested (Vandenberg & Lance, 2000). First, metric invariance was tested by comparing the original model to a model that's factor loadings are free to vary across exercise groups. If the items were loading onto their respective factors differently across groups, then there is evidence that the metric invariant model is poorer fitting than one with varying factor loadings. If there was metric invariance, then scalar invariance was tested by comparing the original model to a model that's factor loadings and item intercepts are free to vary across exercise groups. Metric and scalar invariance helped further identify whether the simulation motive was endorsed at different rates between exercise groups. If there was not metric or scalar invariance, then post-hoc non-parametric testing was conducted to explore differences in each of the simulation motive items across exercise groups. Non-parametric testing was conducted due to the non-normal distributions for each simulation motive items (range of skewness = 2.71 – 3.88, range of kurtosis = 7.30 – 16.64). Kruskal-Wallis one-way analysis of variance omnibus testing and Mann-Whitney U post-hoc tests were used to explore differences between the three exercise groups. This testing helped identify which specific

simulation items were non-invariant across exercise groups, and in what direction was the difference.

Measures

Participants were given the consent form (see Appendix A), a demographics sheet including questions regarding their date of birth, year in college, sex, race/ethnicity, involvement in sport and/or exercise, family history of alcohol misuse, and the Daily Drinking Questionnaire (DDQ; Collins et al., 1985) (See Appendix B), the Drinking Motives Questionnaire including the ten items hypothesized to be assessing the biological underpinnings (simulation) factor (See Appendix C), the Perceived Stress Scale (See Appendix D), the Drinking Norms Rating Form (See Appendix E), injunctive norm scales (See Appendix F), the Conformity to Masculine Norms-29 (See Appendix G), the Satisfaction With Life Scale (See Appendix H), the AUDIT (See Appendix I), and the revised BIS/BAS Scales (See Appendix J).

For the purposes of this study, self-report measures were used to assess whether the simulation factor is a motive for alcohol use. However, a physiological relation may also exist and cannot be measured given the present research design and study aims.

Demographics sheet. The demographics sheet began with collecting general information from the participants, such as: age, year in school, race/ethnicity, and sex. Next, participants provided information on participation in sport and/or exercise. These questions asked about formal participation in varsity sport on campus, as well as number of hours per day and week the participant exercised. Participants were then asked questions from the Daily Drinking Questionnaire (Collins et al., 1985) to assess alcohol use. The DDQ asks participants to report their drinking during a typical week in the last 30 days, their drinking during their heaviest drinking week within the last 30 days, the total number of drinks consumed in a typical weekend

during the last 30 days, and the total number of drinks consumed during their heaviest drinking weekend in the last 30 days. Participants were then asked their perceptions of the approval of drinking alcohol on campus and their perceptions on the amount their friends drink alcohol. Finally, participants were asked questions assessing any family history of alcohol use disorder.

Drinking Motives Questionnaire (DMQ). The DMQ was created to assess the factors related to an individual's motivation to consume alcohol (Cooper et al., 1992; Cooper, 1994). Cooper et al. (1992) originally developed the 15-item scale and found that a three-factor model best fit the data. The three subscales in the DMQ are: social, coping, and enhancement. Social motives for drinking suggest that a person may be motivated to consume alcohol to be social and drink with others. Coping motives suggest that a person may drink to regulate their negative affect. Enhancement motives suggest that a person may drink to enhance their positive affect. Items were endorsed on a Likert-type scale from 1 to 4 (1 = "almost never/never," 4 = "almost always"). Participants were not given the opportunity to provide a neutral response. There are five items on each of the social, coping, and enhancement subscales for a total of 15 items on the DMQ. Examples of items on each subscale are as follows, respectively: "Because it is what most of your friends do when you get together", "Because it helps when you feel depressed or nervous", and "Because it makes you feel good". The scores in each subscale are summed and averaged to create the three subscale scores. Thus, total scores range from 1 to 4 on each of the subscales, with higher scores indicating that factor is a strong contributor to drinking behavior and a lower score indicating that factor is weaker contributor to drinking.

Cooper et al. (1992) reported that the DMQ accounted for about 15 to 26% of the variance in alcohol use indicators. Standardized factor loadings were relatively strong on all factors in the model: ranging from .49 to .73 on the social motives factor, .54 to .82 on the

coping motives factor, and .62 to .83 on the enhancement motives factor. They reported that model fit indices all supported a three-factor model (Cooper et al., 1992). Using a sample of 1,206 participants at an average age of 43 years, the researchers conducted invariance testing to determine if the results were reliable across gender and race. They reported that all scales demonstrated moderate-to-strong reliability across gender and race, indicating internally consistent measures across groups (Cooper et al., 1992). Additionally, enhancement motives were shown to be more strongly associated with frequent, heavy drinking than the other two motives, while coping motives were strongly associated with frequent but not heavy drinking (Cooper et al., 1992). These results indicated that the DMQ subscales are reliable and theoretically consistent measures, but different enough to indicate that they are measuring their own unique constructs.

To test the hypotheses of this study, the questions proposed to be assessing the simulation factor were included alongside the original DMQ.

Convergent Validity. To test the validity of the hypothesized four factor DMM, the Perceived Stress Scale (PSS; Cohen et al., 1983), questions assessing participants' injunctive and descriptive norms about drinking, the Conformity to Masculine Norms – 29 (CMNI-29; Hsu & Iwamoto, 2014), the Satisfaction With Life Scale (SWLS; Diener et al., 1985), the Behavioral Inhibition, Behavioral Activation Scales (BIS/BAS; Carver & White, 1994), The Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993), and questions assessing family history of alcohol misuse were used.

Perceived Stress Scale (PSS). The PSS was created to assess the level of perceived stress in a respondent's life (Cohen et al., 1983). Cohen et al. (1983) developed the 14-item scale and found that a one factor model for perceived stress best fit the data. Items are endorsed on a

Likert-type scale from 0 to 4 with 0 being *never* and 4 being *very often*. Examples of items on the scale are as follows: “In the last month, how often have you been upset because of something that happened unexpectedly” and, “In the last month, how often have you felt nervous and ‘stressed’?” Seven of the fourteen-items are reverse-scored, therefore recoding responses such that a 0 equals a 4, 1 equals a 3, and a 2 equals a 2 is a necessary first step of scoring. The scores are then summed to generate a total score for perceived stress. Total scores can range from 0 to 56, with higher scores indicating greater perceived stress within the last month and lower scores indicating less perceived stress in the last month. Cohen et al. (1983) reported that the alpha coefficient for the scale ranged from .84 to .86 using three different samples, suggesting moderately strong internal reliability of the measure. They also reported a high correlation between perceived stress and depressive symptomatology, suggesting that this measure may help to predict negative outcomes associated with perceived stress (Cohen et al., 1983). This scale adequately assessed the convergent validity of coping because both measures are associated with negative affect.

Norms and CMNI-29. Participants were asked questions assessing their perceptions of the approval of drinking alcohol (injunctive norm) and their perceptions on the amount their peers drink alcohol (descriptive norm) to assess norms about drinking behavior on campus. To measure descriptive norms, participants were given the Drinking Norms Rating Form (DNRF; Baer et al., 1991). This measure asks participants to think back over the past three months and rate different groups of people’s “typical” drinking. The DNRF is scored to measure the number of drinking days per week and the average quantity of drinks per day for the participants’ close friends, social group members (e.g. fraternity, sorority, or dormitory floor), and peers at the university. Injunctive norms were assessed following the recommendation from Larimer et al.

(2009) that at least one group related to the participant be used when assessing norms, and using measures used by Neighbors et al. (2008) and Prince (2015) modified for the Colorado State University (CSU) sample. Participants were asked to estimate the amount of drinks that a typical CSU student would consider acceptable for each day of the week, the average frequency of drinking a typical CSU student would consider acceptable, and the average number of drinks a typical CSU student would consider acceptable to drink on a given occasion. Participants were also asked the same three questions but for what drinking they consider acceptable instead of a typical student.

The CMNI-29 was created to provide a shorter version of the original 94-item CMNI (Mahalik et al., 2003) for clinicians to use quickly in practice (Hsu & Iwamoto, 2014). They developed the 29-item scale and found that an eight-factor model best fit the data. Items are endorsed on a Likert-type scale from 0 to 3 with 0 being *strongly disagree* and 3 being *strongly agree*. Examples of items and their respective factors on the scale are as follows: “I would feel good if I had many sexual partners” (subscale: Playboy) and, “My work is the most important part of my life.” Higher scores indicate stronger conformity and adherence to masculine norms. Hsu and Iwamoto (2014) reported that the alpha coefficient for the scale ranged from .71 to .87, suggesting adequate to moderately strong internal reliability. This scale along with the descriptive and injunctive norm questions assessed the convergent validity of the social factor because both measures are associated with social norms.

Satisfaction with Life Scale (SWLS). The SWLS was developed to assess the level of respondents’ global life satisfaction (Diener et al., 1985). They developed the five-item scale and found that a one factor model best fit the data. Items are endorsed on a Likert-type scale from 1 to 7 with 1 being *strongly disagree* and 7 being *strongly agree*. Participants are given the option

to provide the neutral response of *neither agree nor disagree*. Examples of items on the scale are as follows: “In most ways my life is close to my ideal” and, “I am satisfied with my life.” The scores are summed to generate a total score for life satisfaction. Total scores can range from 5 to 35, with higher scores indicating greater satisfaction with life. Diener et al. (1985) reported strong factor loadings ranging from .61 to .84 suggesting all items are measuring one construct. Additionally, summed domain satisfaction scores highly correlated with the SWLS indicating strong convergent validity of the scale. This scale was used to assess the convergent validity of enhancement because the enhancement motive has been shown to strongly relate to positive affect.

Behavioral Inhibition, Behavioral Activation Scale (BIS/BAS). The BIS/BAS scales were developed to assess the motivational systems underlying behavior (Carver & White, 1994). Recent research suggests that a revised 14-item, four factor model is best for use with diverse samples (Demianczyk et al., 2014). Items on the revised BIS/BAS scales are endorsed on a Likert-type scale from 1 to 4 with 1 indicating strong agreement and 4 indicating strong disagreement. Participants are not given the option to provide a neutral response. To assess convergent validity, only the ten items in the BAS reward responsiveness, BAS drive, and BAS fun seeking subscales will be used. Examples of items on these subscales are as follows: “When I’m doing well at something, I love to keep at it”, “I go out of my way to get things I want”, and, “I crave excitement and new sensations.” The scores for the four items on the BAS drive subscale are summed to generate a total score, scores for the three items on the BAS fun-seeking subscale are summed to generate a total score, and scores for the three items on the BAS reward responsiveness are summed to generate a total score. Lower scores indicate lower BAS sensitivity. The BAS subscales were used to assess the convergent validity of the proposed

simulation factor because the BAS is measuring an underlying motivational construct similar to the simulation factor.

Alcohol Use Disorders Identification Test (AUDIT) and family history. Family history of alcohol misuse was measured by one question: “Have any of your family members ever been diagnosed with a problem with drugs or alcohol?” Gilbertson et al. (2008) state that approximately 40-60% of the risk to develop an alcohol use disorder is attributable to genetic factors, suggesting that assessing family history of misuse can help predict respondents’ alcohol misuse. The AUDIT was developed as a screening tool to measure excessive and problematic drinking (Saunders et al., 1993). For the purposes of this study it was administered as a self-report measure, although it has an interview structure as well. The self-report measure is a ten-item assessment asking participants to report on their alcohol consumption. Responses are on a Likert-type format ranging from 0 to 4. Depending on the question a response of 0 could mean *never, 1 or 2, or no*. Depending on the question a response of 4 could mean *4 or more times a week, 10 or more, daily or almost daily, or yes, during the last year*. Responses range from 0 to 40 with higher scores suggesting more problematic drinking than lower scores. Examples of questions on the AUDIT are, “How often do you have a drink containing alcohol” and, “How often during the last year have you had a feeling of guilt or remorse after drinking?” Past research has established adequate to strong reliability of the measure (Martens et al., 2005; Saunders et al., 1993). The AUDIT and family history were used to assess the convergent validity of the proposed simulation factor because the alcohol use is highly correlated with genetic and biological factors.

Discriminant Validity. To assess discriminant validity of the enhancement subscale, the PSS (Cohen et al., 1983) was used because it should be theoretically different from enhancement

such that those with higher levels of stress should be less likely to drink to enhance positive affect. To assess discriminant validity of the coping subscale, the SWLS (Diener et al., 1985) was used because it should be theoretically different from the coping subscale such that those with higher life satisfaction should be less likely to report drinking to cope with negative affect. To assess discriminant validity of the simulation subscale, only the four items in the BIS (Demianczyk et al., 2014) were used because they assess the inhibition of behavior. Items of the BIS are endorsed on a Likert-type scale from 1 to 4 with 1 indicating strong agreement and 4 indicating strong disagreement. Participants are not given the option to provide a neutral response. Examples of items on this scale are as follows: “I worry about making mistakes” and, “I feel pretty worried or upset when I think or know somebody is angry at me.” The scores were summed to generate a total score for behavioral inhibition. Total scores on the BIS can range from 7 to 28, with lower scores indicating greater BIS activation.

RESULTS

Item Difficulty and Discrimination

Item difficulty values for the simulation motive subscale are presented in Table 1. For all 10 simulation items, item means ranged from 1.11 to 1.48. This indicated that all items were difficult as a value of one in the survey was “almost never/never.” This suggests that the simulation items required participants to have a large amount of motivation to drink to simulate a runner’s high in order to score highly on the items. The range of these difficulty values was substantially below the center value of the scale (2.5) suggesting that this subscale in the present sample is measuring a particularly difficult construct. In order to assess a similar range of the construct, items that were relatively easier (i.e., “when you’re not exercising, you feel low”) and relatively difficult (i.e., “to replace the high you get from exercise on a day off from exercise”) were flagged and considered for removal (See Table 1). Since the literature does not have established cut offs for item difficulty, these items were simply flagged as potentially problematic. Item discrimination values (see Table 2) suggested that all items were moderately discriminating. The simulation items’ discrimination values ranged from .29 to .89. This range suggests that there are several items that may be relatively poorly discriminating (i.e. “when you’re not exercising, you feel low”), however, there are many items that are discriminating well and are closer to a value of one. Similar to item difficulty, since there are no empirically established cut-offs for item discrimination, items that appeared to be discriminating poorly were flagged and considered for removal.

Item difficulty and discrimination values suggested that several items may be too difficult, easy, or poorly discriminating relative to other items. Two items were removed prior to

the EFA, as they were both poorly discriminating and items that were easier than other items in the scale, suggesting that they may not be measuring the intended construct as well as others. These items were: “when you’re not exercising, you feel low” and, “when you’re not exercising, you need to feel that rush.” Several additional items were simply flagged as potentially problematic items.

Exploratory Factor Analysis

In the initial EFA of the updated 23-item scale, four factors had eigenvalues greater than 1, with the scree plot and parallel analysis also suggesting a four-factor model. Model fit statistics for the four-factor model were largely in the accepted range (RMSEA = 0.08, 90% C.I. = 0.07 – 0.08; CFI = 0.94; SRMR = 0.03) following recommendations by Hu and Bentler (1999). Factor loadings for the simulation subscale ranged from 0.56 to 0.98 (see Table 3). However, several items were removed as they had lower factor loadings relative to the other items, were poorly discriminating items, and were relatively easy or difficult as compared to the other simulation motive items. The, “because it makes you feel as good as you do from exercise” item was removed due to its relatively high item mean (1.35), low range of discrimination values (0.43 – 0.67), and low factor loading relative to other items (0.56). The “to replace the high you get from exercise on a day off from exercise was removed as it was the most difficult item (1.11) and had a lower factor loading relative to other items (0.67). Finally, “to mimic the high from exercise” was removed as it moderately correlated with the other items (0.55 – 0.69) and had a lower factor loading compared to other items (0.66). Following the removal of these three items, a second EFA was run to explore whether the factor structure changed as a result of the revision.

In the second EFA of the revised 20-item scale, four factors had eigenvalues greater than one, and the scree plot and parallel analysis also suggested the four-factor model would best fit

the data as the eigenvalue from the four-factor tested model were greater than that of the random model. Model fit statistics indicated excellent model fit (RMSEA = 0.05, 90% C.I. = 0.05 – 0.06; CFI = 0.98; SRMR = 0.02) and item factor loadings were high (0.67 – 0.97) and there were no cross-loading items. These statistics all met recommendations suggested by Hu and Bentler (1999) and Ford et al. (1986) respectively. Further, the four-factor model was most interpretable compared to models with greater than or fewer factors and has theoretical support. Factor 1 had five items load onto it that were measuring the social motives construct. Factor 2 had five items load onto it that were measuring the coping motives construct. Factor 3 had five items load onto it that were measuring the enhancement motives construct. Finally, factor 4 had five items load onto it that were measuring the simulation motives construct. This four-factor model was selected as the final model based on model fit indices, factor loadings, interpretability, and theoretical support. The model was then further tested with a CFA using the stratified random CFA sample.

Confirmatory Factor Analysis

Results from the CFA of the revised 20-item DMQ confirmed findings from the EFA. Model fit statistics indicated that the four-factor model had adequate fit (RMSEA = 0.07, 90% C.I. = 0.07 – 0.08; CFI = 0.93; SRMR = 0.06). These findings were largely at the recommended levels by Hu and Bentler (1999). However, the RMSEA was slightly higher than the recommended value. While this might indicate poor model fit, SRMR is a more stable indicator of model fit, particularly with larger scales (Shi et al., 2019). The SRMR is below the recommended value, suggesting that this model fits well. Standardized factor loadings were all above the .40 threshold recommended by Ford et al. (1986) and ranged from 0.43 – 0.94. Further, the simulation motive factor loadings specifically were high and ranged from 0.61 –

0.94. These findings indicate that the items forced to load on the social, coping, enhancement and simulation motive factors all fit well with their respective factors.

Reliability

Using the final model, alpha and omega coefficients were computed to assess the internal consistency and unidimensionality of the simulation motive factor. The alpha coefficient for the five-item simulation factor was 0.93 which suggests that this factor has strong internal consistency. Further, the omega coefficient was also strong (0.93) which further supports that this factor is internally consistent and relatively unidimensional. These findings indicate that the items in this subscale are together measuring a similar construct reliably well.

Validity

Correlation coefficients for each drinking motive factor score and the PSS (Cohen et al., 1983), injunctive and descriptive norm items, the CMNI-29 (Hsu & Iwamoto, 2014), the SWLS (Diener et al., 1985), the revised BIS/BAS (Carver & White, 1994; Demianczyk et al., 2014), the AUDIT (Saunders et al., 1993), and family history of alcohol misuse were interpreted to assess convergent and discriminant validity. Additionally, coefficients were obtained for the relation between each drinking motives factor. Spearman's rho correlation coefficients were used as the drinking motive factor scores were non-normally distributed.

First, the simulation factor moderately correlated with each of the social, coping, and enhancement motive factors (see Table 6). This suggests that the simulation factor is measuring something similar enough to the other motive factors, but different enough to be measuring a unique motive construct. The simulation factor correlated weakly with the AUDIT (Spearman's $\rho = .17$) and the BIS reward subscale (Spearman's $\rho = .07$). The simulation factor weakly negatively correlated with the BIS fun (Spearman's $\rho = -.10$) subscale. These findings indicate

that the simulation factor has a weak relation to constructs that theoretically should be measuring similar biologically based and alcohol-related constructs. The simulation factor did not correlate with family history of substance misuse, the BIS subscale, and the BAS drive subscale. This finding suggests that the simulation factor does not relate to constructs it should not relate to (i.e., BIS). These findings indicate that the simulation factor items may not be accurately measuring the proposed construct.

The enhancement factor did not correlate with the SWLS and was weakly correlated with the PSS (Spearman's $\rho = .15$). This suggests that, in this sample, the enhancement factor may not be accurately measuring the construct of enhancement. The coping factor and the PSS were moderate-to-weakly correlated (Spearman's $\rho = .21$) and coping and the SWLS were weakly negatively correlated (Spearman's $\rho = -.19$). These findings indicate that the coping factor may be measuring the intended construct moderately well. Finally, the social factor moderately correlated with descriptive norms for a close friend (Spearman's $\rho = .34$), injunctive norms for themselves (Spearman's $\rho = .41$), the CMNI playboy subscale (Spearman's $\rho = .22$), and the CMNI risk-taking subscale (Spearman's $\rho = .22$). Further, the social factor weakly correlated with descriptive (Spearman's $\rho = .13$) and injunctive (Spearman's $\rho = .16$) norms for a typical CSU student, and the CMNI self-reliance subscale (Spearman's $\rho = .10$).

Invariance Testing

Configural measurement testing was conducted to explore the potential differences in the overall latent factor structure across groups. The model fit for the model where the factor structure is the same across groups (RMSEA = 0.12, CFI = 0.99, SRMR = 0.03) was a better fitting model than the model that allows factor structure to vary across groups (RMSEA = 0.13, CFI = 0.97, SRMR = 0.18). There was a 0.01-unit change in RMSEA, the Δ CFI was -0.02, and

the Δ SRMR was -0.15. These findings suggest that a model where non-exercisers, low exercisers, and exercisers have the same factor structure is better fitting than one where the factor structure varies across groups. This indicates that configural invariance is present and the factor structure is the same between non-exercisers, low exercisers, and exercisers.

Next, metric and scalar invariance were tested to explore potential differences in individual item factor loadings and intercepts. Findings suggested that the configural model fit best compared to the metric and scalar models. Model fit was worse for the metric (RMSEA = 0.14, CFI = 0.97, SRMR = 0.13) and scalar (RMSEA = 0.13, CFI = 0.97, SRMR = 0.12) models than the configural model indicating that the model has configural invariance but does not have metric or scalar invariance. Overall, these findings indicate that the overall four-factor model fits well for all exercise groups but that there are differences in the factor loadings and item intercepts between these three exercise groups. Model fit statistics for configural, metric, scalar, and comparison models are presented in Table 7.

Omnibus Kruskal-Wallis one-way analysis of variance tests and Mann-Whitney U post-hoc tests were then conducted to account for the non-normal distributions of the simulation motive items. These tests were run to explore item-level differences across exercise groups in the simulation motive. Results from the Kruskal-Wallis tests indicated that patterns of responses to one item, “To get high, like you get from exercise” was significantly different across exercise groups ($H = 6.12, p < .05$). Of note, this item also had the lowest factor loading of the remaining simulation items in the EFA and CFA. Results for the four other simulation motive items, “Because you miss the high you get from exercise” ($H = 2.26, p = .32$), “To simulate the feeling you get from exercise” ($H = 1.97, p = .37$), “As a way to feel like you do when you exercise” ($H = 2.66, p = .26$), and “As a way to simulate the high you get from exercise” ($H = 2.90, p = .24$)

were not statistically significant. Results from the Mann-Whitney tests indicated that exercisers ($U = -2.32, p < .05$) and low-exercisers ($U = -2.42, p < .05$) endorsed the, “To get high, like you get from exercise” simulation motive item significantly more than non-exercisers. There was no significant difference in endorsement between the exercise and low exercise groups ($U = -0.22, p = .82$). Further, there were now significant differences between groups on the other 4 simulation motive items. These findings suggest that of the five simulation motive items, one demonstrated the expected differences in responding across exercise groups as hypothesized by this study.

DISCUSSION

The purpose of the present study was to examine whether persons are motivated to consume alcohol to simulate an exercise high and explore whether this motive is exclusive to or most frequently endorsed by exercisers. Through the steps detailed above, a subscale assessing the motive to consume alcohol to simulate an exercise high was developed, added to the existing alcohol use motives scale, and tested. The findings in the present study partially supported this simulation motive factor. First, item discrimination and difficulty parameters flagged several items as potentially problematic due to relative difficulty or ease and low correlations with other items. Second, exploratory factor analysis (EFA) revealed that a four-factor model provided adequate model fit to the data and further suggested that several items were problematic due to relative low factor loadings. These items were then removed with the intention to improve model fit and reduce the total number of simulation motive items to match the number of items present in the social, coping, and enhancement motives subscales. Five items were selected based on theoretical fit to the proposed construct, high discrimination parameters, adequate coverage of the latent construct based on difficulty values, and high factor loadings. An EFA was then re-run using the revised 20-item drinking motives questionnaire. Results indicated that a four-factor model provided excellent model fit and that the five items proposed to be measuring a simulation motive all loaded well together on the same item. These findings provided initial evidence for the existence and value of a simulation drinking motive factor. The next step was to conduct a CFA using the second development sample to replicate the results with a new sample and explore whether the factor structure was the same across levels of exercise.

Findings from the CFA indicated that the factor structure revealed through the EFA using the first development sample fit adequately well with the second development sample. The model fit indices and factor loadings suggested that the four-factor model including the simulation motive factor fit well. Invariance testing of the simulation subscale was then conducted using the whole sample to ensure that each exercise group was adequately represented. The findings indicated that the simulation motive model fit similarly across groups and had configural invariance. This suggests that the simulation motive factor exists similarly for non-exercisers, low exercisers, and exercisers. Subsequent invariance testing conducted following confirmation of configural invariance revealed that the simulation motives subscale does not have metric invariance. This finding suggests that the items in the four-factor drinking motives model were not contributing to their respective latent constructs equally well across exercise groups. Further post-hoc testing, revealed that one of the five items' means differed across the three groups such that exercisers and low exercisers endorsed the item, "To get high, like you get from exercise" significantly more than non-exercisers. This item also had the lowest factor loading of the remaining simulation motive items in the final EFA and CFA. There was no difference in mean endorsement between exercisers and low exercisers. This finding indicates that the item, "To get high, like you get from exercise" varied across groups in line with part of the present study's hypothesis such that exercisers endorsed the item more than non-exercisers. However, the expected differences were not observed between exercisers and low exercisers.

Finally, the reliability and validity of the simulation motive factor and enhancement, coping, and social motives factors was assessed. Alpha and omega coefficients indicated that the simulation motive factor showed good internal consistency and is a unidimensional construct. This finding provides support to the reliability of the simulation motive construct. In contrast,

results suggested that the simulation items may not be validly measuring the proposed construct. Results indicated that the simulation factor did not strongly relate to other theoretically similar constructs. However, the simulation factor did not relate to constructs it should theoretically not be similar to which. Further, the simulation factor did correlate with the social, coping, and enhancement motives suggesting that this construct is likely measuring a unique motive to consume alcohol. Overall, these findings suggest that the simulation motive factor is an internally consistent, unidimensional measure that does not appear to validly measure what it theoretically should be measuring.

Conclusions on the Scale

Despite the range of protective properties in a host of bio-psycho-social domains, particularly with regards to alcohol use (Buchowski et al., 2011; Lynch et al., 2013), regular exercise is associated with greater frequency and quantity of alcohol use among college students (Musselman & Rutledge, 2010). While there may be other factors that might contribute to this relation, this study proposed that frequent exercisers might have unique reasons to drink that non-exercisers or infrequent exercisers do not. In consideration of the biological similarities between alcohol use and exercise/runner's high (Boecker et al., 2008; Sparling et al., 2003), it was proposed that these exercisers may also consume alcohol to simulate the natural high they receive through exercise. The development of the simulation motive factor provides initial guidance for future research and assessment of this particular biologically informed construct; however, the findings suggest that in the present sample it may not be validly measuring the intended construct. Though the construct exists for all exercise groups, findings suggest that the strength of the relation between the item and the simulation construct varies across exercise groups. Specifically, one of the simulation items yielded these differences across exercise

groups. While the revised Drinking Motives Questionnaire including the simulation motive factor should not be used until future studies more adequately evaluate the validity of the simulation factor, this study did provide initial evidence of the existence of a biological or simulation motive for use and that responses to these motive items may vary across groups. More research is needed to more effectively measure this motive and the validity of the scale.

Limitations

The present study had several notable limitations. First, this study was a convenience sample of predominantly White, female college students which may limit the ability to generalize findings to different ages, gender, or racial/ethnic groups. While the purpose of this study was to explore a potential reason to explain the positive relation between college student drinking and exercise, this construct may also be one that generalizes beyond college students.

Similar to the stated limitation above, the present study ran into complications collecting data from student-athletes. As expected, this data collection was met with resistance from athletic departments. At Colorado State University and The University of Wyoming, athletic directors cited concerns about the time of their student-athletes as reasons why they would not assist in data collection. Throughout data collection, responses from 40 varsity student-athletes were collected which fell well short of the originally proposed 150 needed to appropriately evaluate the simulation subscale among varsity student-athletes. There are likely unique social factors to consider that likely contribute to the reasons for drinking and increased frequency of drinking among college student-athletes. For example, these student-athletes are notably spending most of their time with teammates (Dams-O'Connor et al., 2007) which may contribute to the formation of descriptive team norms like alcohol use norms (Lewis et al., 2017). While descriptive norms are often the most salient predictor of college student alcohol use (Hustad et

al., 2014), it should also be noted that unique social factors among the most frequently exercising group on college campuses (student-athletes) may also help to explain the differences in alcohol use between student-athletes and non-athletes.

Second, data collection for this study relied on self-report measures at a single time-point. This may have introduced common method bias due to the measures being used instead of accurately measuring the simulation motive (Podsakoff et al., 2012). While efforts such as not informing the participants of the intention of this study to increase psychological distance were taken, it is necessary to collect more data at multiple time points and from multiple sources to further prevent bias in responding.

A third limitation to the study was the lack of research exploring the relation between the frequency of an exercise high and alcohol use. It was proposed that the simulation motive is a motive that is unique to frequent exercisers. Sparling et al. (2003) reported that approximately 50 minutes of moderate-to-intense exercise in one sitting is enough for the brain to release neurotransmitters responsible for euphoria and reinforcement of the activity. However, it is unknown how often during the week or how intensely one needs to exercise in order to experience an exercise high and be motivated to drink to simulate the high. In the present study, a person that endorsed 100 minutes of exercise in a week was considered a low exerciser. That person might have experienced two exercise highs during that week and therefore may be more likely to endorse drinking alcohol to simulate that high. This limitation may help to explain the lack of expected difference between endorsement of simulation motive items between low exercisers and exercisers in the present study. The broad range in drinking behavior across exercise indicates that this may not be the best way to group individuals in order to observe

differences in the simulation motive. It is necessary to further understand and clarify what groups are more likely to endorse a simulation motive to better test the construct.

Future Directions

To further extend this study, it is planned to further explore the relation between exercise high and alcohol use. The mechanisms underlying this simulation motive are poorly understood. It may be that this motive occurs unconsciously as it is biologically based and does not theoretically appear to be tied to mood or cognition. While several measures and constructs were selected to assess the convergent validity of the simulation motive construct, it may be that these measures were not the similar enough to the actual theoretical construct intended to be measured. It is necessary for future research to further explore constructs similar to this simulation motive to more accurately assess the validity of the measure. To address this, studies should test to identify the population which is most likely to endorse these simulation motives to drink. Given that student-athletes who exercise at least 20 hours per week (NCAA Division 1 Manual, 1991) and low exercisers are at higher risk than the general population to consume alcohol (Ford, 2009; Karoly et al., 2013; Martens et al., 2008a; Rexroat, 2014), exercise may not be the ideal method to group participants and identify differences in this particular motive. The present study may not have most accurately measured the simulation motive and possible differences across levels of physical activity. The next steps would be to explore the relation between frequency of endorsement of exercise high, alcohol use, and alcohol use motives as this relation has not yet been explored. Persons that exercise more frequently may experience more runner's highs. But it is currently unknown how often one needs to experience an exercise high to have a desire to simulate that feeling through alcohol use. Studies targeting exercise high frequency instead of exercise frequency may identify the levels of exercise high that are required to be more likely to

drink alcohol to simulate. Following this initial exploration, a more targeted data collection aimed at surveying those that experience frequent exercise highs may be conducted to more adequately test the presence of simulation motive and group differences across exercise high frequency.

Next, future research should consider constructs that would more closely map on to the proposed simulation construct to more adequately assess the validity of the measure. While the measures included in this study theoretically may have been assessing other biologically based constructs, it may be that other measures and constructs would be more similar to the proposed simulation construct. Considering that research on this construct is relatively new and not well-understood, future research efforts should focus on providing clarity to this construct and those similar to it. Once researchers have a greater understanding of similar constructs to the simulation construct, research should replicate this study and confirm the factor structure using other samples (Floyd & Widaman, 1995). Future researchers should test this measure with a more diverse sample of participants to improve the generalizability of the research. While this study provides preliminary evidence supporting the presence of this construct, future research should replicate the findings with a more diverse sample and provide sounder evidence of the validity of the measure.

TABLES

Table 1

Demographic Data

Variable	EFA Sample	CFA Sample
Age (<i>M, SD</i>)	20.08 (2.47)	20.08 (2.16)
Race (%)		
Alaska Native	0.2	0.2
American Indian/Native American	3.1	3.3
Asian or Asian American	6	3.9
Black or African American	3.5	3.3
Latinx or Hispanic	19.3	15.2
Native Hawaiian or Pacific Islander	0.6	1.6
White	82.1	85.6
Otherwise Not Specified	1.2	0.8
Gender (%)		
Male	29	27.9
Female	70.8	71.7
Otherwise Not Specified	0.2	0.4
Sport Participation (%)		
None	90	89.3
Club Sports	8.4	9.3
Varsity Sports	1.6	1.4

Table 2

Item Difficulty Statistics

Item	<i>M</i>
Sim1: Because it makes you feel as good as you do from exercise.	1.35
Sim2: To get high, like you get from exercise.	1.24
Sim3: Because you miss the high you get from exercise.	1.14
Sim4: To simulate the feeling you get from exercise.	1.14
Sim5: As a way to feel like you do when you exercise.	1.14
Sim6: As a way to simulate the high you get from exercise.	1.13
Sim7: To replace the high you get from exercise on a day off from exercise.	1.11
Sim8: When you're not exercising, you feel low.	1.48
Sim9: When you're not exercising, you need to feel that rush.	1.25
Sim10: To mimic the high from exercise.	1.14

Note. Difficulty values are represented by the mean scores. Items in bold are items flagged for high or low relative difficulty and were considered for removal.

Table 3

Item Discrimination Statistics (Inter-Item Correlations)

		Items									
		Sim1	Sim2	Sim3	Sim4	Sim5	Sim6	Sim7	Sim8	Sim9	Sim10
Items	Sim1	1.00									
	Sim2	0.67	1.00								
	Sim3*	0.51	0.61	1.00							
	Sim4*	0.54	0.63	0.84	1.00						
	Sim5*	0.55	0.62	0.82	0.89	1.00					
	Sim6*	0.54	0.63	0.80	0.87	0.86	1.00				
	Sim7	0.45	0.53	0.70	0.68	0.69	0.67	1.00			
	Sim8	0.29	0.32	0.36	0.33	0.33	0.32	0.38	1.00		
	Sim9	0.39	0.44	0.51	0.50	0.49	0.52	0.60	0.61	1.00	
	Sim10	0.43	0.55	0.61	0.67	0.64	0.69	0.74	0.38	0.66	1.00

Note. Discrimination values are represented by inter-item correlations. Items in bold are items flagged for removal due to poor discrimination. Items with an asterisk are items that are highly discriminating.

Table 4

Item Factor Loadings and Model Fit Statistics for 23-Item Drinking Motives Questionnaire.

Item	Factors			
	Social	Coping	Enhancement	Simulation
1. As a way to celebrate	0.42	-0.10	0	0.03
2. Because it is what most of your friends do when you get together	0.62	0.04	0.05	-0.02
3. To be sociable	0.69	-0.02	0.13	-0.01
4. Because it is customary on special occasions	0.63	0.02	-0.21	0.09
5. Because it makes a social gathering more fun	0.64	0.03	0.23	-0.01
6. To relax	0.07	0.59	0.03	-0.05
7. To forget your worries	0.03	0.76	-0.01	0
8. Because you feel more self-confident or sure of yourself	0.22	0.45	0.23	0
9. Because it helps when you feel depressed or nervous	-0.05	0.92	-0.05	0.01
10. To cheer up when you're in a bad mood	0.01	0.77	0.08	0.06
11. Because you like the feeling	-0.03	0.17	0.82	-0.01
12. Because it's exciting	0.15	-0.02	0.77	0.02
13. To get high	-0.01	0.13	0.58	0.13
14. Because it's fun	0.13	-0.07	0.79	-0.03
15. Because it makes you feel good	0.01	0.17	0.72	0.03
16. Because it makes you feel as good as you do from exercise	-0.01	0.07	0.22	0.56
17. To get high, like you get from exercise	0.09	0	0.09	0.69
18. Because you miss the high you get from exercise	-0.01	-0.01	-0.02	0.87
19. To simulate the feeling you get from exercise	-0.04	-0.03	0.02	0.98

20. As a way to feel like you do when you exercise	-0.04	-0.02	0.02	0.96
21. As a way to simulate the high you get from exercise	-0.02	-0.02	0.03	0.92
22. To replace the high you get from exercise on a day off from exercise	0.16	0.03	-0.12	0.67
23. To mimic the high from exercise	0.17	0.05	-0.09	0.66
Eigenvalues	8.17	3.93	1.90	1.48
Parallel Analysis	1.42	1.35	1.29	1.24
RSMEA	0.08			
CFI	0.94			
SRMR	0.03			

Note. Items in boldface denote item's primary factor loading. RMSEA, Root Mean Square Error of Assumption; CFI, Comparative Fit Index; SRMR, Standardized Root Mean Square Residual.

Table 5

Item Factor Loadings and Model Fit Statistics for 20-Item Drinking Motives Questionnaire.

Item	Factors			
	Social	Coping	Enhancement	Simulation
1. As a way to celebrate	0.44	-0.10	-0.04	0.03
2. Because it is what most of your friends do when you get together	0.63	0.04	0.01	-0.02
3. To be sociable	0.73	-0.02	0.06	-0.02
4. Because it is customary on special occasions	0.66	0.03	-0.27	0.08
5. Because it makes a social gathering more fun	0.69	0.03	0.16	-0.01
6. To relax	0.07	0.59	0.03	-0.05
7. To forget your worries	0.04	0.76	-0.01	0
8. Because you feel more self-confident or sure of yourself	0.24	0.45	0.20	-0.01
9. Because it helps when you feel depressed or nervous	-0.04	0.92	-0.06	0.01
10. To cheer up when you're in a bad mood	0.01	0.77	0.08	0.06
11. Because you like the feeling	-0.04	0.17	0.83	-0.01
12. Because it's exciting	0.14	-0.03	0.77	0.02
13. To get high	-0.02	0.12	0.59	0.13
14. Because it's fun	0.12	-0.08	0.79	-0.03
15. Because it makes you feel good	0.01	0.16	0.71	0.03
16. To get high, like you get from exercise	0.10	0.02	0.06	0.67
17. Because you miss the high you get from exercise	0	0.02	-0.03	0.86
18. To simulate the feeling you get from exercise	-0.01	-0.01	0	0.97
19. As a way to feel like you do when you exercise	-0.01	0	0	0.95

20. As a way to simulate the high you get from exercise	0.01	0.01	0.01	0.91
Eigenvalues	7.20	3.32	1.89	1.46
Parallel Analysis	1.37	1.31	1.26	1.21
RSMEA	0.05			
CFI	0.98			
SRMR	0.02			

Note. Items in boldface denote item's primary factor loading. RMSEA, Root Mean Square Error of Assumption; CFI, Comparative Fit Index; SRMR, Standardized Root Mean Square Residual.

Table 6

Subscale Correlation Coefficients

DMQ Subscale	Social	Coping	Enhancement	Simulation
Social	1.00	–	–	–
Coping	.44	1.00	–	–
Enhancement	.51	.56	1.00	–
Simulation	.25	.32	.28	1.00

Table 7

Model Fit Indices for Invariance Testing

Model	RMSEA	CFI	SRMR
Comparison model without constraints	0.13	0.97	0.18
Configural model	0.12*	0.99*	0.03*
Metric model	0.14	0.97	0.13
Scalar model	0.13	0.97	0.12

Note. * represents a statistically significant improvement from the comparison model

REFERENCES

- American College Health Association. American College Health Association – National College Health Assessment II: Undergraduate Student Reference Group Data Report Spring 2019. Silver Spring, MD: American College Health Association; 2019.
- American Educational Research Association, American Psychological Association, National Council on Measurement in Education, Joint Committee on Standards for Educational, & Psychological Testing. (1999). *Standards for educational and psychological testing*. American Educational Research Association. United States.
- Baer, J. S., Stacy, A., & Larimer, M. (1991). Biases in the perception of drinking norms among college students. *Journal of Studies on Alcohol*, 52, 580-586.
- Barry, A. E., & Piazza-Gardner (2012). Drunkorexia: Understanding the co-occurrence of alcohol consumption and eating/exercise weight management behaviors. *Journal of American College Health*, 60, 236-243.
<https://dx.doi.org/10.1080/07448481.2011.587487>
- Boecker, H., Sprenger, T., Spilker, M. E., Henriksen, G., Koppenhoefer, M., Wagner, K. J., ... Tolle, T. R. (2008). The runner's high: Opioidergic mechanisms in the human brain. *Cerebral Cortex*, 18, 2523-2531. <https://dx.doi.org/10.1093/cercor/bhn013>
- Borsari, B., & Carey, K. B. (2001). Peer influences on college drinking: A review of the research. *Journal of Substance Abuse*, 13, 391-424.
- Brown, T. A. (2015). *Confirmatory factor analysis for applied research*. New York, United States: Guilford Press.

- Buchowski, M. S., Meade, N. N., Charboneau, E., Park, S., Dietrich, M. S., Cowan, R. L., ...
Martin, P. R. (2011). Aerobic exercise training reduces cannabis craving and use in non-treatment seeking cannabis-dependent adults. *PLoS ONE*, *6*, 1-6.
<https://dx.doi.org/10.1371/journal.pone.0017465>
- Cahalan, D., & Cisin, I. H. (1968). American drinking practices: Summary of findings from a national probability sample. I. Extent of drinking by population subgroups. *Journal of Studies on Alcohol*, *29*, 130-151.
- Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology*, *67*, 319-333.
- Centers for Disease Control and Prevention. (2016). *Alcohol Use and Your Health* [Fact Sheet]. Retrieved from <https://www.cdc.gov/alcohol/pdfs/alcoholyourhealth.pdf>
- Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling*, *14*, 464-504.
- Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, *58*, 1015-1026.
- Clarke, T. C., Norris, T., & Schiller, J. S. (2017). Early release of selected estimates based on data from the 2016 national health interview survey. *National Center For Health Statistics*, 1-120. <https://dx/doi.org/10.1080/10705510701301834>
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*, 385-396.

- Collins R. L., Parks G. A., & Marlatt G. A. (1985). Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. *Journal of Consulting and Clinical Psychology, 53*, 189–200.
- Colombo, G., Serra, S., Vacca, G., Carai, M. A., & Gessa, G. L. (2005). Endocannabinoid system and alcohol addiction: Pharmacological studies. *Pharmacology Biochemistry and Behavior, 81*, 369-380. <https://dx.doi.org/10.1016/j.pbb.2005.01.022>
- Cooper, M. L. (1994). Motivations for alcohol use among adolescents: Development and validation of a four-factor model. *Psychological Assessment, 6*, 117-128. <https://dx.doi.org/10.1037/1040-3590.6.2.117>
- Cooper, M. L., Russell, M., Skinner, J. B., & Windle, M. (1992). Development and validation of a three-dimensional measure of drinking motives. *Psychological Assessment, 4*, 123–132. <https://dx.doi.org/10.1037/1040-3590.4.2.123>
- Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology, 78*, 98-104. <https://dx.doi.org/10.1037/0021-9010.78.1.98>
- Costello, A. B., & Osborne, J. W. (2005). Best practices in Exploratory Factor Analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation, 10*, 1-9.
- Courtenay, W. (2009). Theorising masculinity and men's health. *Men's health: Body, identity and social context, 9-32*.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*, 297-334.
- Daily and Weekly Hour Limitations – Playing Season, NCAA Division I Manual. § 17.1.7.1 (1991).

- Dams-O'Connor, K., Martin, J. L., Martens, M. P. (2007). Social norms and alcohol consumption among intercollegiate athletes: The role of athlete and nonathlete reference groups. *Addictive Behaviors, 32*, 2657-2666.
<https://dx.doi.org/10.1016/j.addbeh.2007.04.030>
- Deci, E. L., & Ryan, R. M. (1980) Self-determination theory: When mind mediates behavior. *The Journal of Mind and Behavior, 1*, 33-43.
- Demianczyk, A. C., Jenkins, A. L., Henson, J. M., & Conner, B. T. (2014). Psychometric evaluation and revision of Carver and White's BIS/BAS Scales in a diverse sample of young adults. *Journal of Personality Assessment, 96*, 485-494.
<https://dx.doi.org/10.1080/00223891.2013.870570>
- DeVellis, R. F. (2012). *Scale development: Theory and applications* (Vol. 26). Thousand Oaks, CA: Sage Publications, Inc.
- Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction with Life Scale. *Journal of Personality Assessment, 49*, 71-75.
- Drasgow, F. (1984). Scrutinizing psychological tests: Measurement equivalence and equivalent relations with external variables are the central issues. *Psychological Bulletin, 95*, 134–135. <https://dx.doi.org/10.1037/0033-2909.95.1.134>
- Drasgow, F. (1987). Study of the measurement bias of two standardized psychological tests. *Journal of Applied Psychology, 72*, 19–29.
- Dunn, M. S., & Wang, M. Q. (2003). Effects of physical activity on substance use among college students. *American Journal of Health Studies, 18*, 126-132.
- Eisenhower, D., Mathiowetz, N. A., & Morganstein, D. (2011). Recall error: Sources and Bias reduction techniques. In P. P. Biemer, R. M. Groves, L. E. Lyberg, N. A. Mathiowetz, &

- S. Sudman, (Eds.). *Measurement Errors in surveys* (pp. 127-144). John Wiley & Sons, Inc. <https://dx.doi.org/10.1002/9781118150382.ch8>
- El-Sayed, M. S., Ali, N., & El-Sayed Ali, Z. (2005). Interaction between Alcohol and Exercise: Physiological and haematological implications. *Sports Medicine*, 35, 257-269.
- Everly, G. S., & Lating, J. M. (2013). *A clinical guide to the treatment of the human stress response*. New York, NY: Springer Science+Business Media.
https://dx.doi.org/10.1007/978-1-4614-5538-7_15
- Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, 4, 272-299.
- Floyd, F. J., & Widaman, K. F. (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment*, 7, 286-299.
<https://dx.doi.org/10.1037/1040-3590.7.3.286>
- Ford, J. A. (2009). Alcohol use among college students: A comparison of athletes and nonathletes. *Substance Use and Misuse*, 42, 1367-1377.
<https://dx.doi.org/10.1080/10826080701212402>
- Ford, J. K., MacCallum, R. C. & Tait, M. (1986). The application of exploratory factor analysis in applied psychology: A critical review and analysis. *Personnel Psychology*, 39, 291-314.
- French, M. T., Popovici, I., & Maclean, J. C. (2009). Do alcohol consumers exercise more? Findings from a national survey. *The Science of Health Promotion*, 24, 2-10.
- Gilbertson, R., Prather, R., Nixon, S. J. (2008). The role of selected factors in the development and consequences of alcohol dependence. *Alcohol Research & Health*, 31, 389-399.

- Gray, J. A. (1978). The 1977 Myers lecture: The neuropsychology of anxiety. *British Journal of Psychology*, *69*, 417–434.
- Gray, J. A. (Ed.). (1981). *A critique of Eysenck's theory of personality*. New York, NY: Springer.
- Gray, J. A. (1987). *The psychology of fear and stress* (2nd ed.). Cambridge, UK: Cambridge University Press.
- Gray, J. A. (1990). Brain systems that mediate both emotion and cognition. *Cognition and Emotion*, *4*, 269–288.
- Guttman, L. (1954). A new approach to factor analysis: the Radex. In P. F. Lazarsfeld (Ed.), *Mathematical thinking in the social sciences* (pp. 258-348). New York, NY: Free Press.
- Herring, T. E., Zamboanga, B. L., Olthuis, J. V., Pesigan, I. J. A., Martin, J. L., McAfee, N. W., & Martens, M. P. (2016). Utility of the Athlete Drinking Scale for assessing drinking motives among high school athletes. *Addictive Behaviors*, *60*, 18-23.
<https://dx.doi.org/10.1016/j.addbeh.2016.03.026>
- Hingson, R. W., Zha, W., & Weitzman, E. R., (2009). Magnitude of and trends in alcohol-related mortality and morbidity among U.S. college students ages 18-24, 1998-2005. *Journal of Studies on Alcohol and Drugs, Supplement*, 12-20.
<https://dx.doi.org/10.15288/jsads.2009.s16.12>
- Hoelter, J. W. (1983). The analysis of covariance structures goodness-of-fit indices. *Sociological Methods and Research*, *11*(3), 325-344.
<https://dx.doi.org/10.1177/0049124183011003003>
- Horn, J. L., & McArdle, J. J. (1992). A practical and theoretical guide to measurement invariance in aging research. *Experimental Aging Research*, *18*, 117–144.

- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6, 1-55. <https://dx.doi.org/10.1080/107055199909540118>
- Hummer, J. F., LaBrie, J. W., & Lac, A. (2009). The prognostic power of normative influences among NCAA student-athletes. *Addictive Behaviors*, 34, 573-580. <https://dx.doi.org/10.1016/j.addbeh.2009.03.021>
- Humphreys, L. G., & Montanelli Jr., R. G. (1975) An investigation of the parallel analysis criterion for determining the number of common factors. *Multivariate Behavioral Research*, 10, 193-205. https://dx.doi.org/10.1207/s15327906mbr1002_5
- Hustad, J. T. P., Pearson, M. R., Neighbors, C., Borsari, B. (2014). The role of alcohol perceptions as mediators between personality and alcohol-related outcomes among incoming college-student drinkers. *Psychology of Addictive Behaviors*, 28, 336-347. <https://dx.doi.org/10.1037/a0033785>
- Hsu, K., & Iwamoto, D. K. (2014). Testing for measurement invariance in the Conformity to Masculine Norms-46 across White and Asian American college men: Development and validity of the CMNI-29. *Psychology of Men and Masculinity*, 15, 397-406. <https://dx.doi.org/10.1037/a0034548>
- IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.
- Iwamoto, D. K., & Smiler, A. P. (2013). Alcohol makes you macho and helps you make friends: The role of masculine norms and peer pressure in adolescent boys' and girls' alcohol use. *Substance Use & Misuse*, 48, 371-378. <https://dx.doi.org/10.3109/10826084.2013.765479>

- Julien, R. M., Advokat, C. D., & Comaty, J. E. (2011). *A Primer of drug action: A comprehensive guide to the actions, uses, and side effects of psychoactive drugs*. New York, NY: Worth Publishers.
- Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement, 20*, 141-151.
<https://dx.doi.org/10.1177/001316446002000116>
- Karoly, H. C., Stevens, C. J., Thayer, R. E., Magnan, R. E., Bryan, A. D., & Hutchinson, K. E. (2013). Aerobic exercise moderates the effect of heavy alcohol consumption on white matter damage. *Alcohol Clinical and Experimental Research, 37*, 1508-1515.
<https://dx.doi.org/10.1111/acer.12135>
- Kuntsche, E., Knibbe, R., Gmel, G., & Engels, R. (2005). Why do young people drink? A review of drinking motives. *Clinical Psychology Review, 25*, 841-861.
<https://dx.doi.org/10.1016/j.cpr.2005.06.002>
- Larimer, M. E., Kaysen, D. L., Lee, C. M., Kilmer, J. R., Lewis, M. A., Dillworth, T., ... Neighbors, C. (2009). Evaluating level of specificity of normative referents in relation to personal drinking behavior. *Journal of Studies on Alcohol and Drugs, Supplement Number 16*, 115-121.
- Leasure, J. L., Neighbors, C., Henderson, C. E., & Young, C. M. (2015). Exercise and alcohol consumption: What we know, what we need to know, and why it is important. *Frontiers in Psychiatry, 6*, 1-13. <https://dx.doi.org/10.3389/fpsy.2015.00156>
- Leichliter, J.S., Meilman, P.W., Presley, C.A., & Cashin, J.R. (1998). Alcohol use and related consequences among students with varying levels of involvement in college athletics.

Journal of American College Health, 46, 257-262.

<https://dx.doi.org.ezp.lndlibrary.org/10.1080/07448489809596001>

Lewis, T. F., Milroy, J. L., Wyrick, D. L., Hebard, S. P., & Lamberson, K. A. (2017). Binge-drinking and non-binge-drinking student-athletes: The role of proximal norms, negative expectancies, and selected sociodemographic variables. *Journal of Child & Adolescent Substance Abuse*, 26, 141-151. <https://dx.doi.org/10.1080/1067828X.2016.1222978>

Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. *Journal of Applied Psychology*, 86, 114-121.

<https://dx.doi.org/10.1037//0021-9010.86.1.114>

Lisha, N.E., & Sussman, S. (2010). Relationship of high school and college sports participation with alcohol, tobacco, and illicit drug use: A review. *Addictive Behaviors*, 35, 399-407.

<https://dx.doi.org/10.1016/j.addbeh.2009.12.032>

Little, L. M., Kluemper, D., Nelson, D. L., & Gooty, J. (2012). Development and validation of the Interpersonal Emotion Management Scale. *Journal of Occupational & Organizational Psychology*, 85, 407-420.

<https://dx.doi.org/10.1111/j.2044-8325.2011.02042.x>

Lynch, W. J., Peterson, A. B., Sanchez, V., Abel, J., & Smith, M. A. (2013). Exercise as a novel treatment for drug addiction: A neurobiological and stage-dependent hypothesis.

Neuroscience and Biobehavioral Reviews, 37, 1622-1644.

<https://dx.doi.org/10.1016/j.neubiorev.2013.06.011>

Martens, M. P., Cox, R. H., Beck, N. C., & Heppner, P. P. (2003). Measuring motivations for intercollegiate athlete alcohol use: A confirmatory factor analysis of the Drinking

- Motives Measure. *Psychological Assessment*, 15, 235-239.
<https://dx.doi.org/10.1037/1040-3590.15.2.235>
- Martens, M. P., Labrie, J. W., Hummer, J. F., & Pedersen, E. R. (2008a). Understanding sport related drinking motives in college athletes: Psychometric analyses of the Athlete Drinking Scale. *Addictive Behaviors*, 33, 974-977.
<https://dx.doi.org/1016/j.addbeh.2008.03.001>
- Martens, M. P., Rocha, T. L., Martin, J. L., & Serrao, H. F. (2008b). Drinking motives and college students: Further examination of a four-factor model. *Journal of Counseling Psychology*, 55, 289-295. <https://dx.doi.org/10.1037/0022-0167.55.2.289>
- Martens, M. P., Pedersen, E. R., Smith, A. E., Stewart, S. H., & O'Brien, K. (2011). Predictors of alcohol-related outcomes in college athletes: The roles of trait urgency and drinking motives. *Addictive Behaviors*, 36, 456-464.
<https://dx.doi.org/10.1016/j.addbeh.2010.12.025>
- Martens, M. P., Watson II, J. C., Royland, E. M., & Beck, N. C. (2005). Development of the Athlete Drinking Scale. *Psychology of Addictive Behaviors*, 19(2), 158-164.
<https://dx.doi.org/10.1037/0893-164X.19.2.158>
- Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, 50, 370-396.
- Massengale, K. E. C., Ma, A., Rulison, K. L., Milroy, J. L., & Wyrick, D. L. (2017). Perceived norms and alcohol use among first-year college student-athletes' different types of friends. *Journal of American College Health*, 65, 32-40.
<https://dx.doi.org/10.1080/07448481.2016.1233557>
- McDonald, R. P. (1999). *Test theory: A unified treatment*. Psychology Press.

- Meade, A. W., & Bauer, D. J. (2007). Power and precision in confirmatory factor analytic tests of measurement invariance. *Structural Equation Modeling, 14*, 611-635.
<https://dx.doi.org/10.1080/10705510701575461>
- Meade, A. W., Johnson, E. C., & Braddy, P. W. (2008). Power and sensitivity of alternative fit indices in tests of measurement invariance. *Journal of Applied Psychology, 93*, 568-592.
<https://dx.doi.org/10.1037/0021-9010.93.3.568>
- Meade, A. W., & Lautenschlager, G. J. (2004). A monte-carlo study of confirmatory factor analytic tests of measurement equivalence/invariance. *Structural Equation Modeling, 11*, 60-72.
- Miech, R. A., Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2016). Monitoring the Future national survey results on drug use, 1975–2015: Volume I, Secondary school students. Ann Arbor: Institute for Social Research, The University of Michigan. Available at <https://monitoringthefuture.org/pubs.html#monographs>
- Mahalik, J. R., Locke, B. D., Ludlow, L. H., Deimer, M. A., Scott, R. P. J., Gottfried, M., ... Freitas, G. (2003). Development of the Conformity to Masculine Norms Inventory. *Psychology of Men & Masculinity, 4*, 3-25. <https://dx.doi.org/10.1037/1524-9220.4.1.3>
- Murphy, K. R., & Davidshofer, C. O. (1991). *Psychological testing*. Prentice-Hall.
- Musselman, J. R. B., & Rutledge, P. C. (2010). The incongruous alcohol-activity association: Physical activity and alcohol consumption in college students. *Psychology of Sport and Exercise, 11*, 609-618. <https://dx.doi.org/10.1016/j.psychsport.2010.07.005>
- Muthén, L. K. & Muthén, B. O. (1998-2017). Mplus User's Guide. Eighth Edition. Los Angeles, CA: Muthén & Muthén.

- National Collegiate Athletic Association. (2018). *NCAA Sports Sponsorship and Participation Rates Report* [Fact Sheet]. Retrieved https://ncaaorg.s3.amazonaws.com/research/sportpart/Oct2018RES_2017-18SportsSponsorshipParticipationRatesReport.pdf
- National Institute on Alcohol Abuse and Alcoholism. (2015). *College Drinking* [Fact Sheet]. Retrieved from <https://pubs.niaaa.nih.gov/publications/collegefactsheet/Collegefactsheet.pdf>
- Neighbors, C., O'Connor, R. M., Lewis, M. A., Chawla, N., Lee, C. M., & Fossos, N. (2008). The relative impact of injunctive norms on college student drinking: The role of reference group. *Psychology of Addictive Behaviors, 22*, 576-581. <https://dx.doi.org/10.1037/a0013043>
- Nunnally, J. C. & Bernstein, I. H. (1994). *Psychometric Theory*. United States of America: McGraw-Hill.
- O'Brien, K. S., Ali, A., Cotter, J. D., O'Shea, R. P., & Stannard, S. (2007). Hazardous drinking in New Zealand sportspeople: Level of sport participation and drinking motives. *Alcohol and Alcoholism, 42*, 376-382. <https://dx.doi.org/10.1093/alcalc/agm035>
- Pate, R. R., Heath, G. W., Dowda, M., & Trost, S. G. (1996). Associations between physical activity and other health behaviors in a representative sample of US adolescents. *American Journal of Public Health, 86*, 1577-1581.
- Perkins, H. W., & Berkowitz, A. D. (1986). Perceiving the community norms of alcohol use among students: Some research implications for campus alcohol education programming. *The International Journal of the Addictions, 21*, 961-976. <https://dx.doi.org/10.3109/10826088609077249>

- Piazza-Gardner, A. K., & Barry, A. E. (2012). Examining physical activity levels and alcohol consumption: Are people who drink more active? *The Science of Health Promotion*, 26, 95-104. <https://dx.doi.org/10.4278/ajhp.100929-LIT-328>
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology*, 63, 539-569. <https://dx.doi.org/10.1146/annurev-psych-120710-100452>
- Podsakoff, P. M., MacKenzie, S. B., Lee, J-Y, & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88, 879-903. <https://dx.doi.org/10.1037/0021-9010.88.5.879>
- Prince, M. A. (2015). *A comparison of descriptive and injunctive norms brief interventions for college drinkers* (Doctoral dissertation). Retrieved from <https://surface.syr.edu/etd>
- Prince, M. A., & Carey, K. B. (2010). The malleability of injunctive norms among college students. *Addictive Behaviors*, 35, 940-947. <https://dx.doi.org/10.1016/j.addbeh.2010.06.006>
- Prince, M. A., Maisto, S. A., Rice, S. L., Carey, K. B. (2015). Development of a face-to-face injunctive norms brief motivational intervention for college drinkers and preliminary outcomes. *Psychology of Addictive Behaviors*, 29, 825-835. <https://dx.doi.org/10.1037/adb0000118>
- R Core Team. Released 2017. R: A language and environment for statistical computing. Vienna, Austria. Retrieved from: <https://www.R-project.org/>
- Raykov, T. & Marcoulides, G. A. (2011). *Introduction to psychometric theory*. New York, NY: Taylor and Francis Group, LLC.

- Rexroat, M. (2014). *NCAA national study of substance use habits of college student-athletes*. Retrieved from the National Collegiate Athletic Association website:
https://www.ncaa.org/sites/default/files/Substance%20Use%20Final%20Report_FINAL.pdf
- Richards, S., & Aries, E. (1999). The division III student-athlete: Academic performance, campus involvement and growth. *Journal of College Student Development, 40*, 211-218.
- Rockafellow, B. D., & Saules, K. K. (2006). Substance use by college students: The role of intrinsic versus extrinsic motivation for athletic involvement. *Psychology of Addictive Behaviors, 20*, 279-287. <https://dx.doi.org/10.1037/0893-164X.20.3.279>
- Saunders, J. B., Aasland, O. G., Babor, T. F., de la Fuente, J. R., & Grant, M. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption—II. *Addiction, 88*, 791–804.
- Seitz, C. M., Wyrick, D. L., Rulison, K. L., Strack, R. W., & Fearnow-Kenney, M. (2014). The association between coach and teammate injunctive norm reference groups and college student-athlete substance use. *Journal of Alcohol and Drug Education, 58*, 7-26.
- Shi, D., Maydeu-Olivares, A., & Rosseel, Y. (2019). Assessing fit in ordinal factor analysis models: SRMR vs. RMSEA. *Structural Equation Modeling: A Multidisciplinary Journal*. <https://dx.doi.org/10.1080/10705511.2019.1611434>
- Sparling, P. B., Giuffrida, A., Piomelli, D., Rosskopf, L., & Dietrich, A. (2003). Exercise activates the endocannabinoid system. *Cognitive Neuroscience, 14*, 2209-2211.
- Tabachnick, B. G., & Fidell, L. S. (2001). *Using Multivariate Statistics*. Boston: Allyn and Bacon.

- Ullman, J. B., & Bentler, P. M. (2009). Structural equation modeling. In M. Hardy & A. Bryman (Eds.) *The Handbook of Data Analysis, Paperback Edition* (pp. 431-458). Thousand Oaks, CA: Sage Publications.
- Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 3*, 4-70. <https://dx.doi.org/10.1177/109442810031002>
- Watson, J. C. (2002). Assessing the potential for alcohol-related issues among college student-athletes. *Athletic Insight: The Online Journal of Sport Psychology, 4*, 14-27.
- Wechsler, H., Davenport, A. E., Dowdall, G. W., Grossman, S. J., & Zanakos, S. I. (1997). Binge drinking, tobacco, and illicit drug use and involvement in college athletics: A survey of students at 140 American colleges. *Journal of American College Health, 45*, 195-200. <https://dx.doi.org/10.1080/07448481.1997.9936884>
- Wechsler, H., Davenport, A. E., Dowdall, G. W., Moeykens, B., & Castillo, S. (1994). Health and behavioral consequences of binge drinking in college: A national survey of students at 140 campuses. *Journal of the American Medical Association, 272*, 1672-1677.
- Wechsler, H., Lee, J. E., Kuo, M., & Lee, H. (2000). College binge drinking in the 1990s: A continuing problem results of the Harvard School of Public Health 1999 college alcohol study. *Journal of American College Health, 48*, 199-210. <https://dx.doi.org/10.1080/07448480009599305>
- Weitzman, E. R., Nelson, T. F., & Wechsler, H. (2003). Taking up binge drinking in college: The influences of person, social group, and environment. *Journal of Adolescent Health, 32*, 26-35.

- Wells, S., Flynn, A., Tremblay, P. F., Dumas, T., Miller, P., & Graham, K. (2014). Linking masculinity to negative drinking consequences: The mediating roles of heavy episodic drinking and alcohol expectancies. *Journal of Studies on Alcohol and Drugs, 75*, 510-519.
- Wills, T. A., & Shiffman, S. (1985). Coping and substance use: A conceptual framework. In S. Shiffman & T. A. Wils (Eds.), *Coping and substance use* (pp. 3-24). Orlando, FL: Academic Press.
- World Health Organization (2011). *Global Recommendations on Physical Activity for Health* [Fact Sheet]. <https://www.who.int/dietphysicalactivity/physical-activity-recommendations-18-64years.pdf?ua=1>
- Yusko, D. A., Buckman, J. F., White, H. R., & Pandina, R. J. (2008). Alcohol, tobacco, illicit drugs, and performance enhancers: A comparison of use by college student athletes and nonathletes. *Journal of American College Health, 57*, 281-290.
<https://dx.doi.org/10.3200/JACH.57.13.281-290>
- Zamboanga, B. L., Iwamoto, D. K., Pesigan, I. J., & Tomaso, C. C. (2015). A “player’s” game? Masculinity and drinking games participation among White and Asian American male college freshmen. *Psychology of Men & Masculinity, 16*, 468-473.
- Zhou, J., & Heim, D. (2014). Sports and spirits: A systematic qualitative review of emergent theories for student-athlete drinking. *Alcohol and Alcoholism, 49*, 604-617.
<https://dx.doi.org/10.1093/alcalc/agu061>

Appendix A
Consent Form

Dear Participant,

You are being invited to participate in a survey research study. You were selected as a possible participant because you are an undergraduate student enrolled in Psychology classes at Colorado State University, or you are a student-athlete at Colorado State University. You must be 18 years old or older to participate. We ask that you read this form and ask any questions you may have before agreeing to be in the study. This study is being conducted by Dr. Mark Prince, a faculty member, and Sam Davis, a graduate student, in the Department of Psychology at Colorado State University. This study has been approved by the Institutional Review Board of Colorado State University.

Your participation is voluntary which means you can choose whether or not you want to participate. You may withdraw at any time without penalty.

The study for which you are being asked to participate is designed to examine the drinking patterns of college students and student-athletes. The survey takes most people under 30 minutes to complete.

It is expected that participation in this study will provide you with no more than minimal risk or discomfort which means that you should not experience it as any more troubling than your normal daily life. Counseling Services (CSU: 970-491-6053) are available to anyone who experiences distress related to the research. For this survey, direct benefit for participating consists of research credit (for students enrolled in PSY100) and entry into a drawing for a \$50 gift card. Your responses will help us to better understand the research topic, and perhaps will give you insight into your own attitudes and beliefs.

In order to limit one survey submission per participant, we will ask you to generate a special code, but the code will not consist of identifying information. Therefore, any identifying

information will not be linked in any way to the research data. All responses to this survey are confidential. Concerning your rights or treatment as a research subject, you may contact the CSU IRB at: RICRO_IRB@mail.colostate.edu; 970-491-1553.

I understand that my participation in this study is entirely voluntary and that I may refuse to participate or may withdraw from the study at any time without penalty. I have read this entire form and I understand it completely. By clicking below and completing the online assessments that follow I am giving my consent to participate in this study.

If I have questions or concerns regarding my participation in the study, I can contact the principle investigator Dr. Mark Prince at mark.prince@colostate.edu, or Samuel Davis at 302-668-4385 (srdavis@colostate.edu).

Appendix B
Demographic Sheet

1. Sex:

Male

Female

2. Are you... (Mark all that apply.)

White

Black or African American

American Indian/Native American

Latino or Hispanic

Alaska Native

Hawaiian or Pacific Islander

Asian American

Other

3. What is your birthdate (mm/dd/yyyy)?

4. What year are you in school?

First Year

Sophomore

Junior

Senior

Other

5. Do you currently participate in organized athletics at Colorado State University (excluding Intramural leagues)?

No I do not participate in sports

Yes, Club Sports

Yes, Varsity Athletics

6. If you ARE a member of club or varsity athletics, what type of sport do you currently play?

Contact Sport (ex.- basketball, football, lacrosse, rugby, soccer, wrestling)

Non-Contact Sport (ex.- cross country, golf, softball, swimming, tennis, track and field, and volleyball)

7. How many times per week do you currently exercise?

0 times per week

1 time per week

2 times per week

3 times per week

4 times per week

5 times per week

6 times per week

7 or more times per week

N/A (on a club or varsity team)

8. About how many hours would you estimate you engage in aerobic exercise (e.g. running, biking, swimming) per day during a typical week? (Fill in the blank)

9. Have any of your family members ever been diagnosed with a problem with drugs or alcohol?

(Y/N)

STANDARD DRINK CONVERSION

When asked how much you drink in the following questions use this chart.

ONE STANDARD DRINK IS EQUAL TO:



Standard American BEER 12 oz. Can, Bottle or Glass
(3-5% alcohol)

Microbrew or European BEER 1/2 of a 12 oz. Can or Bottle
(8%-12% alcohol)



WINE (12 – 17% alcohol) 4 oz. Glass

WINE Cooler 10 oz. Bottle



HARD LIQUOR 1-1/2 oz. or One Standard Shot
(80-proof, 40% alcohol)

HARD LIQUOR 1 oz.
(100-proof, 50% alcohol)



WINE: 1 Bottle

25 oz. (12 – 17% alcohol)	=	5 standard drinks
40 oz. (12 – 17% alcohol)	=	8 standard drinks



HARD LIQUOR: 1 Bottle

12 oz.	=	8 standard drinks
25 oz.	=	17 standard drinks
40 oz.	=	27 standard drinks

INSTRUCTIONS FOR RECORDING DRINKING DURING A TYPICAL WEEK

IN THE CALENDAR BELOW, PLEASE FILL-IN YOUR DRINKING RATE AND TIME DRINKING DURING A **TYPICAL WEEK** IN THE LAST **30 DAYS**.

First, think of a *typical week* in the last *30 days* (Where did you live? What were your regular weekly activities? Were you working or going to schools? Etc.). Try to remember as accurately as you can, *how much* and *for how long* you *typically drank* in a week during that one-month period.

For each day of the week in the calendar below, fill in the **number of standard drinks typically consumed on that day** in the upper box and the **typical number of hours you drank** that day in the lower box.

Day of Week	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of Drinks							
Number of Hours Drinking							

INSTRUCTIONS FOR RECORDING DRINKING FOR YOUR HEAVIEST DRINKING WEEK

IN THE CALENDAR BELOW, PLEASE FILL-IN YOUR DRINKING RATE AND TIME DRINKING DURING YOUR **HEAVIEST DRINKING WEEK** IN THE LAST **30 DAYS**.

First, think of your *heaviest drinking week* in the last *30 days* (Where did you live? What were your regular weekly activities? Were you working or going to schools? Etc.). Try to remember as accurately as you can, *how much* and *for how long* you *typically drank* during your *heaviest drinking week* in that one-month period.

For each day of the week in the calendar below, fill in the **number of standard drinks consumed on that day** in the upper box and the **number of hours you drank** that day in the lower box.

Day of Week	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of Drinks							
Number of Hours Drinking							

1. **How often did your drink during the last *month*?** (Check one)

- a. I did not drink at all.
- b. About once a month.
- c. Two or three times a month.
- d. Once or twice a week.
- e. Three or four times a week.
- f. Nearly every day.
- g. Once a day or more.

2. **Think of a typical weekend evening** (Friday or Saturday) during the last *month*. How **much** did you drink on that evening? (Check one)

0 drinks	8 drinks	16 drinks	24 drinks
1 drink	9 drinks	17 drinks	25 drinks
2 drinks	10 drinks	18 drinks	26 drinks
3 drinks	11 drinks	19 drinks	27 drinks
4 drinks	12 drinks	20 drinks	28 drinks
5 drinks	13 drinks	21 drinks	29 drinks
6 drinks	14 drinks	22 drinks	30 drinks
7 drinks	15 drinks	23 drinks	<i>More than 30</i>

3. **Think of the occasion** (any day of the week) you drank the most during the last *month*. How **much** did you drink? (Check one)

0 drinks	8 drinks	16 drinks	24 drinks
1 drink	9 drinks	17 drinks	25 drinks
2 drinks	10 drinks	18 drinks	26 drinks
3 drinks	11 drinks	19 drinks	27 drinks
4 drinks	12 drinks	20 drinks	28 drinks
5 drinks	13 drinks	21 drinks	29 drinks
6 drinks	14 drinks	22 drinks	30 drinks
7 drinks	15 drinks	23 drinks	<i>More than 30</i>

Appendix C
Drinking Motives Measure

Instructions: Listed below are 15 reasons people might be inclined to drink alcoholic beverages. Using the four-point scale below, decide how frequently your own drinking is motivated by each of the reasons listed.

Almost Never/Never	Some of the time	Most of the time	Almost Always
1	2	3	4

- _____ 1. As a way to celebrate
- _____ 2. Because it is what most of your friends do when you get together
- _____ 3. To be sociable
- _____ 4. Because it is customary on special occasions
- _____ 5. Because it makes a social gathering more enjoyable
- _____ 6. To relax
- _____ 7. To forget your worries
- _____ 8. Because you feel more self-confident or sure of yourself
- _____ 9. Because it helps when you feel depressed or nervous
- _____ 10. To cheer up when you're in a bad mood
- _____ 11. Because you like the feeling
- _____ 12. Because it's exciting
- _____ 13. To get high
- _____ 14. Because it's fun
- _____ 15. Because it makes you feel good

Appendix D
Perceived Stress Scale

Instructions: 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:

0. Never
1. Almost never
2. Sometimes
3. Fairly often
4. Very often

1. In the last month, how often have you been upset because of something that happened unexpectedly?
2. In the last month, how often have you felt that you were unable to control the important things in your life?
3. In the last month, how often have you felt nervous and "stressed"?
4. **In the last month, how often have you dealt successfully with irritating life hassles?**
5. **In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?**
6. **In the last month, how often have you felt confident about your ability to handle your personal problems?**
7. **In the last month, how often have you felt that things were going your way?**

8. In the last month, how often have you found that you could not cope with all the things that you had to do?
- 9. In the last month, how often have you been able to control irritations in your life?**
- 10. In the last month, how often have you felt that you were on top of things?**
11. In the last month, how often have you been angered because of things that happened that were outside of your control?
12. In the last month, how often have you found yourself thinking about things that you have to accomplish?
- 13. In the last month, how often have you been able to control the way you spend your time?**
14. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

*Note: Items in boldface are reverse-scored.

Appendix E
Drinking Norms Rating Form

Instructions: In the calendar below, please fill in the amount of alcohol you believe was consumed during a typical week in the last 3 months for an average CSU student.

Day of Week	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of Drinks							

In the calendar below, please fill in the amount of alcohol you believe was consumed during a typical week in the last 3 months for your close friends.

Day of Week	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of Drinks							

Appendix F
Injunctive Norms Scales

1. Consider a typical week during the **last month**. How much alcohol on average (measured in number of drinks) would you estimate is the average amount a **typical CSU student** would consider to be an acceptable amount of alcohol to consume on each day of a typical week?

On a typical MONDAY a typical CSU student would consider _____ drink(s) to be an acceptable amount of alcohol to consume	
On a typical TUESDAY a typical CSU student would consider _____ drink(s) to be an acceptable amount of alcohol to consume	
On a typical WEDNESDAY a typical CSU student would consider _____ drink(s) to be an acceptable amount of alcohol to consume	
On a typical THURSDAY a typical CSU student would consider _____ drink(s) to be an acceptable amount of alcohol to consume	
On a typical FRIDAY a typical CSU student would consider _____ drink(s) to be an acceptable amount of alcohol to consume	
On a typical SATURDAY a typical CSU student would consider _____ drink(s) to be an acceptable amount of alcohol to consume	
On a typical SUNDAY a typical CSU student would consider _____ drink(s) to be an acceptable amount of alcohol to consume	

2. What is the average frequency of drinking that you estimate a **typical CSU student** would consider acceptable?

Never	Three times a month	Four times a week
Less than once per month	Once a week	Five times a week
Once a month	Two times a week	Six times a week
Two times a month	Three times a week	Every day

3. What is the average number of drinks you think a **typical CSU student** would find acceptable to drink on a given occasion?

0 drinks 5 drinks 10 drinks 15 drinks 20 drinks

- | | | | | |
|----------|----------|-----------|-----------|-------------------|
| 1 drink | 6 drinks | 11 drinks | 16 drinks | 21 drinks |
| 2 drinks | 7 drinks | 12 drinks | 17 drinks | 22 drinks |
| 3 drinks | 8 drinks | 13 drinks | 18 drinks | 23 drinks |
| 4 drinks | 9 drinks | 14 drinks | 19 drinks | 24 or more drinks |

1. Consider a typical week during the last month. How much alcohol on average (measured in number of drinks) do **YOU** consider to be an acceptable amount of alcohol to consume on each day of a typical week?

On a typical MONDAY YOU would consider _____ drink(s) to be an acceptable amount of alcohol to consume	
On a typical TUESDAY YOU would consider _____ drink(s) to be an acceptable amount of alcohol to consume	
On a typical WEDNESDAY YOU would consider _____ drink(s) to be an acceptable amount of alcohol to consume	
On a typical THURSDAY YOU would consider _____ drink(s) to be an acceptable amount of alcohol to consume	
On a typical FRIDAY YOU would consider _____ drink(s) to be an acceptable amount of alcohol to consume	
On a typical SATURDAY YOU would consider _____ drink(s) to be an acceptable amount of alcohol to consume	
On a typical SUNDAY YOU would consider _____ drink(s) to be an acceptable amount of alcohol to consume	

2. What is the average frequency of drinking that **YOU** consider to be acceptable?

Never	Three times a month	Four times a week
Less than once per month	Once a week	Five times a week
Once a month	Two times a week	Six times a week
Two times a month	Three times a week	Every day

3. What is the average number of drinks that **YOU** consider to be acceptable to drink on a given occasion?

0 drinks	5 drinks	10 drinks	15 drinks	20 drinks
1 drink	6 drinks	11 drinks	16 drinks	21 drinks
2 drinks	7 drinks	12 drinks	17 drinks	22 drinks
3 drinks	8 drinks	13 drinks	18 drinks	23 drinks
4 drinks	9 drinks	14 drinks	19 drinks	24 or more drinks

Appendix G
Conformity to Masculine Norms Inventory-29

Instructions: Below are statements with which you may agree or disagree. Using the 0-3 scale below, indicate your agreement with each item by placing the appropriate number on the line preceding that item. Please be open and honest in your responding.

0. Strongly disagree

1. Disagree

2. Agree

3. Strongly agree

1. I would frequently change sexual partners
2. I hate asking for help
3. I believe that violence is never justified
4. Being thought of as gay is not a bad thing
5. Winning is not my first priority
6. I enjoy taking risks
7. I am disgusted by any kind of violence
8. I bring my feelings when talking to others
9. I would be furious if someone thought I was gay
10. I don't mind losing
11. I take risks
12. It would not bother me if someone thought I was gay
13. I would feel good with many sexual partners
14. It would be awful if people thought I was gay
15. I like to talk about my feelings
16. I am ashamed to ask for help
17. Losing does not bother me
18. I frequently put myself in risky situations
19. Women should be subservient to men
20. Winning is not important

21. Violence is never justified
22. It would enjoyable to date more than one person at a time
23. I would feel uncomfortable if someone thought I was gay
24. I tend to share my feelings
25. No matter what the situation I would never act violent
26. Things tend to be better when men are in charge
27. It bothers me when I have to ask for help
28. I love it when men are in charge of women
29. I try to avoid being perceived as gay

Appendix H
Satisfaction With Life Scale

Instructions: Below are five statements with which you may agree or disagree. Using the 1-7 scale below, indicate your agreement with each item by placing the appropriate number on the line preceding that item. Please be open and honest in your responding.

1. Strongly disagree
2. Disagree
3. Slightly disagree
4. Neither agree nor disagree
5. Slightly agree
6. Agree
7. Strongly agree

- _____ 1. In most ways my life is close to my ideal
- _____ 2. The conditions of my life are excellent
- _____ 3. I am satisfied with my life
- _____ 4. So far I have gotten the important things I want in life
- _____ 5. If I could live my life over, I would change almost nothing

Appendix I
Alcohol Use Disorders Identification Test

Instructions: Please circle the answer that is correct for you

1. How often do you have a drink containing alcohol?

Never	Monthly	Two to four	Two to three	Four or more
	or less	times a month	times a week	times a week

2. How many drinks containing alcohol do you have on a typical day when you are drinking?

1 or 2	3 or 4	5 or 6	7 to 9	10 or more
--------	--------	--------	--------	------------

3. How often do you have six or more drinks on one occasion?

Never	Less than	Monthly	Weekly	Daily or
	monthly			almost daily

4. How often during the last year have you found that you were not able to stop drinking once you had started?

Never	Less than	Monthly	Weekly	Daily or
	monthly			almost daily

5. How often during the last year have you failed to do what was normally expected from you because of drinking?

Never	Less than	Monthly	Weekly	Daily or
	monthly			almost daily

6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?

Never	Less than	Monthly	Weekly	Daily or
	monthly			almost daily

7. How often during the last year have you had a feeling of guilt or remorse after drinking?

Never	Less than	Monthly	Weekly	Daily or
	monthly			almost daily

8. How often during the last year have you been unable to remember what happened the night before because you had been drinking?

Never	Less than	Monthly	Weekly	Daily or
	monthly			almost daily

9. Have you or someone else been injured as a result of your drinking?

No		Yes, but not in		Yes, during
----	--	-----------------	--	-------------

the last year

the last year

10. Has a relative or friend, or a doctor or other health worker been concerned about your drinking or suggested you cut down?

No

Yes, but not in
the last year

Yes, during
the last year

Appendix J
Behavioral Inhibition, Behavioral Activation Scales

Instructions: For each question choose from the following alternatives:

1. Strongly agree
 2. Agree
 3. Disagree
 4. Strongly disagree
-
1. I go out of my way to get things I want
 2. When I'm doing well at something, I love to keep at it
 3. When I get something I want, I feel excited and energized
 4. Criticism or scolding hurts me quite a bit
 5. When I want something, I usually go all-out to get it
 6. I will often do things for no other reason than that they might be fun
 7. If I see a chance to get something I want, I move on it right away
 8. I feel pretty worried or upset when I think or know somebody is angry at me
 9. I often act on the spur of the moment
 10. If I think something unpleasant is going to happen I usually get pretty "worked up"
 11. When good things happen to me, it affects me strongly
 12. I crave excitement and new sensations
 13. It would excite me to win a contest
 14. I worry about making mistakes