

2020-01-01

Further validation of the treatment self-regulation questionnaire for assessing motivations for responsible drinking: A test of self-determination theory

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FURTHER VALIDATION OF THE TREATMENT SELF-REGULATION QUESTIONNAIRE
FOR ASSESSING MOTIVATIONS FOR RESPONSIBLE DRINKING:
A TEST OF SELF-DETERMINATION THEORY

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Dedication

To my wife, Katherine.

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FOR ASSESSING MOTIVATIONS FOR RESPONSIBLE DRINKING:
A TEST OF SELF-DETERMINATION THEORY

by

DYLAN K. RICHARDS, M.A.

DISSERTATION

Presented to the Faculty of the Graduate School of
The University of Texas at El Paso
in Partial Fulfillment
of the Requirements
for the Degree of

DOCTOR OF PHILOSOPHY

Department of Psychology
THE UNIVERSITY OF TEXAS AT EL PASO
May 2020

Acknowledgements

First, I would like to thank my advisor and mentor, Dr. Craig Field. You were instrumental to my success as a graduate student and the development of a program of research that I am passionate about. Your selflessness and straightforwardness are qualities I hope to emulate with my own mentees. I am indebted to you for providing me with the means to pursue a fulfilling career.

Second, I would like to thank the past and present members of the Latino Alcohol and Health Disparities Research and Training Center. It has been a pleasure working with each of you. I would also like to give special thanks to Miriam Alvarez and Sandra Oviedo-Ramirez. Your friendship made my graduate journey enjoyable.

Third, I would like to thank Drs. Osvaldo Morera, Matthew Pearson, and John Riskind for their mentorship. Thank you for all that you have taught me.

Fourth, I would like to thank my committee members who were not mentioned above. Your feedback on this dissertation was engaging and greatly improved its quality.

Finally, and most importantly, I would like to thank my wife, parents, and brothers for their love and support. Without you, my accomplishments would be meaningless.

Abstract

Alcohol protective behavioral strategies (PBS) are cognitive-behavioral strategies used before, during, and/or after drinking to reduce alcohol use and alcohol-related problems. Self-determination theory (SDT) provides a potentially useful framework to understand motivations for responsible drinking, which is operationalized in the present study as PBS use. In the present study, the relation of motivations for responsible drinking, as assessed by the Treatment Self-Regulation Questionnaire (TSRQ), with other SDT constructs (psychological need satisfaction and dispositional autonomy) and PBS use, alcohol use, and alcohol-related problems were examined among college students drinkers. A sample of 507 college students who reported consuming alcohol at least once in the past 3 months were recruited from a random sample of students enrolled at a Hispanic Serving Institution to complete an online survey. Support for a 4-factor structure of the TSRQ that is theoretically consistent with SDT was replicated in the present study. The TSRQ demonstrated scalar invariance across biological sex. Further, consistent with SDT-based hypotheses, greater psychological need satisfaction and dispositional autonomy were related to more self-determined motivations for responsible drinking. Also consistent with SDT, more self-determined motivations for responsible drinking were related to more frequent PBS use, weaker drinking motives, less alcohol use, and fewer alcohol-related problems. The present findings further support the utility of the TSRQ for assessing motivations for responsible drinking and support SDT as a framework for understanding responsible drinking. Future directions for research applying SDT to understand and promote responsible drinking among college students are discussed.

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Chapter 1: Introduction

ALCOHOL MISUSE AMONG COLLEGE STUDENTS

Alcohol misuse among U.S. college students is a significant public health concern (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2019). In 2017, most (82%) college students reported drinking an alcoholic beverage at least once in the past year (Schulenberg et al., 2018). Further, alcohol misuse is prevalent among college students. About one-third of college students in 2017 reported engaging in heavy (or binge) drinking (≥ 5 drinks in a row) in the past two weeks, which is higher than their same-age noncollege peers (28%) (Schulenberg et al., 2018). Heavy drinking is especially problematic as it is the pattern of drinking most associated with alcohol-related problems (Park, 2004). Indeed, college students experience many negative consequences resulting from alcohol misuse, such as academic problems and risky sexual behavior (Perkins, 2002). In addition, the leading cause of death among young adults in the U.S. is injury of which alcohol misuse is a major contributor (Hingson et al., 2009) and alcohol use disorder is the most prevalent psychological disorder among college students (~20%) (Blanco et al., 2008).

Unfortunately, despite the substantial public health burden of alcohol misuse among college students, current interventions for reducing college student drinking have small effects (for meta-analyses, see Carey et al., 2007; Tanner-Smith & Lipsey, 2015). Better understanding motivations underlying responsible drinking is important as such knowledge can be used to develop and refine interventions that increase responsible drinking behaviors among college students. Self-determination theory offers a potentially useful framework for understanding motivations for responsible drinking. The proposed study aims to further evaluate the psychometric properties of the version of the Treatment Self-Regulation Questionnaire for assessing motivations for responsible drinking based on self-determination theory and thereby test

core proposals of the theory. Testing these core proposals represents an initial step toward assessing the viability of self-determination theory-based interventions for promoting responsible drinking among college students.

RESPONSIBLE DRINKING: ENGAGEMENT IN ALCOHOL PROTECTIVE BEHAVIORAL STRATEGIES

In the present study, “responsible drinking” is operationalized as engagement in alcohol protective behavioral strategies (PBS) (Barry & Goodson, 2011). PBS are cognitive-behavioral strategies that are used immediately before, during, and/or after drinking to reduce alcohol use, intoxication, and alcohol-related problems (Martens et al., 2005; Pearson, 2013). Psychometric work on the most widely used and well-validated measure of PBS use, the Protective Behavioral Strategies Scale (Martens et al., 2005; revised by Treloar et al., 2015), has found evidence for three types of PBS: stopping/limiting drinking (e.g., “Determine not to exceed a set number of drinks”), manner of drinking (e.g., “Avoid drinking games”), and serious harm reduction (e.g., “Use a designated driver”) (Martens et al., 2005, 2007a). Indeed, consistent with the definition of PBS, nearly every study included in two comprehensive reviews of the literature found evidence for cross-sectional associations between PBS use and alcohol outcomes such that more frequent PBS use was associated with less alcohol use and fewer alcohol-related problems among college students (Pearson, 2013; Prince et al., 2013). Additional research supports the relations of PBS with reduced alcohol-related harms at both the longitudinal (e.g., Napper et al., 2014) and daily (e.g., Pearson et al., 2013) levels.

Because of the established relations of PBS with harm reduction outcomes, PBS are proposed to be viable intervention targets and proximal antecedents, or mechanisms of change, following intervention (Pearson, 2013). In other words, PBS may be taught as components of alcohol interventions and alcohol interventions may reduce alcohol-related harms through

increased engagement in PBS. However, there is mixed evidence as to whether single PBS-based interventions effectively increase PBS use (e.g., Dvorak et al., 2018; Martens et al., 2013) and whether multi-component alcohol interventions, such as brief motivational intervention, increase engagement in PBS, and, in turn, reduce alcohol-related harms (e.g., Larimer et al., 2007; Richards et al., 2019). The mixed findings for PBS in the context of alcohol interventions warrants research on the motivational antecedents of PBS to inform the development and modification of interventions to effectively motivate PBS use. Studies have examined numerous antecedents of PBS among college students (Pearson, 2013; Prince et al., 2013), but few studies have directly investigated motivations for PBS use. The lack of research on motivations for PBS use may be because the dominant conceptualizations of motivation for alcohol-related behaviors do not provide a framework for understanding motivation for PBS use.

DOMINANT CONCEPTUALIZATIONS OF MOTIVATION FOR ALCOHOL-RELATED BEHAVIORS

Drinking motives

One of the dominant conceptualizations of motivation for alcohol-related behaviors is drinking motives, or reasons why people drink (Cooper et al., 2016). In brief, according to the motivational model of alcohol use proposed by Cox and Klinger (1988, 2000), there are two dimensions that characterize the affective changes that result from drinking: valence (positive or negative) and source (internal or external). Crossing these two dimensions yields four types of drinking motives: 1) enhancement (positive and internal; e.g., “Because you like the feeling”), 2) social (positive and external; e.g., “Because it helps you to enjoy a party”), 3) coping (negative and internal; e.g., “To forget your worries”), and 4) conformity (negative and external; e.g., “Because your friends pressure you to drink”) (Cooper, 1994).

Decades of research among college students provides substantial evidence for the four types of drinking motives and the utility of drinking motives in predicting alcohol outcomes (e.g., Kuntsche et al., 2005). For example, coping motives have been found to be one of the strongest predictors of alcohol-related problems (Neighbors et al., 2007). Several studies have also examined drinking motives as antecedents of PBS use (e.g., Bravo et al., 2015; LaBrie et al., 2011; Looby et al., 2019; Martens et al., 2007b; Patrick et al., 2011). Despite the usefulness of Cox and Klinger's motivational model, it is limited in that the model does not provide a framework of motivation for alcohol-related behaviors other than consumption. Further, a harm reduction approach (e.g., Marlatt & Witkiewitz, 2002) has been widely adopted for addressing the public health burden of alcohol misuse among college students, which focuses on reducing the harmful consequences of alcohol misuse as opposed to abstaining from alcohol use. Given that a harm reduction approach presupposes alcohol use, Cox and Klinger's model is less useful for understanding the motivational antecedents of harm reduction behaviors.

Readiness to change

The other dominant conceptualization of motivation for alcohol-related behaviors is readiness to change (Krebs et al., 2018). In the context of alcohol use, readiness to change is posited as a framework to understand how individuals reduce or quit drinking with or without treatment, and, furthermore, to explain why alcohol treatment outcomes vary between clients (Prochaska et al., 1992). Five stages of change are proposed in this model: precontemplation, contemplation, preparation, action, and maintenance. Behavior change is proposed to occur as a progression through these stages, although this progression is not necessarily linear. Further, these stages represent varying degrees of motivation, or readiness, to change. Research among college students has generally failed to show that higher readiness to change predicts subsequent

reductions in drinking (e.g., Collins et al., 2010) and that increased readiness to change is a mechanism underlying changes in drinking following intervention (e.g., Borsari et al., 2009). Further, readiness to change has received substantial criticism (e.g., West, 2005; Sutton, 2001). Notable criticisms include arbitrary categorization criteria for defining the stages and the focus on planning/decision-making which detracts from the potential influence of unconscious processes, specifically motivation (West, 2005). Despite these shortcomings, readiness to change has been useful in understanding that people who misuse alcohol vary in motivation to change and that alcohol treatment and intervention may be more effective if tailored to an individual's level of motivation (DiClemente, 1999).

Neither the motivational model of alcohol use (Cox & Klinger, 1988, 2000) nor readiness to change (Prochaska et al., 1992) offer viable frameworks for understanding motivations for PBS use given the focus on consumption and behavior change, respectively. The dominant conceptualizations of motivation for alcohol-related behaviors are derived from these models, which may explain why little research has directly examined motivations for PBS use itself—the most popular models of motivation do not provide a framework for doing so. Yet, understanding motivations for PBS use is important given the growing body of research that has demonstrated that PBS are related to fewer alcohol-related harms. One theory that may inform motivations for PBS use, but is relatively novel in the alcohol literature, is self-determination theory.

SELF-DETERMINATION THEORY: THEORETICAL FRAMEWORK

Self-determination theory (SDT; Ryan & Deci, 2000, 2017) is a general theory of human motivation that has been applied to understand motivations for behaviors in an extensive number of domains (e.g., education, sport, work; Ryan & Deci, 2000), including physical health (Gillison et al., 2019; Ng et al., 2012; Ntoumanis et al., 2020). Indeed, the breadth of support for SDT across

behavioral domains is impressive (Ryan & Deci, 2000). Three core postulates of SDT that are relevant to the present study are the self-determination continuum of motivation, the basic psychological needs, and dispositional autonomy. The focus of the present study, however, is particularly on the self-determination continuum of motivation.

Self-determination continuum of motivation

SDT proposes that motivation is a multi-dimensional construct in that there are different types of motivation that vary in self-determination, or autonomy (Ryan & Deci, 2000, 2017). The types of motivation can be arranged on a continuum based on the extent to which the types of motivation are self-determined. The most self-determined type of motivation is *intrinsic motivation*, which refers to engaging in a behavior because the behavior itself is inherently satisfying (Ryan & Deci, 2000). However, because most healthy behaviors are not inherently satisfying (e.g., smoking cessation; Ryan et al., 2008), intrinsic motivation is not considered further in the present study, although some healthy behaviors, such as exercise and physical activity (Teixeira et al., 2012), can be inherently satisfying. On the opposite end of the self-determination continuum of motivation from intrinsic motivation is *amotivation*, which refers to a lack of motivation for engaging in a behavior and is nonself-determined. Thus, behaviors are either performed for unknown reasons or not performed at all. Between intrinsic motivation and amotivation on the continuum is extrinsic motivation.

Extrinsic motivation is proposed to be any reason for engaging in a behavior that is not inherent satisfaction. However, extrinsic motivation can vary in the extent to which it is self-determined. Specifically, SDT proposes four types of behavioral regulation within extrinsic motivation. The four types of regulation, presented from the least to the most self-determined, are as follows: 1) *external regulation*, engaging in a behavior to avoid external punishments or obtain

external rewards (i.e., behaviorist learning principles); 2) *introjected regulation*, engaging in a behavior to avoid internal punishments (e.g., guilt) or obtain internal rewards (e.g., pride); 3) *identified regulation*, engaging in a behavior because one values the behavior; and 4) *integrated regulation*, engaging in a behavior because one has assimilated the behavior with one's sense of self (Ryan & Deci, 2000). External and introjected regulation are often grouped together as *controlled motivation* because the perceived locus of causality (i.e., one's perception of the origin of their reasons for engaging in a behavior) for both is mostly external. Similarly, identified and integrated regulation are often grouped together as *autonomous motivation* because the perceived locus of causality for both is mostly internal. Figure 1 presents the self-determination continuum of motivation (excluding intrinsic motivation).

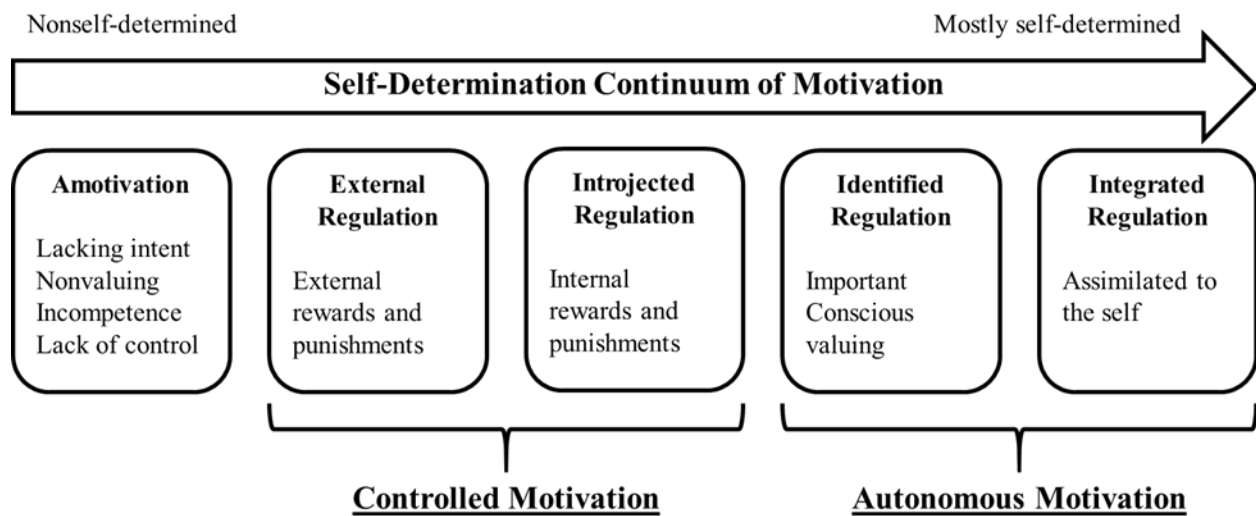


Figure 1: The self-determination continuum of motivation.

According to SDT, more self-determined motivation results in increased energy, effectiveness, and persistence in behavior, which, in turn, results in positive outcomes (Ryan & Deci, 2000). Thus, more self-determined motivation is proposed to be of higher quality than less self-determined motivation. More self-determined motivation has other benefits as well, such as

enhanced psychological well-being. In contrast, the alienation and inauthenticity of less self-determined types of motivation are proposed to foster psychological ill-being. The benefits of more self-determined motivation are proposed to apply to people of all cultures and have been demonstrated across behavioral contexts, including religion, political activity, and environmental activism (Ryan & Deci, 2000). *Internalization* and *integration* refer to the processes through which people come to self-regulate and endorse behaviors that are extrinsically motivated (Ryan & Deci, 2000). In other words, internalization and integration are the processes through which more self-determined motivation is achieved. Whether internalization and integration occur is contingent upon environmental support for the basic psychological needs.

Basic psychological needs

SDT proposes three basic psychological needs for autonomy, competence, and relatedness (Ryan & Deci, 2000, 2017). *Autonomy* is the experience of volition and willingness; *competence* is the experience of effectiveness and mastery; and *relatedness* is the experience of warmth, bonding, and care in relationships with others (Vansteenkiste et al., 2020). Research strongly supports autonomy, competence, and relatedness as basic psychological needs. For example, Sheldon and colleagues (2001) identified 10 candidate psychological needs by reviewing prominent psychological theories. The authors found that of the 10 candidate needs, autonomy, competence, and relatedness emerged as the top needs in that they were the most salient aspects of satisfying events and had the strongest associations with event-related affect. Although extending the list of the psychological needs is proposed to be a critical theme for future research on SDT, the list of basic psychological needs is currently limited to autonomy, competence, and relatedness (Vansteenkiste et al., 2020). Several candidate needs have failed to meet the criteria to be included in the list of psychological needs (Ryan & Deci, 2000, 2017).

A large body of research has shown that the satisfaction of the basic psychological needs is a major contributor to positive outcomes and well-being across behavioral domains and in different cultures (Vansteenkiste et al., 2020). In contrast, frustration of the basic psychological needs, which is a distinct and more severely negative experience from the absence of satisfaction, is proposed to be a major contributor to negative outcomes and ill-being, although more research on this topic is needed (Vansteenkiste et al., 2020). The mechanism through which satisfaction of the basic psychological needs is proposed to result in positive outcomes is by promoting the internalization and integration of the regulation of behavior.

Dispositional autonomy

The final core postulate of SDT that is relevant to the present study is *dispositional autonomy*. According to SDT, there are individual differences in the extent to which people are likely to experience their behaviors as self-determined across contexts (Ryan & Deci, 2000). That is, people higher in dispositional autonomy are more likely to experience their behaviors as originating from and endorsed by the self (Weinstein et al., 2012). Dispositional autonomy is shaped by interpersonal and intrapersonal experiences, specifically the extent to which one's psychological needs are satisfied, that affect developmental trajectories (Deci & Ryan, 1985). Those whose needs are satisfied develop a greater predisposition for acting in a self-determined manner across behaviors. Indeed, greater dispositional autonomy has been shown to be related to greater satisfaction of the psychological needs, more autonomous engagement in daily activities, and higher well-being (Weinstein et al., 2012). Figure 2 displays the relationships of the psychological needs and dispositional autonomy with the self-determination continuum of motivation.

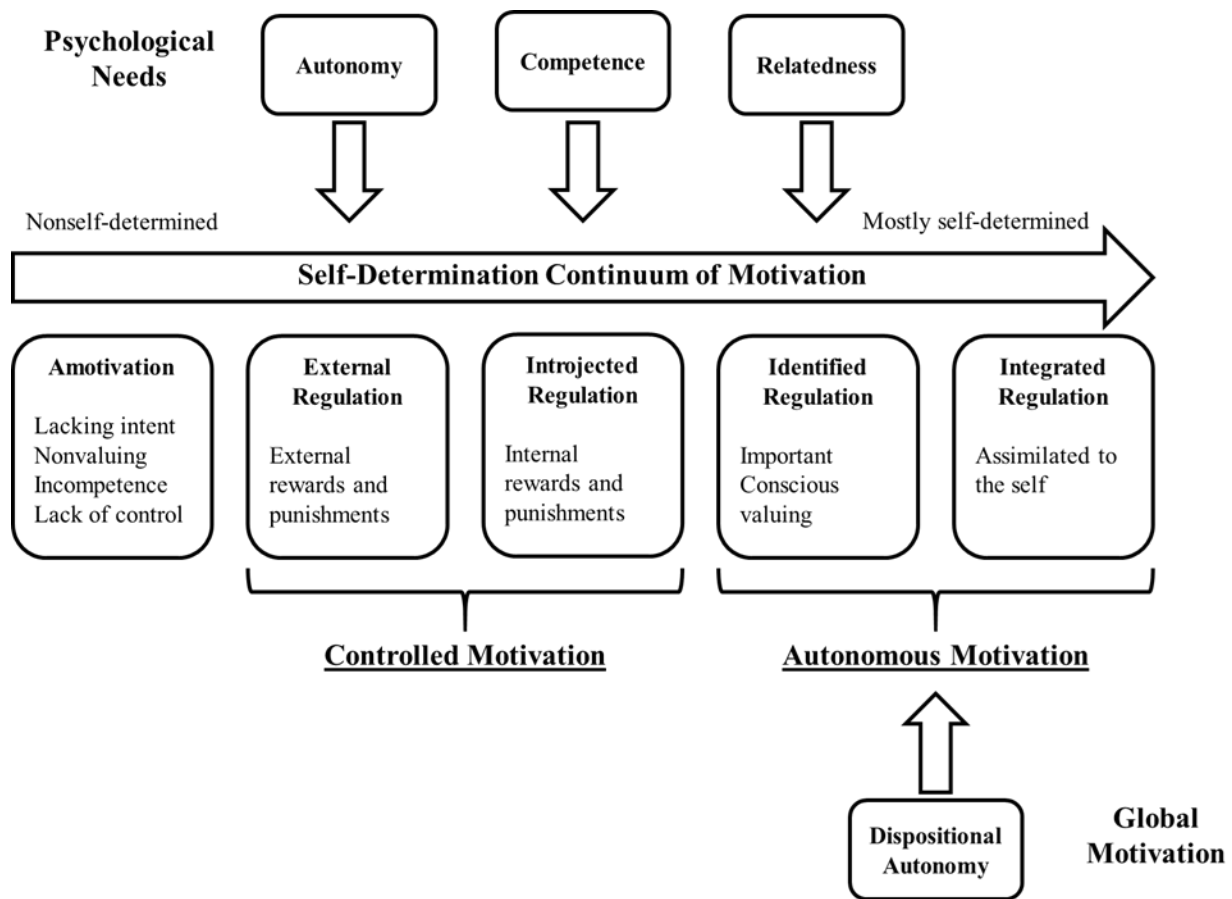


Figure 2: The self-determination continuum of motivation, basic psychological needs, and dispositional autonomy.

To summarize, SDT proposes that motivation is multi-dimensional in that there are different types of motivation that vary in the extent to which motivation is self-determined. Motivation is increasingly associated with positive outcomes as it increases in self-determination and therefore more self-determined motivation is of higher quality. Satisfaction of the psychological needs and higher dispositional autonomy lead to more self-determined motivation.

SELF-DETERMINATION THEORY: APPLICATIONS TO HEALTHY BEHAVIORS

As mentioned previously, the framework of motivation proposed by SDT has been applied to physical health. According to SDT, the likelihood of initiating and persisting in healthy behaviors (e.g., tobacco cessation, medication use, glycemic control) increases as motivation for

doing so increases in self-determination (Ryan et al., 2008). Thus, the internalization and integration processes are proposed to be mechanisms of health behavior change. Further, support for the psychological needs is proposed to be an important characteristic of health care settings and a target for health interventions to facilitate the initiation and maintenance of healthy behaviors (Ryan et al., 2008). The effect of psychological needs satisfaction on health outcomes is proposed to occur through the internalization and integration of motivation for engagement in healthy behaviors. Finally, individuals higher in dispositional autonomy are proposed to experience more self-determined motivation for healthy behaviors, and, in turn, positive health outcomes. Several meta-analyses (Gillison et al., 2019; Ng et al., 2012; Ntoumanis et al., 2020) provide support for SDT postulates as applied in health contexts.

The most recent meta-analysis (Ntoumanis et al., 2020) was conducted on data from 73 primary studies, which included a total 30,088 participants, testing the effects of SDT-informed interventions for promoting healthy behaviors. The authors identified SDT-informed interventions based on whether the interventions included one or more of 17 common need supportive behaviors or techniques (Teixeira et al., 2020). Ntoumanis et al. found that SDT-based interventions resulted in increased engagement in healthy behaviors at the end of intervention period ($g = 0.45$) as well as at follow-up ($g = 0.28$) compared to control conditions. However, SDT proposes a causal chain of effect in which SDT-based interventions affects need satisfaction, which, in turn, affects self-determined (or autonomous) motivation, which, in turn, affects engagement in healthy behaviors. Indeed, Ntoumanis et al. found increased combined need satisfaction following SDT-based interventions both at the end of the intervention ($g = 0.369$) and at follow-up assessments (only when outliers were removed) ($g = 0.28$). The interventions also increased autonomous motivation at the end of the intervention ($g = 0.296$) as well as follow-up assessments ($g = 0.28$) (again, only

when outliers were removed). Finally, increased autonomous motivation at the end of the intervention was associated with increased engagement in healthy behaviors at the end of the intervention ($\beta = 0.66$). In sum, the findings of the meta-analysis conducted by Ntoumanis et al. strongly supports SDT as a framework for understanding motivations for healthy behaviors and that this framework can be used to promote healthy behaviors through SDT-informed interventions. Notably, the meta-analysis only included two studies on the application of SDT to alcohol-related behaviors, one of which was unpublished.

THE APPLICATION OF SDT TO ALCOHOL-RELATED BEHAVIORS

Despite the nuanced framework provided by SDT for understanding healthy behaviors, relatively few studies have applied SDT to alcohol-related behaviors in comparison to other health behaviors. Most studies that have applied SDT to alcohol use (e.g., Chawla et al., 2009; Knee & Neighbors, 2002; Neighbors et al., 2003, 2004) have focused on lower dispositional autonomy as a risk factor for alcohol misuse and related consequences among college students. For example, one study found that positive alcohol expectancies were related to greater alcohol use and alcohol-related problems among college student drinkers lower in dispositional autonomy (Neighbors et al., 2003). These studies provide support for SDT in relation to alcohol-related behaviors, but neglect the nuance of motivation as a continuum and how motivation of higher quality may increase the likelihood of initiation and maintenance of healthy behaviors. There are studies (e.g., Rockafellow & Saules, 2006; Wormington et al., 2011) that have applied the self-determination continuum to healthy behaviors and that are related to alcohol use, but none of these studies have directly examined motivations for alcohol-related behaviors *per se*. For example, one study found that more self-determined motivations for academics was associated with less alcohol use and alcohol-related problems among college students (Wormington et al., 2011).

SDT has also been invoked to explain the effectiveness of alcohol interventions. Carey et al. (2013) invoked SDT's focus on the need for autonomy as the rationale for allowing college students mandated to receive an alcohol intervention to choose between receiving a face-to-face vs. a computerized alcohol intervention, purporting that choice may enhance efficacy. Although they did not find support for choice improving alcohol outcomes, choice was associated with greater intervention satisfaction. SDT is also often invoked to explain the psychological mechanisms of change underlying the effectiveness of motivational interviewing (e.g., Markland et al., 2005; Miller & Rollnick, 2012; Patrick & Williams, 2012), which was initially developed for motivating changes in drinking. Specifically, motivational interviewing is proposed to satisfy the basic psychological needs, which, in turn, promote internalization and integration of motivation for reducing alcohol use. Taken together, the alcohol literature lacks comprehensive tests of SDT postulates and few applications of SDT to alcohol have used the SDT framework to understand motivation for PBS use.

Given that the framework of motivation proposed by SDT is most applicable to healthy behaviors, SDT may be particularly useful in guiding research on motivations for PBS use. That is, college students' motivations for using PBS may vary in self-determination and the extent to which motivation is self-determined may differentially relate to PBS use. For example, some college students may use PBS because they feel pressured by others to do so (i.e., controlled motivation) and others may use PBS because it is consistent with their values (i.e., autonomous motivation). According to SDT, students with higher autonomous motivation for using PBS would not only be more likely to start using PBS (i.e., initiation) but also more likely to continue to use PBS over time (i.e., maintenance). Given the potential utility of the self-determination continuum of motivation to inform the understanding of PBS use, a validated measure to quantify motivations

based on this continuum for PBS use is needed. A version of the Treatment Self-Regulation Questionnaire exists for assessing motivations per SDT for responsible drinking, but little research has examined its psychometric properties.

TREATMENT SELF-REGULATION QUESTIONNAIRE

The Treatment Self-Regulation Questionnaire (TSRQ; Ryan & Connell, 1989) was adapted to assess types of motivation per SDT for engaging in healthy behaviors. Levesque et al. (2007) conducted initial psychometric studies on the TSRQ. Across three different versions of the TSRQ for tobacco cessation, healthy eating, and exercise, Levesque et al. found support for a 4-factor structure. These four factors were amotivation (3 items; e.g., “I really don’t think about stopping smoking”), external regulation (4 items; e.g., “Because I feel pressure from others to stop smoking permanently”), introjected regulation (2 items; e.g., “Because I would feel guilty or ashamed of myself if I smoked”), and autonomous motivation (i.e., identified and integrated regulation) (6 items; e.g., “Because stopping smoking is very important for being as healthy as possible”). Subscales representing more self-determined types of motivation demonstrated correlations of greater magnitude with positive health outcomes (e.g., eating fruits and vegetables) (Levesque et al., 2007). Across versions of the TSRQ, the instructions and item stems remain the same except for the referenced behavior. There have been some adaptations of the TSRQ to assess motivations for alcohol-related harm reduction behaviors.

Two studies (Osterman, 2011; Ryan et al., 1995) have used the TSRQ to assess motivations per SDT for alcohol-related harm reduction behaviors other than responsible drinking. Ryan et al. (1995) used an adapted version of the TSRQ to assess motivations for entering an outpatient clinic for the treatment of alcohol use disorder. The authors found that autonomous motivation for entering treatment was associated with better treatment outcomes, such as greater involvement and

retention in treatment. Osterman (2011) adapted the TSRQ to assess motivations for reducing alcohol use during pregnancy and found that motivational interviewing increased autonomous motivation to reduce alcohol use during pregnancy.

Only two studies (Benka, 2017; Richards et al., 2020) have used the TSRQ to assess motivations for responsible drinking, or PBS use. Benka (2017) examined the relations of autonomous motivation, controlled motivation, and amotivation for responsible drinking, assessed using the TSRQ, with drinking motives and alcohol use among college students in Eastern Slovakia. Consistent with SDT, the author generally found that types of motivation for responsible drinking were associated with weaker endorsement of drinking motives and less alcohol use as motivation increased in self-determination. Benka also tested indirect associations (i.e., mediation) between autonomous motivation and alcohol use through drinking motives. Although statistically significant indirect associations were found, it is unclear why motivation to drink responsibly would affect motivation to drink and not vice versa. It seems most plausible that there would be a bidirectional relationship between motivation to drinking responsible and motivation to drink. Another concern is that mediation processes occur over time and testing mediation with cross-sectional data results in substantially biased estimates of longitudinal parameters (Maxwell et al., 2011; Maxwell & Cole, 2007). However, the greatest concern of this study is that Benka did not examine the factor structure of the TSRQ and the use of a controlled motivation subscale is inconsistent with psychometric evaluations of other versions of the TSRQ as introjected and external regulation emerge as separate factors as opposed to one controlled motivation factor (Levesque et al., 2007). Another major concern is that harm reduction outcomes (e.g., PBS use and alcohol-related problems) were not assessed which are arguably the most important outcomes

to consider in relation to responsible drinking because of the focus on reducing the harms of alcohol consumption and not alcohol consumption *per se*.

Richards et al. (2020) conducted two studies to evaluate the psychometric properties of the version of the TSRQ for assessing motivations for responsible drinking among college students. In the first study, the authors tested the factor validity of the TSRQ among a convenience sample of college student drinkers (N = 308) recruited from a predominantly Hispanic-Serving Institution on the U.S. border with Mexico. Using confirmatory factor analysis, the authors found that a 4-factor model demonstrated for other versions of the TSRQ (Levesque et al., 2007) did not provide an adequate fit to the data. However, modification indices that were supported by theoretical justification suggested eliminating Item 4 (“Because others would be upset with me if I did not”) and loading Item 10 (“Because it is easier to do what I am told than think about it”) onto the external regulation factor as opposed to the amotivation factor. This revised 4-factor model with 14 items provided an adequate fit to the data and a better fit to the data than alternative models, including a 3-factor model that is consistent with how the TSRQ was scored in a previous study (i.e., Benka, 2017). Further, the subscales demonstrated acceptable reliability estimates except for the amotivation subscale.

In the second study, Richards et al. tested the concurrent validity of the TSRQ among a sample of college student drinkers (N = 196) recruited from a random sample of 750 undergraduate students at the same institution as the first study. The authors found that the bivariate correlations among the TSRQ subscales were consistent with SDT in that subscales representing types of motivation closer on the self-determination continuum of motivation demonstrated larger positive associations than types of motivation further on the continuum. Also consistent with hypotheses based on SDT were the correlations of the TSRQ subscales with PBS use. That is, types of

motivation higher (i.e., autonomous motivation and introjected regulation) in self-determination for responsible drinking were related to more frequent PBS use. However, correlations of the TSRQ subscales with alcohol use and alcohol-related problems were largely unresponsive of SDT-based hypotheses as autonomous motivation did not consistently demonstrate the largest negative correlations with alcohol use and alcohol-related problems. The authors argued that these findings may be due to some less self-determined types of motivation (i.e., introjected regulation) being associated with positive health outcomes in the short term but not the long term. In contrast, SDT proposes that higher autonomous motivation is necessary for the long-term maintenance of healthy behaviors. The authors also argued that motivations for responsible drinking are likely to affect alcohol use and alcohol-related problems through PBS use. The existence of an indirect effect may explain why the associations were not entirely consistent with SDT. Overall, however, Richards et al. found support for the validity of the version of the TSRQ for assessing motivations per SDT for responsible drinking, and, consequently, support for an SDT perspective for understanding motivation for PBS use.

PRESENT STUDY

The aims of the present study were to extend the psychometric evaluation of the version of the TSRQ for assessing motivations for responsible drinking conducted by Richards et al. (2020). Consequently, and perhaps more importantly, core postulates of the framework of motivation proposed by SDT as applied to responsible drinking among college students were tested.

Aim #1

The first aim of the present study was to test the factor validity of the TSRQ. Richards et al. found support a 4-factor model of the TSRQ that is consistent theoretically with SDT and with the factor structure of other versions of the TSRQ (Levesque et al., 2007). In addition, Richards et

al. found support for two revisions to the TSRQ: eliminate Item 4 and use Item 10 as an external regulation item as opposed to an amotivation item. No other study has assessed the factor structure of this version of the TSRQ nor replicated the revisions made by Richards et al. Replications of the factor structure are especially important as Richards et al. tested the factor validity among a relatively small convenience sample of college student drinkers. Testing the factor validity among larger random samples may increase confidence in the generalizability of the factor structure to the population of college student drinkers.

Hypothesis 1.1.

It was hypothesized that the revised 4-factor model of the TSRQ would provide a good fit to the data.

Hypothesis 1.2.

It was hypothesized that the revised 4-factor model of the TSRQ would provide a better fit to the data than the original 4-factor model of the TSRQ.

Aim #2

The second aim was to test the measurement invariance of the TSRQ across biological sex, which was not tested by Richards et al. Testing measurement invariance across biological sex is important for two reasons. First, this aim tests the claim of SDT that the self-determination continuum of motivation is universal. Second, studies have found that the Protective Behavioral Strategies Scale (Martens et al., 2005; revised by Treloar et al., 2015), the most well-validated and popular measure of PBS use (Prince et al., 2013), lacks measurement invariance across biological sex (e.g., Richards et al., 2018; Treloar et al., 2014), suggesting that women and men may have different conceptualizations of PBS. Studies have also found that women report more frequent PBS use than men (Pearson, 2013). Thus, given that evidence suggests that women and men have

different conceptualizations of PBS use, women and men may also have different conceptualizations of motivations for responsible drinking. Further, establishing scalar invariance is a requirement for making meaningful comparisons across groups. If the TSRQ does demonstrate scalar invariance across biological sex, one reason that women report more frequent PBS use than men may be that women endorse greater motivation for responsible drinking.

Hypothesis 2.1.

Consistent with SDT, it was hypothesized that the TSRQ would demonstrate scalar invariance across biological sex.

Hypothesis 2.2.

Contingent on support for Hypothesis 2.1, it was further hypothesized that women would endorse greater motivations for responsible drinking than men.

Aim #3

The third aim was to test the concurrent validity of the TSRQ. Importantly, Richards et al. did not examine the associations of the TSRQ subscales with other SDT constructs, which is a critical test of the concurrent validity of the TSRQ and SDT in the context of responsible drinking. Testing the concurrent validity of the TSRQ with other SDT constructs is also important for practical reasons. For example, the psychological needs are proposed to be targets for interventions that promote healthy behaviors through the internalization and integration of motivation (Teixeira et al., 2020). Another example is that dispositional autonomy may influence response to interventions based on whether the intervention targets less or more self-determined reasons for health behavior change (e.g., Neighbors et al., 2006). Thus, the present study examined the associations of psychological need satisfaction and dispositional autonomy with the TSRQ subscales.

Hypothesis 3.1.

Consistent with SDT, it was hypothesized that greater satisfaction of all three psychological needs would demonstrate increasingly positive correlations with motivations for drinking responsibly as motivation increases in self-determination.

Hypothesis 3.2.

Consistent with SDT, it was hypothesized that higher dispositional autonomy would demonstrate increasingly positive correlations with motivations for drinking responsibly as motivation increases in self-determination.

Another aim was to attempt to replicate the findings of Richards et al. for the concurrent validity of the TSRQ with PBS use. The replication of these findings is important because Richards et al. tested the concurrent validity of the TSRQ among a relatively small sample (N = 192). It is also important because Richards et al. used the original version of the Protective Behavioral Strategies Scale of which the Serious Harm Reduction subscale has been shown to lack content validity (Treloar et al., 2015). In the present study, a revised version of this measure was used that has improved content validity and other psychometric properties (e.g., reliability) of the Serious Harm Reduction subscale (Treloar et al., 2015).

Hypothesis 3.3.

Consistent with SDT, it was hypothesized that more frequent PBS use would demonstrate increasingly positive correlations with motivations for drinking responsibly as motivation increases in self-determination.

Hypothesis 3.3.1. Relatedly, it was hypothesized that the correlations between the autonomous motivation subscale and PBS use would be statistically larger than those for the other TSRQ subscales.

Hypothesis 3.3.2. Additionally, the autonomous motivation subscale was hypothesized to emerge as a statistically significant correlate of PBS use while controlling for the other TSRQ subscales.

Associations of the TSRQ subscales with alcohol use and alcohol-related problems were also be examined, but given the mixed findings reported by Richards et al., there were no hypotheses for these associations. Explanations for these mixed findings were discussed previously and it is presumed that PBS use is the most important test of the TSRQ in relation to alcohol-related behaviors.

Aim #4

The fourth aim was to test whether the TSRQ subscales explained variance in PBS use above and beyond drinking motives and readiness to change. In evaluating the utility of the SDT framework for understanding motivation for responsible drinking, it is important to demonstrate that SDT constructs have added value beyond widely used conceptualizations of motivation in the literature.

Hypothesis 4.1.

It was hypothesized that the TSRQ subscales would explain additional variance in PBS use beyond drinking motives and readiness to change.

Exploratory aim

An exploratory aim of the present study was to test potential interaction effects between the TSRQ subscales on PBS use. The types of motivation proposed by SDT are not mutually exclusive in that a person may simultaneously endorse types of motivation of varying degrees in self-determination. Thus, the purpose of this exploratory aim was to elucidate the interplay between the types of motivation.

Chapter 2: Method

PARTICIPANTS AND PROCEDURE

A random sample of 2,500 undergraduate students at the University of Texas at El Paso (UTEP) was obtained from the Center for Institutional Evaluation, Research, and Planning to recruit participants for an online survey. Weekly recruitment messages were sent via email from October 2018 to May 2019. To be eligible for participation, participants had to be 18 years of age or older. About 42% (N = 1,045) of students in the random sample responded to the survey. The response rate for the present study is commensurate with other studies on college student drinking that used email to recruit participants from randomly selected samples of undergraduate students (e.g., Larimer et al., 2007). For the purpose of the present study, data from 507 students who reported consuming alcohol at least once in the past three months were used. Table 1 presents the socio-demographic characteristics and alcohol use profile of the study sample. Participants responded to a battery of self-report measures and received a \$5 retail gift card and raffle entry to receive one of five \$100 gift cards as compensation. Ethical approval for this study was obtained from the Institutional Review Board at UTEP.

Table 1: Socio-demographic characteristics and alcohol use profile of the study sample

Categorical Variables	<i>n</i>	%
Biological sex		
Female	341	67.3
Male	166	32.7
Hispanic or Latinx		
Yes	461	90.9
No	46	9.1
Work status		
Unemployed	169	33.3
Part-time job	252	49.7
Full-time job	86	17.0
Income		
< \$15k	95	18.8
Between \$15k and \$30k	166	32.8
Between \$30k and \$50k	112	22.1
> \$50k	133	26.3
Student classification		
Freshman	72	14.2
Sophomore	75	14.8
Junior	164	32.3
Senior	196	38.7
Student status		
Part-time	100	19.7
Full-time	407	80.3
Continuous variables		
	<i>M</i>	<i>SD</i>
Age	22.84	5.84
Alcohol use/problems (past 3 months)		
Frequency	36.07	29.01
Typical quantity	4.15	3.86
Peak quantity	5.30	4.54
Heavy episodes	5.40	9.77
Alcohol problems	0.17	0.18

Note. Frequency = Number of drinking days in the past 3 months; Typical quantity = Number of alcoholic drinks consumed on a typical drinking occasion in the past 3 months; Peak quantity = Number of alcoholic drinks consumed on the heaviest drinking occasion in the past 3 months; Heavy episodes = Number of heavy drinking episodes in the past 3 months; Alcohol problems = Proportion of the 24 items endorsed on the Brief-Young Adult Alcohol Consequences Questionnaire.

MEASURES

In total, participants responded to 14 self-report measures which was expected to take between 20 to 30 minutes to complete based on pilot testing of the survey and the estimation provided by the survey website (Qualtrics.com). The order of the measures was determined by the priority of the research questions. More specifically, measures relevant to research questions of higher priority were presented earlier in the survey. The present study was conducted primarily to address the aims of this dissertation and thus the 9 (including the socio-demographics questionnaire) measures relevant to this dissertation were presented first. These 9 measures assessed socio-demographic information, motivations for responsible drinking, psychological need satisfaction, dispositional autonomy, drinking motives, readiness to change, PBS, alcohol use, and alcohol-related problems. The other measures included in the present study assessed compensatory health beliefs, well-being, resilience, perceived discrimination, and Hispanic/Latinx identity.

Socio-demographic information

Typical socio-demographic information was assessed, such as age, biological sex, and student information (e.g., year in school). The socio-demographic questionnaire is provided in Appendix A.

Motivations for responsible drinking

The TSRQ (Ryan & Connell, 1989), which was previously described in further detail, was used to assess autonomous motivation, introjected regulation, external regulation, and amotivation for responsible drinking. Each item begins with the following prompt: “The reason I would use alcohol responsibly is...”. Participants are instructed to rate each item on the extent to which each item is true for them using a 1 (*Not at all true*) to 7 (*Very true*) Likert-type scale. The version of

the TSRQ for responsible drinking, as well as other versions of the TSRQ, are freely available at from the SDT website: <https://selfdeterminationtheory.org/>. The TSRQ is provided in Appendix B.

Psychological need satisfaction

Psychological need satisfaction in daily life was assessed using the 21-item Basic Psychological Need Satisfaction Scale (BPNSS; Gagné, 2003). Items reflect each of the three psychological needs described by SDT: autonomy (7 items; $\alpha = .59$, 95% CI [.55, .65]; e.g., “I feel like I can decide for myself how to live my life”), competence (8 items; $\alpha = .62$, 95% CI [.60, .66]; e.g., “People I know tell me I am good at what I do”), and relatedness (6 items; $\alpha = .63$, 95% CI [.61, .69]; e.g., “I really like the people I interact with”). Participants indicate the extent to which each item is true for them on a Likert-type scale ranging from 1 (*Not at all true*) to 7 (*Definitely true*). Subscale scores are created for each of the psychological needs by averaging the scores for their respective items. Previous studies (e.g., Gagné, 2003) support the reliability and validity of the subscales of the BPNSS. The BPNSS is provided in Appendix C.

Dispositional autonomy

Dispositional autonomy was assessed using the Index of Autonomous Functioning (IAF; Weinstein et al., 2012). The IAF consists of three subscales (5 items each) representing facets of dispositional autonomy: authorship/self-congruence ($\alpha = .89$, 95% CI [.88, .91]; e.g., “My decisions represent my most important values and feelings”), susceptibility to control ($\alpha = .78$, 95% CI [.76, .79]; e.g., “I do things in order to avoid feeling badly about myself”), and interest-taking ($\alpha = .86$, 95% CI [.85, .87]; e.g., “I often reflect on why I react the way I do”). Items are scored on a 5-point Likert-type scale from 1 (*Not at all true*) to 5 (*Completely true*). A total score for the IAF is created by summing the authorship/self-congruence and interest-taking subscale

scores and then subtracting the susceptibility to control subscale score (Weinstein et al., 2012). Across seven different studies of varying methodologies, Weinstein et al. found high reliability estimates and strong support for the validity of the IAF. The IAF is provided in Appendix D.

Drinking motives

Drinking motives were assessed using the Drinking Motive Questionnaire-Revised Short Form (DMQ-R SF; Cooper, 1994; revised by Kuntsche & Kuntsche, 2009). The DMQ-R SF is comprised of four subscales (3 items each) that reflect the drinking motives proposed by Cox and Klinger's (1988, 2000) motivational model of alcohol use: enhancement ($\alpha = .74$, 95% CI [.70, .76]; e.g., "Because you like the feeling"), social ($\alpha = .94$, 95% CI [.92, .95]; e.g., "Because it helps you enjoy a party"), conformity ($\alpha = .86$, 95% CI [.85, .88]; e.g., "To fit in with a group you like"), and coping ($\alpha = .89$, 95% CI [.88, .91]; e.g., "Because it helps when you feel depressed or nervous"). Items are responded to on a 5-point response scale ranging from 1 (*Almost never/Never*) to 5 (*Almost always/Always*) and subscale scores are created by averaging the items. Initial validation of the DMQ-R SF (Kuntsche & Kuntsche, 2009) among a nationally representative sample of young adults in Switzerland suggested that the psychometric properties were similar to that of the original DMQ-R, which is a popular measure of drinking motives that has been extensively validated among college students (e.g., MacLean & Lecci, 2000). The DMQ-R SF is provided in Appendix E.

Readiness to change

Readiness to change for reducing alcohol use was assessed using the 12-item version of the University of Rhode Island Change Assessment Scale (URICA; Soderstrom et al., 2007). The URICA includes four subscales (3 items per subscale) that represent the following stages of change: precontemplation ($\alpha = .59$, 95% CI [.51, .69]; e.g., "It doesn't make much sense for me to

consider changing my drinking”), contemplation ($\alpha = .70$, 95% CI [.65, .71]; e.g., “I’ve been thinking that I might want to change something about my drinking”), action ($\alpha = .77$, 95% CI [.73, .81]; e.g., “At times my drinking causes problems and I’m determined to change”), and maintenance ($\alpha = .84$, 95% CI [.81, .86]; e.g., “It is frustrating, but I feel I might be having a recurrence of a drinking problem I thought I had resolved”). Items are responded to on a 5-point Likert-type scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). A total readiness to change score is computed by summing the contemplation, action, and maintenance subscale scores and then subtracting the precontemplation subscale score. The URICA is a commonly used measure of readiness to change in alcohol research (Carey et al., 1999) and the 12-item version has demonstrated reliability and validity (Soderstrom et al., 2007). The URICA is provided in Appendix F.

PBS

Frequency of PBS use while drinking or “partying” during the past three months was assessed using the Protective Behavioral Strategies Scale-20 (PBSS-20; Martens et al., 2005; revised by Treloar et al., 2015). The PBSS-20 includes three subscales representing the types of PBS: stopping/limiting drinking (7 items; $\alpha = .81$, 95% CI [.78, .83]; e.g., “Alternate alcoholic and nonalcoholic drinks”), manner of drinking (5 items; $\alpha = .79$, 95% CI [.77, .81]; e.g., “Avoid drinking games”), and serious harm reduction (8 items; $\alpha = .72$, 95% CI [.68, .75]; e.g., “Use a designated driver”). Participants respond to each item on a 6-point response scale ranging from 1 (*Never*) to 6 (*Always*). Both mean subscale and total scores are computed for the PBSS-20. Previous studies support both the reliability and validity of the PBSS-20 (Treloar et al., 2015). The PBSS-20 is provided in Appendix G.

Alcohol use

Alcohol use during the past three months was assessed using a Quantity-Frequency Index (QFI) based on the guidelines proposed by the Task Force on Recommended Alcohol Questions of the NIAAA (2003). Prior to completing the QFI, participants were provided with a standard drink chart, which defines a standard drink as 12 ounces of regular beer, 8 - 9 ounces of malt liquor, 5 ounces of wine, and 1.5 ounces of distilled spirits (see Appendix H). Frequency of alcohol use, quantity of drinks on both a typical and the heaviest drinking occasion (i.e., peak consumption), and number of heavy drinking episodes (≥ 4 drinks on one occasion for women and ≥ 5 drinks on one occasion for men) during the past three months were assessed with one item each. The QFI is provided in Appendix H.

Alcohol-related problems

Alcohol-related problems experienced over the past three months was assessed using the brief version of the Young Adult Alcohol Consequences Questionnaire (B-YAACQ; Read et al., 2006; revised by Kahler et al., 2005). The B-YAACQ is comprised of 24 items (e.g., “While drinking, I have said or done embarrassing things”) that are responded to using a dichotomous (Yes[1]/No[0]) response format. The responses are averaged to create a total score that reflects the proportion of the 24 problems represented by the items that participants endorsed having experienced during the past three months ($\alpha = .88$, 95% CI [.85, .89]). Previous studies (e.g., Kahler et al., 2008) support the unidimensionality, reliability, and validity of the B-YAACQ among college student drinkers. The B-YAACQ is provided in Appendix I.

ANALYSIS PLAN

Descriptive statistics and reliability

Reliability estimates for the study variables were computed using Cronbach's alpha (α) with 95% confidence intervals constructed around α using 10,000 bias-corrected bootstrap resamples (Padilla et al., 2012). The 'psych' (Revelle, 2018) package for R (R Core Team, 2019) was used to compute α estimates and their associated confidence intervals. However, reliability estimates for the TSRQ subscales were computed using McDonald's coefficient omega (ω ; McDonald, 1999) based on the results of the confirmatory factor analysis—these analyses are described in further detail below.

Factor validity

Confirmatory factor analysis (CFA) was used to test the factor validity of the TSRQ (Aim #1). Specifically, a CFA of the revised (14 item) 4-factor model of the TSRQ reported by Richards et al. (2020) and a CFA of the original (15 item) 4-factor model of the TSRQ were conducted (see Figure 3). *Mplus* 8.3 (Muthén & Muthén, 1998-2019) was used to conduct the CFAs with maximum likelihood estimation with robust standard errors that accounts for missing data (MLR). All item loadings were estimated and the unit of measurement of the latent variables was fixed by setting the factor variances to one. Model fit was assessed using joint criteria proposed by Hu and Bentler (1999) for indices of global fit: $CFI \geq .95$, $RMSEA \leq .06$, and $SRMR \leq .08$. Notably, others have recommended less strict values for these fit indices (e.g., $CFI \geq .90$; Blackburn et al., 2004) and these recommendations were also considered in making determinations as to whether the models fit the data. Further, the two models were compared by examining the global fit indices described above as well as using the Akaike information criterion (AIC) such that the model with the lowest AIC is the preferred model (Brown, 2014). Given that it is hypothesized that the revised

4-factor model of the TSRQ will be the preferred model, it is assumed that the reliability and measurement invariance analyses described below will be based on this model.

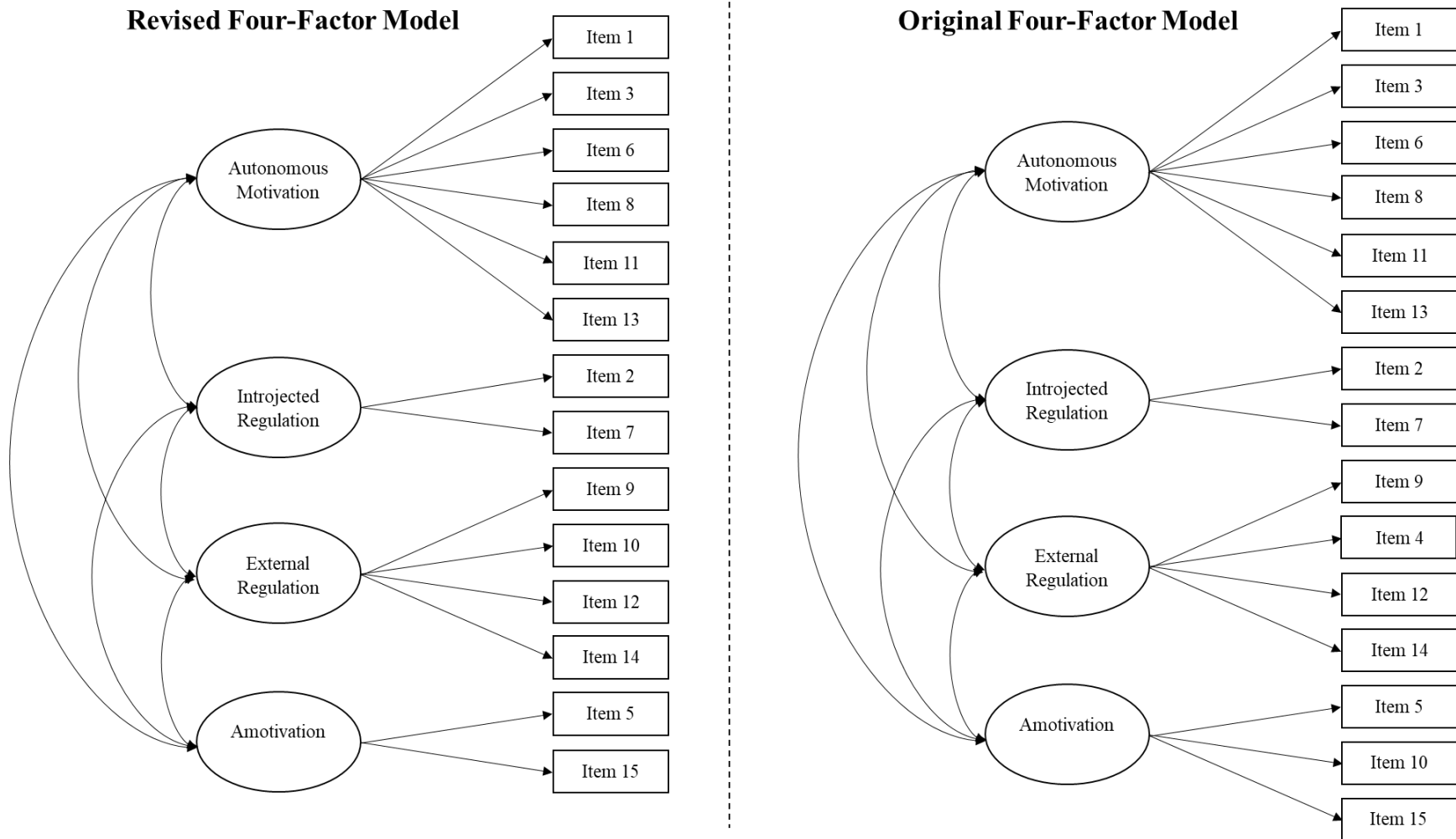


Figure 3: The revised 4-factor model of the TSRQ reported by Richards et al. (2020) and the original 4-factor model of the TSRQ. TSRQ = Treatment Self-Regulation Questionnaire.

Reliability

As mentioned previously, ω was computed to estimate the reliability of the four TSRQ subscales, which is based on the results of CFA. ω is computed by summing the unstandardized factor loadings and squaring the total. This value is then divided by the sum of item unique variances plus the unstandardized factor loadings, squared.

Measurement invariance

A series of multigroup CFAs were conducted to test for measurement invariance of the TSRQ across biological sex (Aim #2) using *Mplus* with MLR estimation. All item loadings were estimated and the unit of measurement of the latent variables was fixed by setting the factor variances to one. The following hierarchy was used to test for measurement invariance: configural, metric, and scalar invariance. Configural invariance occurs when the pattern of factor loadings is the same across groups (Meredith, 1993). Metric invariance occurs when the factor loadings do not statistically differ across groups. Scalar invariance occurs when the latent item intercepts do not statistically differ across groups. Configural invariance was assessed using the same global fit criteria described for the single group CFAs. Metric and scalar invariance were assessed by examining changes in CFI and RMSEA from the less restrictive model to the more restrictive model. Measurement invariance holds if the more restrictive model (compared to the less restrictive model) results in a reduction in CFI that is less than .01 (Cheung & Rensvold, 2002) and an increase in RMSEA that is $< .015$ (Chen, 2007). (Higher CFI values and lower RMSEA values are indicative of better model fit, and, because a more restrictive model should result in worse model fit, a negative change in CFI and a positive change in RMSEA is assumed.) Conceptually, the equality constraints associated with each level of measurement invariance should not result in significant decrement in model fit, if the TSRQ is measurement invariant

across the groups. Meeting the strictest of the level of measurement invariance described above (i.e., scalar invariance) is necessary to meaningfully compare means across groups. If scalar invariance is met, latent mean differences will be computed for each of the four factors across biological sex.

Concurrent validity

To first test the concurrent validity of the TSRQ subscales (Aim #3), bivariate correlations (i.e., Pearson product-moment correlation coefficients) were computed between the TSRQ subscales and each of the other study variables. However, alcohol use variables are known to have non-normal distributions as such variables are count data and thus are positively skewed and bounded by zero (Atkins et al., 2013). For this reason, non-parametric tests of association (i.e., Spearman rank-order correlation coefficients) were computed for the associations of the TSRQ subscales with the alcohol use variables. The ‘ggcorrplot’ (Kassambara, 2019) package for R was used to compute the parametric and non-parametric tests of association.

To determine the relative strength of the associations of the TSRQ subscales with the other study variables (Aim #3), two sets of analyses were conducted. First, the magnitude of the Pearson product-moment correlation coefficients of the TSRQ subscales with the other study variables were statistically compared using Lee and Preacher’s (2013) online utility for conducting tests of the equality of two dependent correlations with one variable in common. These statistical comparisons were done for sets of two correlations (i.e., two TSRQ subscales with one other study variable) that were statistically significant and of the same direction. Second, a series of ordinary least squares regression analyses were conducted to test the relations of the TSRQ subscales simultaneously with PBS use. The TSRQ subscales were entered simultaneously into three

separate regression analyses predicting the three PBSS-20 subscale scores. The “MASS” (Venables & Ripley, 2002) package for R was used to conduct the regression analyses.

Another series of regression analysis was conducted to determine whether the TSRQ subscales are associated with PBS use while statistically controlling for drinking motives and readiness to change (Aim #4). The general procedures used for these regression analyses were the same as the regression analyses described above. However, a hierarchical procedure was employed in which the DMQ-R SF and URICA subscales were entered into Step 1 and the TSRQ subscales were entered into Step 2.

Interaction effects

Finally, potential interaction effects were tested between the TSRQ subscales (Exploratory Aim) using the same general regression procedures described above. A hierarchical procedure was employed in which the TSRQ subscales were entered into Step 1 and interaction terms for all possible two-way interactions (six in total) between the TSRQ subscales were entered into Step 2. The TSRQ subscale scores were mean centered prior to computing the interaction terms to facilitate the interpretation of potential interaction effects and remove nonessential collinearity between the predictor variables (Aiken & West, 1991). Statistically significant interaction effects were probed using the Johnson-Neyman technique (Preacher et al., 2006). The Johnson-Neyman technique is used to determine the range of values of one of the variables involved in the interaction for which the simple slope of the dependent variable on the other variable involved in the interaction is statistically significant (e.g., Preacher et al., 2006).

Power considerations

The number of students chosen for the random sample was based on a response rate for a previous study conducted by the present author and colleagues (Richards et al., 2020) in

combination with funding considerations. More specifically, Richards et al. obtained a response rate around 50% ($N = 371$) using similar recruitment procedures to recruit a randomly selected sample of 750 undergraduate students from the same university to complete an online survey. Further, among those who responded to recruitment messages, about half ($n = 192$) reported having consumed alcohol at least once in the past month. Further, for the present study, a \$3,000 grant was obtained to purchase 600 \$5 gift cards and another \$500 grant was obtained to purchase five \$100 gift cards for a raffle. Smaller incentives to pay more participants was chosen as opposed to larger incentives to pay fewer participants (e.g., 300 \$10 gift cards) in order to have adequate statistical power to test the aims of the present study. Thus, based on the response rate and percentage of drinkers reported by Richards et al., it was determined that a random sample of 2,500 students would be needed to obtain a final sample of about 600 students who reported drinking.

The actual sample size of 507 was deemed acceptable to test most aims of the present study. Post-hoc power analyses for the CFA of the revised 4-factor model of the TSRQ were conducted for both close fit (H_0 : RMSEA = .05, H_1 : RMSEA = .08) and not close fit (H_0 : RMSEA = .05, H_1 : RMSEA = .01) using Preacher and Coffman's (2006, May) online utility for computing power and minimum sample size for RMSEA. Both power analyses yielded statistical power of 99.7% with $N = 507$, $df = 71$, and $\alpha = .01$ (two-tailed). Also, 507 participants with 14 items included in the CFA well exceeds the rule of thumb of a participant-to-item ratio of 10:1, although this ratio is not supported by research and studies find that a larger sample size is always better for factor analysis (Osborne & Costello, 2004). Further, concurrent validity of the TSRQ will primarily be assessed using correlations and simulation studies demonstrate that stable estimates of correlations are obtained at sample sizes of about 250 (Schönbrodt & Perugini, 2013). The present study has the least statistical power to test for measurement invariance and interaction effects. Multigroup CFAs

for testing measurement invariance across biological sex requires splitting the sample into groups (i.e., females and males) and most (67.3%) participants in the present study were female. For this reason, another set of power analyses were conducted for a CFA of the revised 4-factor model of the TSRQ using the same procedures described above, expect 166 (i.e., number of males in the sample) was used as the value for n and α was set to .05. Although the power analysis for a test of close fit yielded statistical power of 80.0%, the power analysis for a test of not close fit yielded statistical power of 62.1%. Therefore, the present study may have been underpowered to test measurement invariance across biological sex. Additionally, interaction effects are small and thus large sample sizes are needed to detect interaction effects (if said interaction effects exist in the population) (e.g., McClelland & Judd, 1993), although testing for interactions effects is an exploratory aim.

Chapter 3: Results

CONFIRMATORY FACTOR ANALYSIS

The revised 4-factor model of the TSRQ based on Richards et al. (2020) demonstrated acceptable fit indices, SB $X^2(71, N = 507) = 125.00, p = .0001$; CFI = .945; RMSEA = .039, 90% CI [.027, .050]; SRMR = .040; AIC = 27923.51. In contrast, the original 4-factor model of the TSRQ demonstrated unacceptable fit indices, SB $X^2(84, N = 507) = 197.58, p < .0001$; CFI = .894; RMSEA = .052, 90% CI [.042, .061]; SRMR = .063; AIC = 30062.93. Given the overall better model fit indices including a lower AIC, the revised 4-factor model was selected as the preferred model over the original 4-factor model. Figure 4 presents the standardized results of the CFA for the revised 4-factor model of the TSRQ. All items loaded saliently onto the proposed factor (standardized loadings $\geq .37$, median = .62, all $ps < .01$). As predicted, the inter-factor correlations were consistent with the proximity of the types of motivation on the self-determination continuum of motivation. Autonomous motivation was strongly related to introjected regulation, weakly positively related to external regulation, and moderately negatively related to amotivation. Introjected regulation was weakly positively related to external regulation and weakly negatively related to amotivation. External regulation was moderately positively related to amotivation (all $ps < .01$).

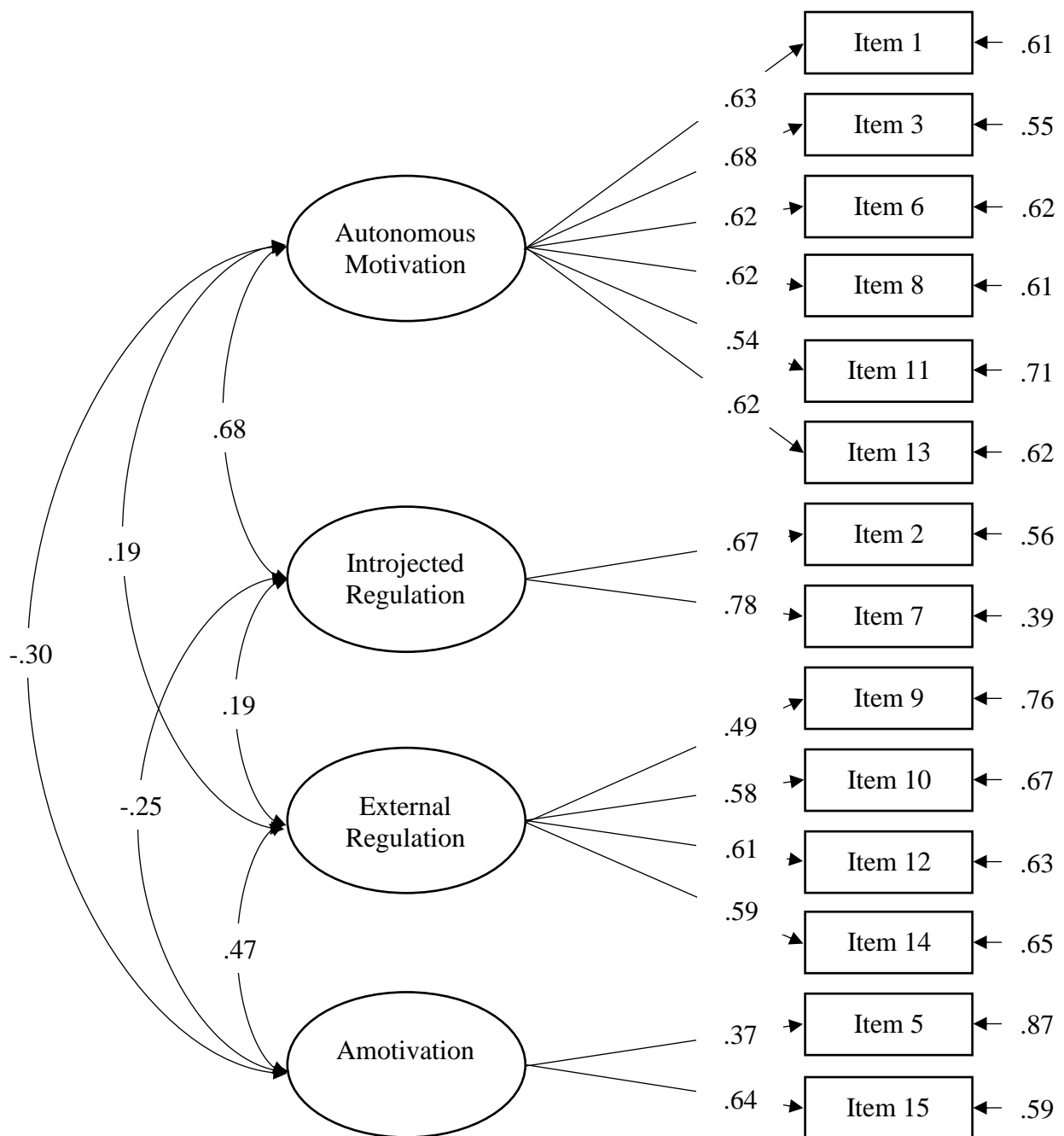


Figure 4: Standardized results of the confirmatory factor analysis for the revised 4-factor model of the Treatment Self-Regulation Questionnaire. All factor loadings and inter-factor correlations were statistically significant (all $ps < .01$).

RELIABILITY

Reliability of the items forming the autonomous motivation subscale yielded a ω of 0.78, reliability of the items forming the introjected regulation subscale yielded a ω of 0.69, reliability of the items forming the external regulation subscale yielded a ω of 0.66, and reliability of the items forming the amotivation subscale yielded a ω of 0.41.

MEASUREMENT INVARIANCE

As shown in Table 3, the multigroup CFA models of the revised 4-factor model of the TSRQ did not demonstrate a significant decrement in fit for the metric invariant model compared to the configural invariant model, nor for the scalar invariant model compared to the metric invariant model. These results suggest that the TSRQ is scalar invariant across biological sex (females and males). With scalar invariance established, the latent mean differences were compared across groups. Females reported significantly lower amotivation (latent mean difference = $-.273$, $p = .024$) and significantly higher introjected regulation (latent mean difference = $.297$, $p = .035$) than males.

Table 2: Results of the multi-group confirmatory factor analyses testing measurement invariance for the revised 4-factor model of the TSRQ across biological sex

Biological Sex	Overall Model Fit Indices							Comparing Model Fit Indices					
	SB χ^2	<i>df</i>	<i>p</i>	CFI	TLI	RMSEA	SRMR	$\Delta\chi^2$	<i>p</i>	Δ CFI	Δ TLI	Δ RMSEA	
1. Configural	200.54	142	<.001	.942	.926	.040	.051						
2. Metric	212.99	152	<.001	.940	.928	.040	.058	1 vs. 2	12.52	.252	-.002	+.002	.000
3. Scalar	228.25	162	<.002	.935	.927	.040	.061	2 vs. 3	15.57	.113	-.005	-.001	.000

Note. TSRQ = Treatment Self-Regulation Questionnaire; SB χ^2 = Satorra-Bentler scaled χ^2 ; CFI = Comparative Fit Index; RSMSEA = Root mean square error of approximation; SRMR = Standardized root mean square residual; AIC = Akaike information criterion.

CONCURRENT VALIDITY

Table 3 presents the Pearson correlations for the TSRQ subscales with the other SDT-related variables (psychological need satisfaction and dispositional autonomy). The pattern of correlations was largely consistent with hypotheses based on SDT that both psychological need satisfaction and dispositional autonomy would demonstrate increasingly positive correlations with motivations for responsible drinking as motivation increases in self-determination. Psychological need satisfaction and dispositional autonomy demonstrated the strongest positive relationships with autonomous motivation, followed by introjected regulation; the correlations were statistically larger for autonomy and competence ($ps < .05$), but not for relatedness and dispositional autonomy ($ps > .05$). Psychological need satisfaction and dispositional autonomy were negatively related to external regulation and amotivation; the magnitude of these negative correlations did not statistically differ ($ps > .05$).

Table 3: Pearson correlations for the TSRQ subscales with the other SDT-related variables

	Autonomous Motivation	Introjected Regulation	External Regulation	Amotivation
Autonomy	.25**	.15**	-.17**	-.16**
Competence	.23**	.12**	-.17**	-.16**
Relatedness	.23**	.16**	-.09*	-.15**
Dispositional autonomy	.30**	.22**	-.09*	-.17**

Note. TSRQ = Treatment Self-Regulation Questionnaire; SDT = Self-determination theory.

* $p < .05$, ** $p < .01$.

Table 4 presents the Pearson correlations for the TSRQ subscales with the alcohol-related variables (with approximately normal distributions). As shown, drinking motives demonstrated the strongest negative relationships with autonomous motivation, followed by introjected regulation; these correlations were statistically larger for enhancement, social, and coping motives ($ps < .05$), but not for conformity motives ($p > .05$). Drinking motives were positively related to external regulation and amotivation; the magnitude of these negative correlations did not

statistically differ ($ps > .05$). Additionally, readiness to change was positively related to external regulation, but not related to any of the other types of motivation.

Most relevant to the aims of the present study were the correlations between the TSRQ and harm-reduction outcomes, specifically PBS use and alcohol-related problems. As shown in Table 4, the correlations for the TSRQ subscales with *manner of drinking* and *serious harm reduction* PBS were entirely consistent with predictions based on SDT as autonomous motivation demonstrated the strongest positive associations, followed by introjected regulation. Then, external regulation was non-significantly associated with using these PBS, and amotivation was negatively correlated with using these PBS. For *stopping/limiting drinking* PBS, introjected regulation had a stronger positive relationship than autonomous motivation and external regulation had the weakest positive relationship. In contrast, amotivation had a negative relationship with *stopping/limiting drinking* PBS. There were no statistically significant differences in the magnitude of the positive correlations for autonomous motivation and introjected regulation with PBS ($ps < .05$), though they were statistically larger than the positive correlations for external regulation with PBS ($ps < .05$). For alcohol-related problems, autonomous motivation demonstrated the strongest negative association, followed by introjected regulation, and the magnitude of these correlations statistically differed ($p < .05$). Both external regulation and amotivation were non-significantly associated with alcohol-related problems.

Table 4: Pearson correlations between the TSRQ subscales and alcohol-related variables

	Autonomous Motivation	Introjected Regulation	External Regulation	Amotivation
Enhancement motives	-.28**	-.17**	.07	.17**
Social motives	-.28**	-.15**	.09*	.14**
Conformity motives	-.12**	-.09*	.20**	.17**
Coping motives	-.30**	-.10*	.11*	.16**
Readiness to change	-.04	.02	.16**	.07
Serious harm reduction	.32**	.30**	.01	-.16**
Stopping/limiting drinking	.32**	.34**	.11*	-.10*
Manner of drinking	.34**	.29**	.01	-.14**
Alcohol-related problems	-.26**	-.14**	.08	.08

Note. TSRQ = Treatment Self-Regulation Questionnaire.

* $p < .05$, ** $p < .01$.

The standardized regression coefficients of a simultaneous regression analysis predicting PBS from the TSRQ subscales were examined to understand the relationships of each motivation on PBS while controlling for the other motivations (see Table 5). Both autonomous motivation and introjected regulation emerged as significant positive predictors of all three types of PBS. Consistent with hypotheses, autonomous motivation was a stronger predictor of *serious harm reduction* and *manner of drinking* PBS than introjected regulation. However, inconsistent with hypotheses, introjected regulation was a stronger predictor of *stopping/limiting drinking* PBS than autonomous motivation. External regulation was a significant negative predictor of *serious harm reduction* PBS only and amotivation was not a significant predictor of PBS.

Table 5: TSRQ subscales as predictors of protective behavioral strategies

Predictor	Dependent Variables: Protective Behavioral Strategies					
	Serious Harm Reduction		Stopping/Limiting Drinking		Manner of Drinking	
	R^2	β	R^2	β	R^2	β
Step 1	.14**		.15**		.14**	
Autonomous motivation		.22**		.18**		.25**
Introjected regulation		.18**		.24**		.17**
External regulation		-.02		.06		-.03
Amotivation		-.09*		-.05		-.06

Note. TSRQ = Treatment Self-Regulation Questionnaire.

* $p < .05$, ** $p < .01$.

Table 6 presents the Spearman correlations for the TSRQ subscales with the alcohol use variables. As shown, autonomous motivation demonstrated the strongest negative associations with each of the alcohol use variables, followed by introjected regulation. External regulation was non-significantly associated with each of the alcohol use variables. Amotivation was positively associated with typical quantity, peak quantity, and heavy episodes. Notably, the magnitude of these correlation coefficients were not statistically compared because non-parametric tests of association (i.e., Spearman correlations) were used.

Table 6: Spearman correlations between the TSRQ subscales and alcohol use variables

	Autonomous motivation	Introjected regulation	External regulation	Amotivation
Frequency	.19**	.10*	-.08	-.07
Typical quantity	-.26**	-.23**	.00	.10*
Peak quantity	-.24**	-.20**	-.01	.12**
Heavy episodes	-.22**	-.14**	.07	.13**

Note. TSRQ = Treatment Self-Regulation Questionnaire.

* $p < .05$, ** $p < .01$.

Finally, a hierarchical regression analysis was conducted to determine whether the TSRQ subscales explained variance in PBS use beyond other motivational constructs (drinking motives and readiness to change) (see Table 7). As shown, the TSRQ subscales explained an additional 7%, 9%, and 5% of the variance in *serious harm reduction*, *stopping/limiting drinking*, and *manner of drinking* PBS, respectively, beyond drinking motives and readiness to change. Introjected regulation emerged as the strongest positive predictor of all three types of PBS use, which was contrary to hypotheses. Autonomous motivation was a significant positive predictor of *serious harm reduction* and *manner of drinking* PBS, but not *stopping/limiting drinking* PBS. External regulation was a significant positive predictor of *stopping/limiting drinking* PBS, but not the other types of PBS. Amotivation was not a significant predictor of PBS.

Table 7: TSRQ subscales as predictors of protective behavioral strategies controlling for drinking motives and readiness to change

Predictor	Dependent Variables: Protective Behavioral Strategies					
	Serious Harm Reduction		Stopping/Limiting Drinking		Manner of Drinking	
	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	.16**		.17**		.34**	
Enhancement motives		-.23**		-.21**		-.37**
Social motives		-.08		-.17**		-.21**
Conformity motives		-.11*		.02		.01
Coping motives		-.09		-.12*		-.08
Readiness to change		-.09*		.09*		-.00
Step 2	.07**		.09**		.05**	
Autonomous motivation		.12*		.07		.09*
Introjected regulation		.17**		.24**		.16**
External regulation		.05		.10*		.03
Amotivation		-.05		-.02		-.01

Note. TSRQ = Treatment Self-Regulation Questionnaire.

* $p < .05$, ** $p < .01$.

INTERACTION EFFECTS

The results of the hierarchical regression analyses testing interactions among the TSRQ subscales are presented in Table 8. The interaction terms entered in Step 2 accounted for an additional 3% of the variance in each type of PBS beyond the individual TSRQ subscales entered in Step 1. Out of the 18 interaction effects tested, 4 were statistically significant. Probing these interactions using the Johnson-Neyman technique (see Figures 5 - 8) revealed a similar nature of the interaction effects. That is, the positive associations between more self-determined types of motivation (i.e., autonomous motivation and introjected regulation) and PBS use increased as less self-determined types of motivation (i.e., introjected and external regulation and amotivation) increased.

Table 8: TSRQ subscales and their interactions as predictors of protective behavioral strategies

Predictor	Dependent Variables: Protective Behavioral Strategies					
	Serious Harm Reduction		Stopping/Limiting Drinking		Manner of Drinking	
	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	.14**		.15**		.14**	
Autonomous motivation		.22**		.18**		.25**
Introjected regulation		.18**		.24**		.17**
External regulation		-.02		.06		-.03
Amotivation		-.09*		-.05		-.06
Step 2	.03**		.03**		.03**	
Autonomous motivation		.04		.02		.13**
X Introjected regulation						
Autonomous motivation		.12*		.03		.03
X External regulation						
Autonomous motivation		-.08		.02		.06
X Amotivation						
Introjected regulation		.05		.13**		.03
X External regulation						
Introjected regulation		.11*		.06		.08
X Amotivation						
External regulation		.02		.03		.05
X Amotivation						

Note. TSRQ = Treatment Self-Regulation Questionnaire.

* $p < .05$, ** $p < .01$.

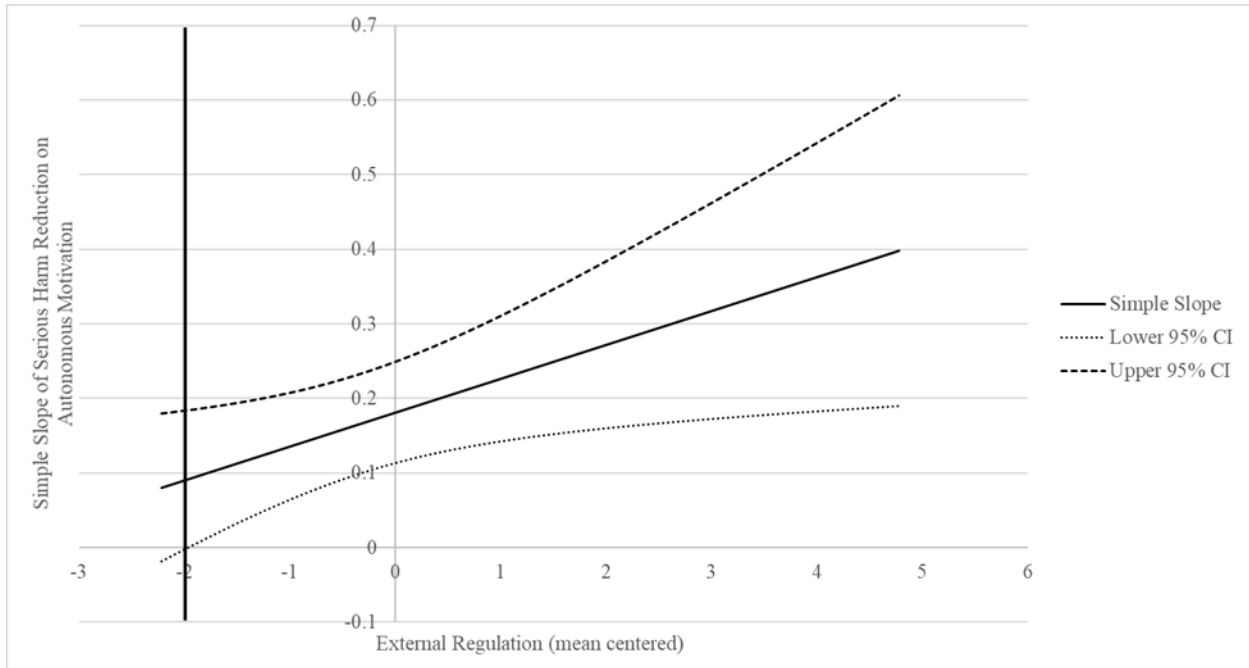


Figure 5: Johnson-Neyman technique probing the interaction effect between autonomous motivation and external regulation on serious harm reduction

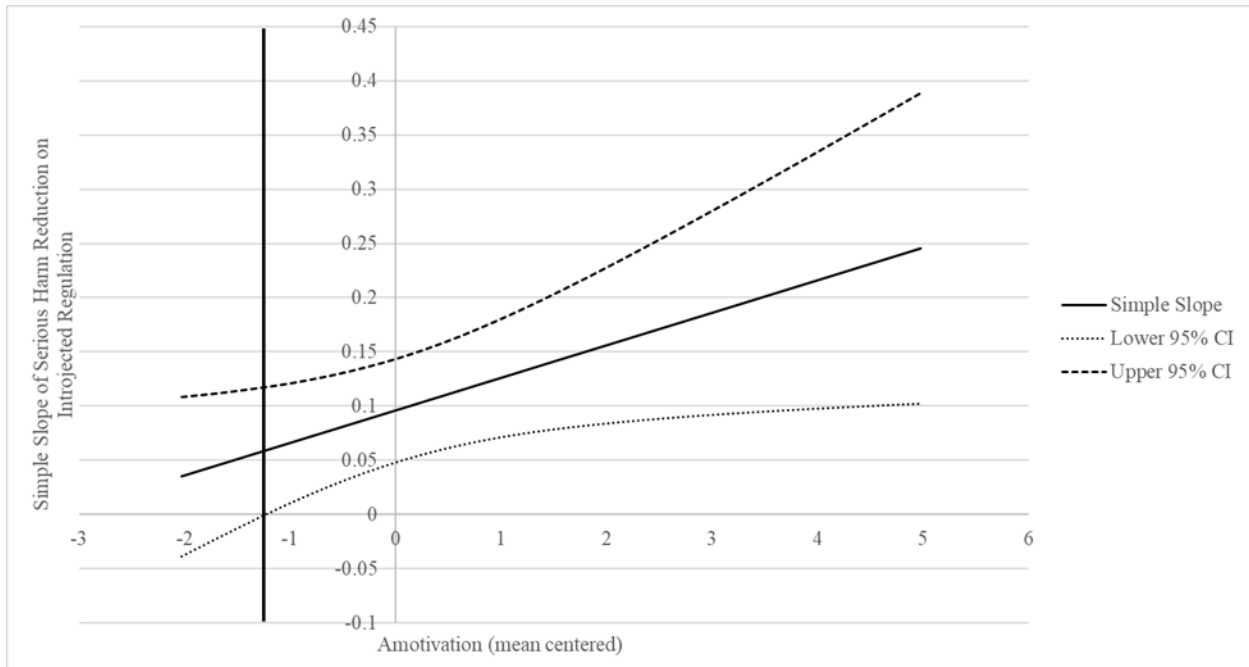


Figure 6: Johnson-Neyman technique probing the interaction effect between introjected regulation and amotivation on serious harm reduction

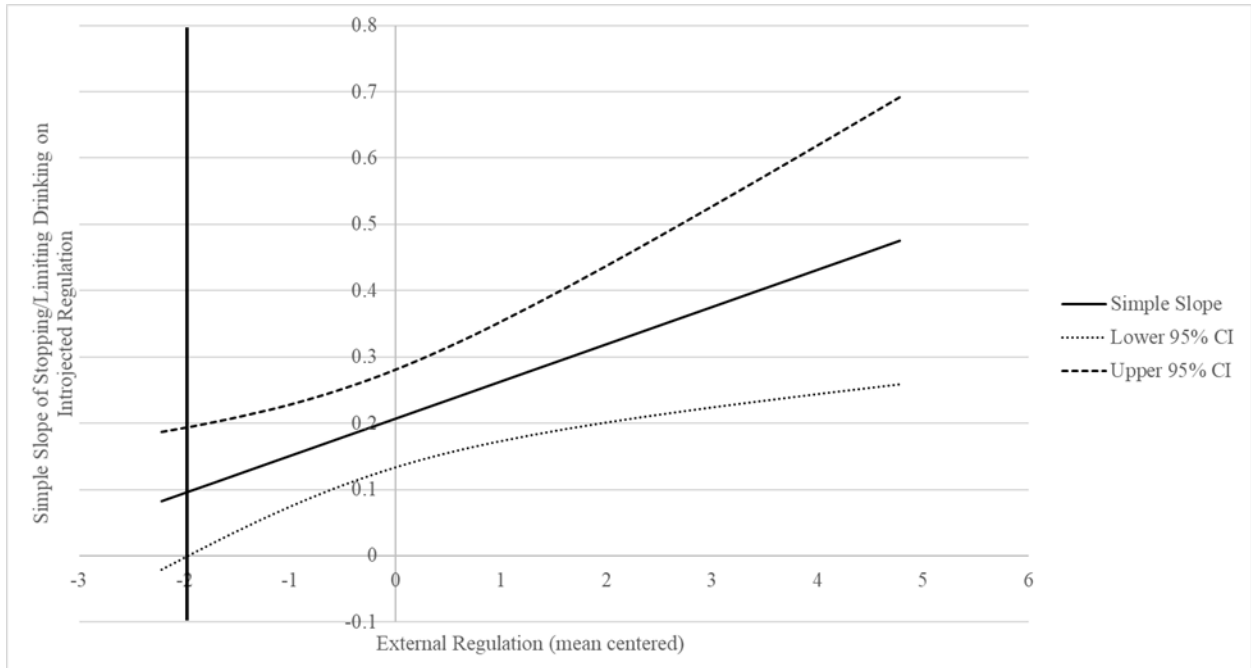


Figure 7: Johnson-Neyman technique probing the interaction effect between introjected regulation and external regulation on stopping/limiting drinking

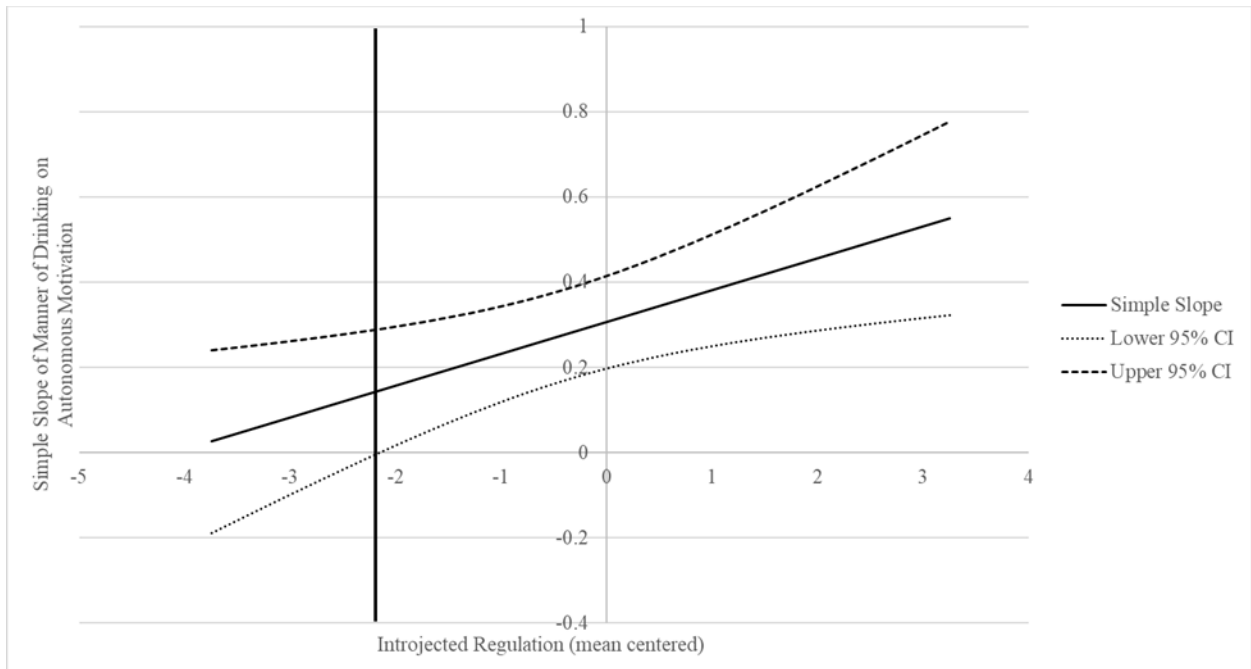


Figure 8: Johnson-Neyman technique probing the interaction effect between autonomous motivation and introjected regulation on manner of drinking

Chapter 4: Discussion

To further test the utility of SDT as a framework for understanding motivations for responsible drinking, the present study extended psychometric work on the TSRQ conducted by Richards et al. (2020).

AIM #1

The present study replicated the 4-factor structure for the responsible drinking version of the TSRQ found by Richards et al. Further, the 4-factor structure is both consistent with SDT and previous psychometric studies on other versions of the TSRQ (e.g., tobacco cessation; Levesque et al., 2007). The replication of the 4-factor structure among a relatively large (compared to Richards et al.) random sample increases confidence in the generalizability of the finding that the items of the TSRQ represent four types of motivation that are proposed by SDT. The inter-factor correlations were also highly consistent with the position of the types of motivation on the self-determination continuum proposed by SDT. Additionally, the present findings also confirm two revisions made by Richards et al.: 1) eliminate Item 4 and 2) use Item 10 as an external regulation item as opposed to an amotivation item. Researchers who use the TSRQ for assessing motivations for responsible drinking for future studies should implement these two revisions. Additionally, largely supportive of SDT is the fact that a 4-factor structure emerges across versions of the TSRQ as the self-determination continuum motivation is proposed to apply across different health behaviors (Ryan et al., 2008). That said, although the findings of the present study were mostly suggestive of strong psychometric properties of the TSRQ, the reliability estimates for the subscales were low, especially for amotivation. As noted by Richards et al., this is unlikely the final version of the TSRQ and future research should consider adding items to the subscales to improve both content validity and reliability of the subscales.

AIM #2

Further, the findings of the present study suggest that the TSRQ is scalar invariant across biological sex. There is evidence for lack of measurement invariance of the PBSS across biological sex, suggesting that certain PBS may be interpreted differently between males and females (Treloar et al., 2014, 2015; Richards et al., 2018). However, the present findings suggest that males and females interpret motivations for drinking responsibly similarly. This finding is consistent with the notion of SDT that types of motivation of the self-determination continuum are universal. Comparisons of the latent means suggested that females endorse higher introjected motivation and lower amotivation than males. Studies have consistently found that females use PBS more frequently than males (Pearson, 2013) and the present findings have implications for why this may be the case. Females may be more likely to experience negative affect due to not drinking responsibly (i.e., introjected regulation) and less likely to lack intent (i.e., amotivation) to drink responsibly in comparison to males.

AIM #3

Beyond the measurement of motivations for drinking responsibly, the results supported several other tenets of SDT. The relations of the satisfaction of psychological needs and dispositional autonomy with motivations for responsible drinking were entirely consistent with SDT. Specifically, both psychological need satisfaction and dispositional autonomy demonstrated the strongest positive associations with autonomous motivation (i.e., the most self-determined motivation) and the strongest negative associations with amotivation (i.e., the least self-determined motivation). These findings are consistent with the proposal of SDT that the satisfaction of the psychological needs gives rise to more self-determined motivations, and that dispositional autonomy translates to greater self-determined motivation across behavioral contexts (i.e., in this

case, drinking responsibly). The concurrent validity of the TSRQ in relation to other SDT constructs was not tested by Richards et al. (2020) and these findings are a major contribution of the present study. Both the psychological needs and dispositional autonomy have implications for alcohol interventions. More specifically, alcohol interventions could target the psychological needs in order to promote the internalization and integration of motivation for responsible drinking among college students. Indeed, SDT has been invoked to explain the effectiveness of motivational interviewing, such that motivational interviewing satisfies the psychological needs thereby internalizing and integrating motivation for behavior change (e.g., Markland et al., 2005; Patrick & Williams, 2012; Vansteenkiste & Sheldon, 2006); however, this has not been empirically tested in relation to motivational interviewing for alcohol misuse. Dispositional autonomy, on the other hand, may be an important characteristic influencing response to alcohol intervention. Because people high in dispositional autonomy are more likely to experience their behaviors as originating from or endorsed by the self, they may be particularly responsive to types of alcohol intervention that target more self-determined reasons for changing one's drinking (e.g., motivational interviewing). In contrast, those low in dispositional autonomy may be particularly responsive to types of alcohol intervention that target less self-determined reasons for changing one's drinking (e.g., normative feedback) (Neighbors et al., 2006). The present study is a first and necessary step toward the application of SDT to alcohol interventions.

Concurrent validity of the TSRQ with PBS use demonstrated by Richards et al. was mostly replicated in the present study using an improved measure of PBS use (i.e., the PBSS-20 as opposed to the original PBSS). For *manner of drinking* and *serious harm reduction* PBS, both the bivariate correlations and the standardized coefficients for the simultaneous regression analysis showed that autonomous motivation had the strongest association with more PBS use, followed

by introjected regulation. External regulation was non-significantly related to these PBS, and amotivation tended to be negatively correlated with these PBS. Interestingly, research has shown that *manner of drinking* and *serious harm reduction* PBS are the most effective types of PBS in reducing the harms of alcohol misuse (e.g., Linden-Carmichael et al., 2018; Napper et al., 2014). In other words, the types of PBS that autonomous motivation was most associated with are also the types of PBS that research has shown to be most associated with harm reduction outcomes. For *stopping/limiting drinking* PBS, both the bivariate correlations and simultaneous regression analysis showed that introjected regulation was slightly more strongly related to PBS than autonomous motivation, but the remaining scales demonstrated a remarkably similar pattern of associations. Similar exceptions were found by Richards et al. (2020) regarding introjected regulation. The association of introjected regulation with positive health outcomes is consistent with the findings of a meta-analysis (Ng et al., 2012), but some studies suggest that this may only be true for positive health outcomes in the short-term (e.g., Pelletier et al., 2001). However, this meta-analysis also found that introjected regulation was associated with negative psychological outcomes, such as depression and anxiety (Ng et al., 2012). These findings are theoretically consistent with SDT which proposes that the alienation and inauthenticity of less self-determined types of motivation may foster psychological ill-being (Ryan & Deci, 2000) and that autonomous motivation is necessary for the maintenance of healthy behaviors over time (Ryan et al., 2008). Longitudinal studies are needed to elucidate the potentially different long-term effects of introjected regulation and autonomous motivation for responsible drinking on PBS use.

Also supportive of the validity of the TSRQ were the pattern of correlations between the TSRQ subscales and the other alcohol-related variables. First, the associations between the types of motivations for responsible drinking and drinking motives were entirely consistent with SDT.

Greater endorsement of more self-determined motivations (i.e., autonomous motivation and introjected regulation) for responsible drinking were associated with weaker endorsement of drinking motives. These associations were stronger for autonomous motivation than introjected regulation, further supporting SDT. In contrast, less self-determined motivations (i.e., external regulation and amotivation) were generally associated with greater endorsement of drinking motives. These associations were generally stronger for amotivation than external regulation, further supporting SDT. The one exception was that the positive association between external regulation and conformity motives was larger than that for amotivation, which makes theoretical sense as those high in external regulation are strongly influenced by external factors and thus more likely to engage in behaviors to conform to social norms. The associations between motivations for responsible drinking and drinking motives are consistent with a previous study (Benka, 2017). Second, only external regulation was associated (positively) with readiness to change. This finding also makes theoretical sense as college students with greater alcohol misuse severity may be more likely to be pressured by others to drink responsibly and therefore be more motivated to change their drinking. Indeed, studies show that greater readiness to change is associated with greater alcohol misuse severity among college students (e.g., Collins et al., 2010). Finally, the associations between motivations for responsible drinking and alcohol use were entirely consistent with SDT. Although the finding that autonomous motivation and introjected regulation were positively associated with frequency of alcohol use may seem counterintuitive, infrequent binge drinking is the pattern of drinking most associated with increased harms and a characteristic pattern of drinking among college students (Park, 2004). Drinking more frequently is inconsistent with this pattern. Further, motivation for responsible drinking was increasingly associated with less alcohol use as motivation increased in self-determination. This is inconsistent with the findings of Richards

et al. who failed to find definitive support for the validity of the TSRQ in relation to alcohol use/problems. One reason for this may be the larger sample in the present study.

Taken together, these findings of the analyses conducted to test Aim #3 provide strong support for a primary contention of SDT that self-determined motivation is associated with greater engagement in healthy behaviors (Ryan et al., 2008). The implication of these findings is that more self-determined motivations for responsible drinking should be targeted by intervention efforts as college students who more strongly endorse behaviors most consistent with a profile of responsible drinking (more frequent PBS use, weaker drinking motives, less alcohol use, and experience fewer alcohol-related problems). Further, the internalization and integration of motivation for responsible drinking may be a proximal outcome (or mechanism of change) through which alcohol interventions for college students can promote responsible drinking. Internalization and integration can potentially be achieved by satisfying the psychological needs as a component of the intervention.

AIM #4

In support of the hypothesis that motivations for responsible drinking from an SDT perspective would add to the explanation of PBS use beyond other conceptualization of motivation, the TSRQ subscales explained 5% - 9% of additional variance in PBS use while controlling for drinking motives and readiness to change. This is practically significant as several interventions targeting PBS among college students have failed to effectively increase PBS use (for a review, see Reid & Carey, 2015). More self-determined types of motivation for responsible drinking may offer novel targets for interventions that will effectively increase PBS use. Less supportive of predictions was the fact that introjected regulation, not autonomous motivation, emerged as the strongest positive predictor of PBS use in the regression analyses controlling for

drinking motives and readiness to change. However, this may be due to greater shared variability between autonomous motivation and drinking motives than introjected regulation and drinking motives, as indicated by the stronger correlations. It stands to reason that those who are more autonomously motivated to drink responsibly would also be less motivated to drink and vice versa. An interesting direction for future research would be to examine overall motivational profiles for drinking behaviors by considering both motivations for responsible drinking and drinking motives using latent profile analysis.

EXPLORATORY AIM

Because the types of motivation proposed by SDT do not exist in isolation and behavior can be multi-determined (e.g., Vansteenkiste et al., 2009), potential interaction effects between the TSRQ subscales were explored to better understand the dynamic effects of the types of motivation. Several interaction effects emerged, and the nature of these interaction effects were similar. More specifically, the positive associations between more self-determined types of motivation (i.e., autonomous motivation and introjected regulation) and PBS use increased as less self-determined types of motivation (i.e., external regulation and amotivation) increased. Although not presented, the interaction effects were also probed by switching the focal predictor and moderator variable in the Johnson-Neyman plots to better understand the interaction effects. Probing the interaction effects in this manner suggested that the negative associations between less self-determined types of motivation and PBS use increased as more self-determined types of motivation increased. At higher levels of more self-determined motivations, the negative associations between less self-determined motivations and PBS use were no longer statistically significant. Taken together, this suggests that higher levels of less self-determined motivation can be beneficial when levels of more self-determined motivation are high. Although these findings need to be replicated,

especially given that the analyses were exploratory, these findings may have important implications for alcohol interventions. That is, PBS interventions that target external factors (e.g., personalized normative feedback) may be less effective without a component that simultaneously targets internal factors. Overall, the findings of the present study strongly suggest that targeting more self-determined motivations for responsible drinking in alcohol interventions will have larger effects than targeting less self-determined motivations for responsible drinking.

LIMITATIONS

There are several limitations that should be considered in evaluating the present findings. The cross-sectional nature of the data prevents causal inferences and the ability to test other psychometric properties including longitudinal measurement invariance, test-retest reliability, and predictive validity. The cross-sectional data also do not allow the testing of the hypothesized chain of effects. That is, psychological needs and dispositional autonomy are expected to affect motivations for responsible drinking, which, in turn, affects PBS use, which, in turn, affects alcohol use and related problems. For these reasons, longitudinal and experimental (i.e., interventions targeting these motivations) studies are needed. Another limitation is the poor internal consistency estimates for the subscales of the General Need Satisfaction Scale which limits inferences pertaining to the results for psychological need satisfaction. Future research should seek to replicate the present findings using improved measures of psychological need satisfaction, such as the Basic Psychological Need Satisfaction and Frustration Scale (Chen et al., 2015). Finally, the low responsible rate (although commensurate with other studies [Larimer et al., 2007]) and the predominantly Hispanic sample (although also a strength), warrant some concern regarding whether the findings generalize to the U.S. college student population.

CONCLUSION

In sum, SDT offers a potentially useful framework of motivation for understanding responsible drinking, which was defined in the present study as PBS use. The present study provides initial evidence for this framework by extending psychometric work on the TSRQ and testing central SDT hypotheses. Future research is needed to continue to improve the measurement of motivations for responsible drinking and comprehensively test SDT hypotheses in relation to responsible drinking. For example, the content validity of the TSRQ subscales can potentially be improved by adding items, especially because two of the subscales consist of only two items. Another example is the use of longitudinal designs of test the causal chain of effects proposed by SDT. This future research is warranted given the preliminary evidence of the present study for using SDT to understand motivations for responsible drinking among college students and the potential utility of SDT to inform alcohol intervention targets, characteristics of who is more likely to respond to different alcohol interventions, and mechanisms of change following alcohol interventions.

References

- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Sage.
- Atkins, D. C., Baldwin, S. A., Zheng, C., Gallop, R. J., & Neighbors, C. (2013). A tutorial on count regression and zero-altered count models for longitudinal substance use data. *Psychology of Addictive Behaviors, 27*, 166-177.
- Barry, A. E., & Goodson, P. (2011). How college students conceptualize and practice responsible drinking. *Journal of American College Health, 59*, 304-312.
- Benka, J. (2017). Autonomous self-regulation and different motivations for alcohol use among university students. *Mental Health & Prevention, 7*, 12-16.
- Blackburn, R., Donnelly, J. P., Logan, C., & Renwick, S. J. (2004). Convergent and discriminative validity of interview and questionnaire measures of personality disorder in mentally disordered offenders: A multitrait-multimethod analysis using confirmatory factor analysis. *Journal of Personality Disorders, 18*, 129-150.
- Blanco, C., Okuda, M., Wright, C., Hasin, D. S., Grant, B. F., Liu, S. M., & Olfson, M. (2008). Mental health of college students and their non-college-attending peers: Results from the national epidemiologic study on alcohol and related conditions. *Archives of General Psychiatry, 65*, 1429-1437.
- Borsari, B., Murphy, J. G., & Carey, K. B. (2009). Readiness to change in brief motivational interventions: A requisite condition for drinking reductions? *Addictive Behaviors, 34*, 232-235.

- Bravo, A. J., Prince, M. A., & Pearson, M. R. (2015). Does the how mediate the why? A multiple replication examination of drinking motives, alcohol protective behavioral strategies, and alcohol outcomes. *Journal of Studies on Alcohol and Drugs, 76*, 872-883.
- Brown, T. A. (2014). *Confirmatory factor analysis for applied research*. Guilford.
- Carey, K. B., DeMartini, K. S., Prince, M. A., Luteran, C., & Carey, M. P. (2013). Effects of choice on intervention outcomes for college students sanctioned for campus alcohol policy violations. *Psychology of Addictive Behaviors, 27*, 596-603.
- Carey, K. B., Purnine, D. M., Maisto, S. A., & Carey, M. P. (1999). Assessing readiness to change substance abuse: A critical review of instruments. *Clinical Psychology: Science and Practice, 6*, 245-266.
- Carey, K. B., Scott-Sheldon, L. A. J., Carey, M. P., & DeMartini, K. S. (2007). Individual level interventions to reduce college student drinking: A meta-analytic review. *Addictive Behaviors, 32*, 2469-2494.
- Chawla, N., Neighbors, C., Logan, D., Lewis, M. A., & Fossos, N. (2009). Perceived approval of friends and parents as mediators of the relationship between self-determination and drinking. *Journal of Studies on Alcohol and Drugs, 70*, 92-100.
- Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal, 14*, 464-504.
- Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*, 233-255.
- Collins, S. E., Logan, D. E., & Neighbors, C. (2010). Which came first: the readiness or the change? Longitudinal relationships between readiness to change and drinking among college drinkers. *Addiction, 105*, 1899-1909.

- Cooper, M. L. (1994). Motivations for alcohol use among adolescents: Development and validation of a four-factor model. *Psychological Assessment, 6*, 117-128.
- Cooper, M. L., Kuntsche, E., Levitt, A., Barber, L., & Wolf, S. (2016). A motivational perspective on substance use: Review of theory and research. In K. J. Sher (Ed.), *Oxford handbook of substance use disorders* (pp. 375–421). Oxford University Press.
- Cox, W. M., & Klinger, E. (1988). A motivational model of alcohol use. *Journal of Abnormal Psychology, 97*, 168-180.
- Cox, W. M., & Klinger, E. (2000). Incentive motivation, affective change, and alcohol use: A model. In W. M. Cox (Ed.), *Why people drink* (pp. 291-311). Gardner Press.
- Deci, E. L., & Ryan, R. M. (1985). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality, 19*, 109-134.
- DiClemente, C. C. (1999). Motivation for change: Implications for substance abuse treatment. *Psychological Science, 10*, 209-213.
- Dvorak, R. D., Troop-Gordon, W., Stevenson, B. L., Kramer, M. P., Wilborn, D., & Leary, A. V. (2018). A randomized control trial of a deviance regulation theory intervention to increase alcohol protective strategies. *Journal of Consulting and Clinical Psychology, 86*, 1061-1075.
- Gagné, M. (2003). The role of autonomy support and autonomy orientation in prosocial behavior engagement. *Motivation and Emotion, 27*, 199-223.
- Gillison, F. B., Rouse, P., Standage, M., Sebire, S. J., & Ryan, R. M. (2019). A meta-analysis of techniques to promote motivation for health behaviour change from a self-determination theory perspective. *Health Psychology Review, 13*, 110-130.

- 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, 16*, 12-20.
- Hu, L. T., & 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.
- Kahler, C. W., Hustad, J., Barnett, N. P., Strong, D. R., & Borsari, B. (2008). Validation of the 30-day version of the Brief Young Adult Alcohol Consequences Questionnaire for use in longitudinal studies. *Journal of Studies on Alcohol and Drugs, 69*, 611-615.
- Kahler, C. W., Strong, D. R., & Read, J. P. (2005). Toward efficient and comprehensive measurement of the alcohol problems continuum in college students: The Brief Young Adult Alcohol Consequences Questionnaire. *Alcoholism: Clinical and Experimental Research, 29*, 1180-1189.
- Kassambara, A. (2019). ggcorrplot: Visualization of a correlation matrix using 'ggplot2'. R package version 0.1.3. <https://CRAN.R-project.org/package=ggcorrplot>
- Knee, C. R., & Neighbors, C. (2002). Self-determination, perception of peer pressure, and drinking among college students. *Journal of Applied Social Psychology, 32*, 522-543.
- Krebs, P., Norcross, J. C., Nicholson, J. M., & Prochaska, J. O. (2018). Stages of change and psychotherapy outcomes: A review and meta-analysis. *Journal of Clinical Psychology, 74*, 1964-1979.
- 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.

- Kuntsche, E., & Kuntsche, S. (2009). Development and validation of the drinking motive questionnaire revised short form (DMQ-R SF). *Journal of Clinical Child and Adolescent Psychology, 38*, 899-908.
- LaBrie, J. W., Lac, A., Kenney, S. R., & Mirza, T. (2011). Protective behavioral strategies mediate the effect of drinking motives on alcohol use among heavy drinking college students: Gender and race differences. *Addictive Behaviors, 36*, 354-361.
- Larimer, M. E., Lee, C. M., Kilmer, J. R., Fabiano, P. M., Stark, C. B., Geisner, I. M., Mallet, K. A., Lostutter, T. W., Crouce, J. M., Feeney, M., & Neighbors, C. (2007). Personalized mailed feedback for college drinking prevention: A randomized clinical trial. *Journal of Consulting and Clinical Psychology, 75*, 285-293.
- Lee, I. A., & Preacher, K. J. (2013, September). Calculation for the test of the difference between two dependent correlations with one variable in common [Computer software].
<http://quantpsy.org>
- Leeman, R. F., DeMartini, K. S., Gueorguieva, R., Nogueira, C., Corbin, W. R., Neighbors, C., & O'Malley, S. S. (2016). Randomized controlled trial of a very brief, multicomponent web-based alcohol intervention for undergraduates with a focus on protective behavioral strategies. *Journal of Consulting and Clinical Psychology, 84*, 1008-1015.
- Levesque, C. S., Williams, G. C., Elliot, D., Pickering, M. A., Bodenhamer, B., & Finley, P. J. (2007). Validating the theoretical structure of the Treatment Self-Regulation Questionnaire (TSRQ) across three different health behaviors. *Health Education Research, 22*, 691-702.
- Linden-Carmichael, A. N., Calhoun, B. H., Patrick, M. E., & Maggs, J. L. (2018). Are protective behavioral strategies associated with fewer negative consequences on high-intensity

- drinking days? Results from a measurement-burst design. *Psychology of Addictive Behaviors*, 32, 904-913.
- Looby, A., Bravo, A. J., Kilwein, T. M., Zimmerman, L., Pearson, M. R., & Protective Strategies Study Team. (2019). Alcohol-related protective behavioral strategies as a mediator of the relationship between drinking motives and risky sexual behaviors. *Addictive Behaviors*, 93, 1-8.
- MacLean, M. G., & Lecci, L. (2000). A comparison of models of drinking motives in a university sample. *Psychology of Addictive Behaviors*, 14, 83-87.
- Markland, D., Ryan, R. M., Tobin, V. J., & Rollnick, S. (2005). Motivational interviewing and self-determination theory. *Journal of Social and Clinical Psychology*, 24, 811-831.
- Marlatt, G. A., & Witkiewitz, K. (2002). Harm reduction approaches to alcohol use: Health promotion, prevention, and treatment. *Addictive Behaviors*, 27, 867-886.
- Martens, M. P., Ferrier, A. G., & Cimini, M. D. (2007b). Do protective behavioral strategies mediate the relationship between drinking motives and alcohol use in college students? *Journal of Studies on Alcohol and Drugs*, 68, 106-114.
- Martens, M. P., Ferrier, A. G., Sheehy, M. J., Corbett, K., Anderson, D. A., & Simmons, A. (2005). Development of the Protective Behavioral Strategies Survey. *Journal of Studies on Alcohol*, 66, 698-705.
- Martens, M. P., Pederson, E. R., LaBrie, J. W., Ferrier, A. G., & Cimini, M. D. (2007a). Measuring alcohol-related protective behavioral strategies among college students: Further examination of the Protective Behavioral Strategies Scale. *Psychology of Addictive Behaviors*, 21, 307-315.

- Martens, M. P., Smith, A. E., & Murphy, J. G. (2013). The efficacy of single-component brief motivational interventions among at-risk college drinkers. *Journal of Consulting and Clinical Psychology, 81*, 691-701.
- Maxwell, S. E., & Cole, D. A. (2007). Bias in cross-sectional analyses of longitudinal mediation. *Psychological Methods, 12*, 23-44.
- Maxwell, S. E., Cole, D. A., & Mitchell, M. A. (2011). Bias in cross-sectional analyses of longitudinal mediation: Partial and complete mediation under an autoregressive model. *Multivariate Behavioral Research, 46*, 816-841.
- McClelland, G. H., & Judd, C. M. (1993). Statistical difficulties of detecting interactions and moderator effects. *Psychological Bulletin, 114*, 376-390.
- McDonald, R. P. (1999). *Test theory: a unified treatment*. Erlbaum.
- Meredith, W. (1993). Measurement invariance, factor analysis and factorial invariance. *Psychometrika, 58*, 525-543.
- Miller, W. R., & Rollnick, S. (2012). Meeting in the middle: motivational interviewing and self-determination theory. *International Journal of Behavioral Nutrition and Physical Activity, 9*, 25.
- Muthén, L. K., & Muthén, B. O. (1998-2019). *Mplus user's guide* (8th ed). Muthén & Muthén.
- Napper, L. E., Kenney, S. R., Lac, A., Lewis, L. J., & LaBrie, J. W. (2014). A cross-lagged panel model examining protective behavioral strategies: Are types of strategies differentially related to alcohol use and consequences? *Addictive Behaviors, 39*, 480-486.
- National Institute on Alcohol Abuse and Alcoholism (NIAAA). (2003, October). Recommended alcohol questions. <https://www.niaaa.nih.gov/research/guidelines-and-resources/recommended-alcohol-questions>

- National Institute on Alcohol Abuse and Alcoholism (NIAAA). (2019, October). *College drinking*. <https://www.niaaa.nih.gov/publications/brochures-and-fact-sheets/college-drinking>
- Neighbors, C., Larimer, M. E., Geisner, I. M., & Knee, C. R. (2004). Feeling controlled and drinking motives among college students: Contingent self-esteem as a mediator. *Self and Identity, 3*, 207-224.
- Neighbors, C., Lee, C. M., Lewis, M. A., Fossos, N., & Larimer, M. E. (2007). Are social norms the best predictor of outcomes among heavy-drinking college students? *Journal of Studies on Alcohol and Drugs, 68*, 556-565.
- Neighbors, C., Lewis, M. A., Bergstrom, R. L., & Larimer, M. E. (2006). Being controlled by normative influences: Self-determination as a moderator of a normative feedback alcohol intervention. *Health Psychology, 25*, 571-579.
- Neighbors, C., Walker, D. D., & Larimer, M. E. (2004). Expectancies and evaluations of alcohol effects among college students: self-determination as a moderator. *Journal of Studies on Alcohol, 64*, 292-300.
- Ng, J. Y., Ntoumanis, N., Thøgersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Duda, J. L., & Williams, G. C. (2012). Self-determination theory applied to health contexts: A meta-analysis. *Perspectives on Psychological Science, 7*, 325-340.
- Nguyen, M. L., & Neighbors, C. (2013). Self-determination, perceived approval, and drinking: Differences between Asian Americans and Whites. *Addictive Behaviors, 38*, 1656-1662.
- Ntoumanis, N., Ng, J. Y. Y., Prestwich, A., Quested, E., Hancox, J. E., Thøgersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Lonsdale, C., & Williams, G. C. (2020). A meta-analysis of self-determination theory-informed intervention studies in the health domain: Effects on

- motivation, health behavior, physical, and psychological health. *Health Psychology Review*. Advance online publication.
- Osborne, J. W., & Costello, A. B. (2004). Sample size and subject to item ratio in principal components analysis. *Practical Assessment, Research, and Evaluation*, 9, 11.
- Osterman, R. (2011). Feasibility of using motivational interviewing to decrease alcohol consumption during pregnancy. *Journal of Addictions Nursing*, 22, 93-102.
- Padilla, M. A., Divers, J., & Newton, M. (2012). Coefficient alpha bootstrap confidence interval under nonnormality. *Applied Psychological Measurement*, 36, 331-348.
- Park, C. L. (2004). Positive and negative consequences of alcohol consumption in college students. *Addictive Behaviors*, 29, 311-321.
- Patrick, M. E., Lee, C. M., & Larimer, M. E. (2011). Drinking motives, protective behavioral strategies, and experienced consequences: Identifying students at risk. *Addictive Behaviors*, 36, 270-273.
- Patrick, H., & Williams, G. C. (2012). Self-determination theory: its application to health behavior and complementarity with motivational interviewing. *International Journal of Behavioral Nutrition and Physical Activity*, 9, 18.
- Pearson, M. R. (2013). Use of alcohol protective behavioral strategies among college students: A critical review. *Clinical Psychology Review*, 33, 1025-1040.
- Pearson, M. R., D'Lima, G. M., & Kelley, M. L. (2013). Daily use of protective behavioral strategies and alcohol-related outcomes among college students. *Psychology of Addictive Behaviors*, 27, 826-831.
- Perkins, H. W. (2002). Surveying the damage: A review of research on consequences of alcohol misuse in college populations. *Journal of Studies on Alcohol. Supplement*, 14, 91-100.

- Preacher, K. J., & Coffman, D. L. (2006, May). Computing power and minimum sample size for RMSEA [Computer software]. <http://quantpsy.org/>
- Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interactions in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics, 31*, 437-448.
- Prince, M. A., Carey, K. B., & Maisto, S. A. (2013). Protective behavioral strategies for reducing alcohol involvement: A review of the methodological issues. *Addictive Behaviors, 38*, 2343-2351.
- Prochaska, J. O., DiClemente, C. C., Norcross, J. C. (1992). In search of how people change: Applications to addictive behaviors. *American Psychologist, 47*, 1102-1114.
- R Core Team (2019). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>
- Read, J. P., Kahler, C. W., Strong, D. R., & Colder, C. R. (2006). Development and preliminary validation of the young adult alcohol consequences questionnaire. *Journal of Studies on Alcohol, 67*, 169-177.
- Reid, A. E., & Carey, K. B. (2015). Interventions to reduce college student drinking: State of the evidence for mechanisms of behavior change. *Clinical Psychology Review, 40*, 213-224.
- Revelle, W. (2018). psych: Procedures for Personality and Psychological Research, Northwestern University, Evanston, Illinois, USA, <https://CRAN.R-project.org/package=psych> Version = 1.8.4.
- Richards, D. K., Morera, O. F., & Field, C. A. (2020). The psychometric properties of a version of the Treatment Self-Regulation Questionnaire for assessing motivations for responsible drinking. *Journal of American College Health*. Advance online publication.

- Richards, D. K., Pearson, M. R., Morera, O. F., & Field, C. A. (2019). Protective behavioral strategies predict alcohol-related problems among injured patients following a brief intervention. *Drug and Alcohol Dependence, 205*, 107535.
- Richards, D. K., Puentes, R. P., Gonzales, R., Cardoso Smith, J., Field, C. A., & Morera, O. F. (2018). A psychometric evaluation of the Protective Behavioral Strategies Scale-20 among internet samples of adult drinkers. *Addictive Behaviors Reports, 8*, 71-78.
- 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.
- Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology, 57*, 749-761.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 68-78.
- Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford.
- Ryan, R. M., Patrick, H., Deci, E. L., & Williams, G. C. (2008). Facilitating health behaviour change and its maintenance: Interventions based on self-determination theory. *The European Health Psychologist, 10*, 2-5.
- Ryan, R. M., Plant, R. W., & O'Malley, S. (1995). Initial motivations for alcohol treatment: Relations with patient characteristics, treatment involvement, and dropout. *Addictive Behaviors, 20*, 279-297.

- Schönbrodt, F. D., & Perugini, M. (2013). At what sample size do correlations stabilize? *Journal of Research in Personality, 47*, 609-612.
- Schulenberg, J. E., Johnston, L. D., O'Malley, P. M., Bachman, J. G., Miech, R. A. & Patrick, M. E. (2018). Monitoring the Future national survey results on drug use, 1975–2017: Volume II, College students and adults ages 19–55. Ann Arbor: Institute for Social Research, The University of Michigan.
<http://monitoringthefuture.org/pubs.html#monographs>
- Sheldon, K. M., Elliot, A. J., Kim, Y., & Kasser, T. (2001). What is satisfying about satisfying events? Testing 10 candidate psychological needs. *Journal of Personality and Social Psychology, 80*, 325-339.
- Soderstrom, C. A., DiClemente, C. C., Dischinger, P. C., Hebel, J. R., McDuff, D. R., Auman, K. M., & Kufera, J. A. (2007). A controlled trial of brief intervention versus brief advice for at-risk drinking trauma center patients. *Journal of Trauma-Injury Infection and Critical Care, 62*, 1102-1112.
- Sutton, S. (2001). Back to the drawing board? A review of applications of the transtheoretical model to substance use. *Addiction, 96*, 175-186.
- Tanner-Smith, E. E., & Lipsey, M. W. (2015). Brief alcohol interventions for adolescents and young adults: A systematic review and meta-analysis. *Journal of Substance Abuse Treatment, 51*, 1-18.
- Teixeira, P. J., Carraça, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: a systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 9*, 78.

- Teixeira, P. J., Marques, M. M., Silva, M. N., Brunet, J., Duda, J., Haerens, L., La Guardia, J., Lindwall, M., Lonsdale, C., Markland, D., Michie, S., Moller, A. C., Ntoumanis, N., Patrick, H., Reeve, J., Ryan, R. M., Sebire, S., Standage, M., Vansteenkiste, M., Weinstein, N., Weman-Josefsson, K., Williams, G. C., & Hagger, M. S. (2020). Classification of techniques used in self-determination theory-based interventions in health contexts: An expert consensus study. *Motivation Science*. Advance online publication.
- Treloar, H. R., Martens, M. P., & McCarthy, D. M. (2014). Testing measurement invariance of the Protective Behavioral Strategies Scale in college men and women. *Psychological Assessment, 26*, 307-313.
- Treloar, H., Martens, M. P., & McCarthy, D. M. (2015). The Protective Behavioral Strategies Scale-20: Improved content validity of the Serious Harm Reduction subscale. *Psychological Assessment, 27*, 340-346.
- Vansteenkiste, M., Ryan, R. M., & Soenens, B. (2020). Basic psychological need theory: Advancements, critical themes, and future directions. *Motivation and Emotion, 44*, 1-31.
- Vansteenkiste, M., Sierens, E., Soenens, B., Luyckx, K., & Lens, W. (2009). Motivational profiles from a self-determination perspective: The quality of motivation matters. *Journal of Educational Psychology, 101*, 671-688.
- Venables, W. N., & Ripley, B. D. (2002). *Modern Applied Statistics with S* (4th ed.). Springer.
- Weinstein, N., Przybylski, A. K., & Ryan, R. M. (2012). The Index of Autonomous Functioning: Development of a scale of human autonomy. *Journal of Research in Personality, 46*, 397-413.

West, R. (2005). Time for a change: Putting the Transtheoretical (Stages of Change) Model to rest. *Addiction, 100*, 1036-1039.

Wormington, S. V., Anderson, K. G., & Corpus, J. H. (2011). The role of academic motivation in high school students' current and lifetime alcohol consumption: Adopting a self-determination theory perspective. *Journal of Studies on Alcohol and Drugs, 72*, 965-974.

Appendices

Appendix A: Socio-Demographic Questionnaire

Appendix B: Treatment Self-Regulation Questionnaire (TSRQ)

Appendix C: Basic Psychological Needs Satisfaction Scale (BPNSS)

Appendix D: Index of Autonomous Functioning (IAF)

Appendix E: Drinking Motive Questionnaire-Revised Short Form (DMQ-R SF)

Appendix F: University of Rhode Island Change Assessment Scale (URICA)

Appendix G: Protective Behavioral Strategies Scale-20 (PBSS-20)

Appendix H: Quantity-Frequency Index (QFI)

Appendix I: Brief-Young Adult Alcohol Consequences Questionnaire (B-YAACQ)

APPENDIX A: SOCIO-DEMOGRAPHIC QUESTIONNAIRE

1. How old are you?
2. What sex were you assigned at birth?
 - Male
 - Female
3. What is your student classification?
 - Freshman
 - Sophomore
 - Junior
 - Senior
4. What is your student status?
 - Part-time (1-11 credits)
 - Full-time (12+ credits)
5. Most recent semester's GPA? (write N/A if this does not apply to you):
6. Where are you living this semester?
 - Residence halls/Dorm room
 - Fraternity/Sorority house
 - Off-Campus housing/Apartment/House
7. Are you currently a Fraternity or Sorority Member?
 - Yes
 - No
8. Are you currently an athlete or represent the University in any sports competition?
 - Yes
 - No
9. What is your marital status?
 - Single (never married)
 - Engaged
 - Married
 - Divorced
 - Widow/Widower
 - Living with significant other
 - Separated
10. Please indicate which of the following categories best describes your race:
 - White
 - African American
 - Asian American
 - Native American/Alaskan Native
 - Native Hawaiian/other Pacific Islander
 - Other (please specify)
11. Are you Hispanic or Latinx?
 - Yes

- No
12. Please indicate the ethnic or national origin group to which you belong:
- Mexican National
 - Mexican American
 - Other Hispanic/Latin ethnic group (please specify)
 - Not applicable
13. What is your total annual household/family income from all sources?
- Less than \$15,000
 - Between \$15,000 and \$30,000
 - Between \$30,000 and \$50,000
 - More than \$50,000
14. What is the size of your household, including yourself (number of members)?
15. What is your work status?
- I do not work
 - Working part-time
 - Working full-time
16. What is your religious affiliation?
- Christian
 - Jewish
 - Hindu
 - Buddhist
 - Muslim/Islam
 - Agnostic
 - Atheist
 - Non-religious/secular
 - Other (please specify)

APPENDIX B: TREATMENT SELF-REGULATION QUESTIONNAIRE (TSRQ)

The following question relates to the reasons why you would control your use of alcohol. Different people have different reasons for doing that, and we want to know how true each of the following reasons is for you. All 15 response are to the one question:
Please indicate the extent to which each reason is true for you, using the following 7-point scale:

1 (not at all true) 2 3 4 (somewhat true) 5 6 7 (very true)

The reason I would use alcohol responsibly is:

1. Because I feel that I want to take responsibility for my own health.
2. Because I would feel guilty or ashamed of myself if I did not use alcohol responsibly.
3. Because I personally believe it is the best thing for my health.
4. *Because others would be upset with me if I did not.
5. I really don't think about it.
6. Because I have carefully thought about it and believe it is very important for many aspects of my life.
7. Because I would feel bad about myself if I did not use alcohol responsibly.
8. Because it is an important choice I really want to make.
9. Because I feel pressure from others to do so.
10. Because it is easier to do what I am told than think about it.
11. Because it is consistent with my life goals.
12. Because I want others to approve of me.
13. Because it is very important for being as healthy as possible.
14. Because I want others to see I can do it.
15. I don't really know why.

Note: *Eliminated in the revised 4-factor model.

APPENDIX C: BASIC PSYCHOLOGICAL NEEDS SATISFACTION SCALE (BPNSS)

Please read each of the following items carefully, thinking about how it relates to your life, and then indicate how true it is for you. Use the following scale to respond:

1 (not at all true) 2 3 4 (somewhat true) 5 6 7 (very true)

1. I feel like I am free to decide for myself how to live my life.
2. I really like the people I interact with.
3. Often, I do not feel very competent.
4. I feel pressured in my life.
5. People I know tell me I am good at what I do.
6. I get along with people I come into contact with.
7. I pretty much keep to myself and don't have a lot of social contacts.
8. I generally feel free to express my ideas and opinions.
9. I consider the people I regularly interact with to be my friends.
10. I have been able to learn interesting new skills recently.
11. In my daily life, I frequently have to do what I am told.
12. People in my life care about me.
13. Most days I feel a sense of accomplishment from what I do.
14. People I interact with on a daily basis tend to take my feelings into consideration.
15. In my life I do not get much of a chance to show how capable I am.
16. There are not many people that I am close to.
17. I feel like I can pretty much be myself in my daily situations.
18. The people I interact with regularly do not seem to like me much.
19. I often do not feel very capable.
20. There is not much opportunity for me to decide for myself how to do things in my daily life.
21. People are generally pretty friendly towards me.

APPENDIX D: INDEX OF AUTONOMOUS FUNCTIONING (IAF)

Below is a collection of statements about your general experiences. Please indicate how true each statement is of your experiences on the whole. Remember that there are no right or wrong answers. Please answer according to what really reflects your experience rather than what you think your experience should be.

Items are paired with a Likert-type scale with 1 = “not at all true”, 2 = “a bit true”, 3 = “somewhat true”, 4 = “mostly true”, and 5 = “completely true.”

1. My decisions represent my most important values and feelings.
2. I strongly identify with the things that I do.
3. My actions are congruent with who I really am.
4. My whole self stands behind the important decisions I make.
5. My decisions are steadily informed by things I want or care about.
6. I do things in order to avoid feeling badly about myself.
7. I do a lot of things to avoid feeling ashamed.
8. I try to manipulate myself into doing certain things.
9. I believe certain things so that others will like me.
10. I often pressure myself.
11. I often reflect on why I react the way I do.
12. I am deeply curious when I react with fear or anxiety to events in my life.
13. I am interested in understanding the reasons for my actions.
14. I am interested in why I act the way I do.
15. I like to investigate my feelings.

APPENDIX E: DRINKING MOTIVE QUESTIONNAIRE-REVISED SHORT FORM (DMQ-R SF)

Now you are going to read a list of reasons people sometimes give for drinking alcohol. Thinking of all the times you drink, how often would you say that you drink for each of the following reasons?

1 = almost never/never, 2 = some of the time, 3 = half of the time, 4 = most of the time, 5 = almost always/always

1. Because I like the feeling.
2. To get high.
3. Because it's fun.
4. Because it helps me enjoy a party.
5. Because it makes social gatherings more fun.
6. Because it improves parties and celebrations.
7. To fit in with a group I like.
8. To be liked.
9. So that I won't feel left out.
10. Because it helps when I feel depressed or nervous.
11. To cheer me up when I'm in a bad mood.
12. To forget about my problems.

APPENDIX F: UNIVERSITY OF RHODE ISLAND CHANGE ASSESSMENT SCALE (URICA)

Each statement below describes how a person might feel when approaching problems related to drinking in their lives. Please indicate how much you tend to agree or disagree with each statement. In each case, make your choice in terms of how you feel right now. Not what you have felt in the past or would like to feel.

There are five possible responses to each of these items:

1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree

Indicate the number that best describes how much you agree or disagree with each statement.

1. It doesn't make much sense for me to consider changing my drinking.
2. I've been thinking that I might want to change something about my drinking.
3. At times my drinking causes problems and I'm determined to change.
4. It is frustrating, but I feel I might be having a recurrence of a drinking problem I thought I had resolved.
5. Trying to change my drinking is pretty much a waste of time for me.
6. I guess I have faults, but there's nothing that I really need to change about my drinking.
7. I thought once I had resolved my problem drinking I would be free of it, but sometimes I still find myself struggling with it.
8. I may have a problem with drinking and I think I should work on it.
9. I am really working hard to change my drinking.
10. I hope that someone will have some good advice for me about my drinking.
11. Anyone can talk about changing the way they drinking; I'm actually going to do something about it.
12. After all I had done to try and change my problem drinking, every now and then it comes back to haunt me.

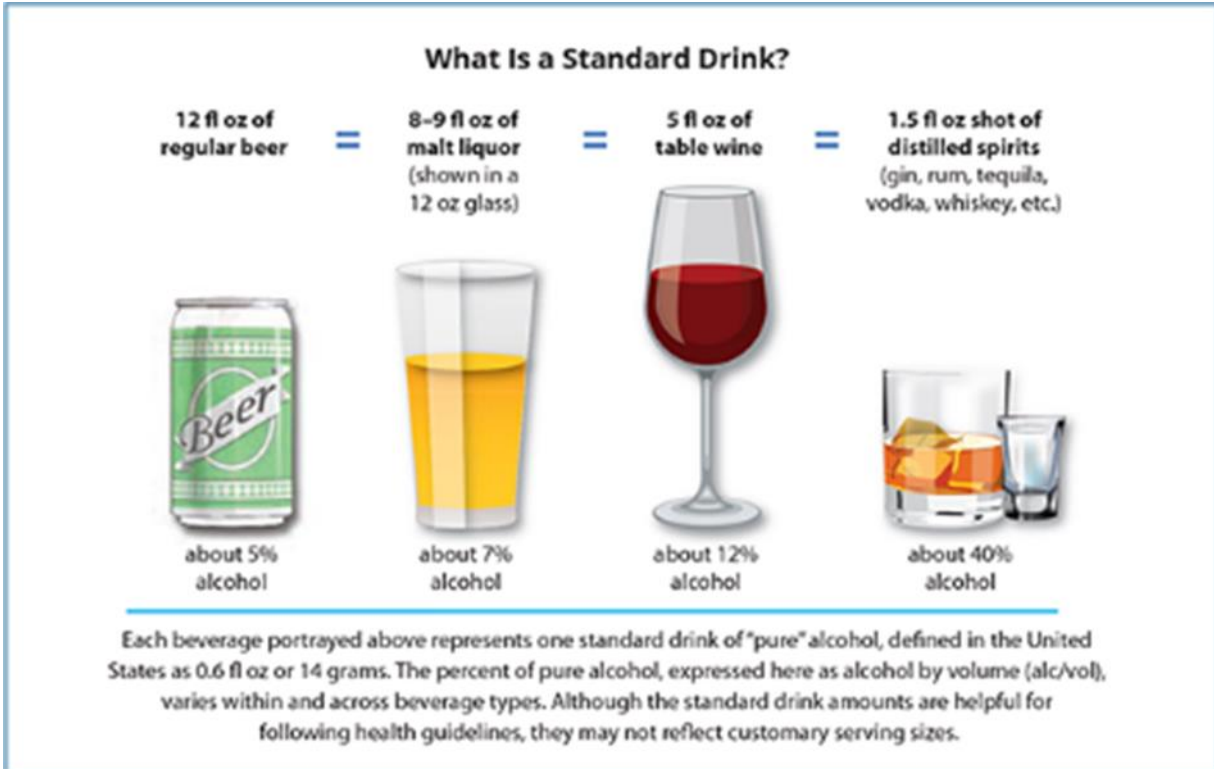
APPENDIX G: PROTECTIVE BEHAVIORAL STRATEGIES SCALE-20 (PBSS-20)

Please indicate the degree to which you engage in the following behaviors when using alcohol or “partying.”

Never (1), Rarely (2), Occasionally (3), Sometimes (4), Usually (5), Always (6)

1. Use a designated driver
2. Determine not to exceed a set number of drinks
3. Alternate alcoholic and nonalcoholic drinks
4. Have a friend let you know when you have had enough to drink
5. Avoid drinking games
6. Leave the bar/party at a predetermined time
7. Make sure that you go home with a friend
8. Know where your drink has been at all times
9. Stop drinking at a predetermined time
10. Drink water while drinking alcohol
11. Put extra ice in your drink
12. Avoid mixing different types of alcohol
13. Drink slowly, rather than gulp or chug
14. Avoid trying to “keep up” or “out-drink” others
15. Refuse to ride in a car with someone who has been drinking
16. Only go out with people you know and trust
17. Avoid combining alcohol with marijuana
18. Avoid “pre-gaming” (i.e., drinking before going out)
19. Make sure you drink with people who can take care of you if you drink too much
20. Eat before or during drinking

APPENDIX H: QUANTITY-FREQUENCY INDEX (QFI)



1. During the last 3 months, how often did you usually have any kind of drink containing alcohol? By a drink we mean half an ounce of absolute alcohol (e.g. a 12 ounce can or glass of beer or wine cooler, a 5 ounce glass of wine, or a drink containing 1 shot of liquor). Choose only one.
 - a) Every day
 - b) 5 to 6 times a week
 - c) 3 to 4 times a week
 - d) twice a week
 - e) once a week
 - f) 2 to 3 times a month
 - g) Once a month
 - h) Less than once a month
 - i) Once in the past three months
 - j) I did not drink any alcohol in the 3 months, but I did drink in the past.

- k) I never drank any alcohol in my life
2. During the last 3 months, how many drinks containing alcohol including beer, wine or liquor did you have on a typical day when you drank alcohol? Choose only one.
- a) 24 or more drinks
 - b) 19 to 23 drinks
 - c) 16 to 18 drinks
 - d) 12 to 15 drinks
 - e) 8 to 11 drinks
 - f) 6 to 7 drinks
 - g) 5 drinks
 - h) 4 drinks
 - i) 3 drinks
 - j) 2 drinks
 - k) 1 drink
3. During the last 3 months, what is the largest number of drinks containing alcohol that you drank within a 24-hour period? Choose only one.
- a) 36 drinks or more
 - b) 24 to 35 drinks
 - c) 18 to 23 drinks
 - d) 12 to 17 drinks
 - e) 8 to 11 drinks
 - f) 6 to 7 drinks
 - g) 5 drinks
 - h) 4 drinks
 - i) 3 drinks
 - j) 2 drinks
 - k) 1 drink

4. During the past 3 months, how often did you...

a. FOR MEN:

...have five or more drinks containing alcohol on the same occasion (i.e., at the same time or within a couple of hours of each other)?

[That would be the equivalent of at least:

- 5 12-ounce cans or bottles of beer,
- 5 five ounce glasses of wine,
- 5 drinks each containing one shot of liquor]

b. FOR WOMEN:

...have four or more drinks containing alcohol on the same occasion (i.e., at the same time or within a couple of hours of each other)?

[That would be the equivalent of at least:

- 4 12-ounce cans or bottles of beer
- 4 five ounce glasses of wine
- 4 drinks each containing one shot of liquor or spirits]

Choose only one:

- a) Every day
- b) 5 to 6 days a week
- c) 3 to 4 days a week
- d) two days a week
- e) one day a week
- f) 2 to 3 days a month
- g) One day a month
- h) Less than one day a month
- i) One day in the past three months
- j) None

APPENDIX I: BRIEF-YOUNG ADULT ALCOHOL CONSEQUENCES QUESTIONNAIRE (B-YAACQ)

Below is a list of things that sometimes happen to people either during, or after they have been drinking alcohol. Next to each item below, please select either the YES or NO choice to indicate whether that item describes something that has happened to you IN THE PAST THREE MONTHS.

In the past three months...

1. While drinking, I have said or done embarrassing things.
2. I have had a hangover (headache, sick stomach) the morning after I had been drinking.
3. I have felt very sick to my stomach or thrown up after drinking.
4. I often have ended up drinking on nights when I had planned not to drink.
5. I have taken foolish risks when I have been drinking.
6. I have passed out from drinking.
7. I have found that I needed larger amounts of alcohol to feel any effect, or that I could no longer get high or drunk on the amount that used to get me high or drunk.
8. When drinking, I have done impulsive things that I regretted later.
9. I've not been able to remember large stretches of time while drinking heavily.
10. I have driven a car when I knew I had too much to drink to drive safely.
11. I have not gone to work or missed classes at school because of drinking, a hangover, or illness caused by drinking.
12. My drinking has gotten me into sexual situations I later regretted.
13. I have often found it difficult to limit how much I drink.
14. I have become very rude, obnoxious or insulting after drinking.
15. I have woken up in an unexpected place after heavy drinking.
16. I have felt badly about myself because of my drinking.
17. I have had less energy or felt tired because of my drinking.
18. The quality of my work or schoolwork has suffered because of my drinking.
19. I have spent too much time drinking.
20. I have neglected my obligations to family, work, or school because of drinking.
21. My drinking has created problems between myself and my boyfriend/girlfriend/spouse, parents, or other near relatives.
22. I have been overweight because of drinking.
23. My physical appearance has been harmed by my drinking.
24. I have felt like I needed a drink after I'd gotten up (that is, before breakfast).

Vita

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Generally, his research interests are in the psychosocial factors that promote alcohol-related harm reduction behaviors. He is particularly interested in the application of self-determination theory to better understand motivations for alcohol-related protective behavioral strategies and changing one's drinking. He is a member of the Research Society on Alcoholism and Society of Addiction Psychology (APA Division 50) and regularly presents his work at the annual meetings of these organizations. He currently has 10 peer-reviewed publications in journals such as *Addictive Behaviors*, *Alcohol & Alcoholism*, *Drug and Alcohol Dependence*, and *Journal of American College Health*.

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