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Predictive Effects of Good Self-Control and Poor Regulation on Alcohol-Related Outcomes: Do Protective Behavioral Strategies Mediate?

Matthew R. Pearson*, Benjamin A. Kite, and James M. Henson

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Abstract

In the present study, we examined whether use of protective behavioral strategies mediated the relationship between self-control constructs and alcohol-related outcomes. According to the two-mode model of self-control, good self-control (planfulness; measured with Future Time Perspective, Problem Solving, and Self-Reinforcement) and poor regulation (impulsivity; measured with Present Time Perspective, Poor Delay of Gratification, Distractibility) are theorized to be relatively independent constructs rather than opposite ends of a single continuum. The analytic sample consisted of 278 college student drinkers (68% women) who responded to a battery of surveys at a single time point. Using a structural equation model based on the two-mode model of self-control, we found that good self-control predicted increased use of three types of protective behavioral strategies (Manner of Drinking, Limiting/Stopping Drinking, and Serious Harm Reduction). Poor regulation was unrelated to use of protective behavioral strategies, but had direct effects on alcohol use and alcohol problems. Further, protective behavioral strategies mediated the relationship between good self-control and alcohol use. The clinical implications of these findings are discussed.

Keywords

self-control; poor regulation; alcohol use; alcohol problems; college students

Researchers have documented that a large proportion of college students report engaging in heavy episodic drinking; it has been estimated that as many as 43% of college students have engaged in binge drinking at least once within the past month (defined as consuming five or more drinks on one occasion; Hingson, Heeren, Winter, & Wechsler, 2005). These extreme patterns of consumption lead to distressingly high levels of reported alcohol-related problems. For example, research has shown that approximately 71% of college student drinkers report experiencing at least one alcohol-related problem within the past 30 days (Neal, Corbin, & Fromme, 2006). Further, it is estimated that 600,000 students are injured while drinking per year and 1,800 college students die every year from alcohol-related incidents (e.g., traffic collision, drowning, falling, alcohol poisoning; Hingson, Zha, &

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Weitzman, 2009). Clearly, alcohol use and the associated problems on college campuses are a public health concern, and research is needed to ascertain ways to reduce the number of alcohol-related negative consequences.

Self-Control

Self-control (or self-regulation) can be defined as the ability of a person to focus and monitor their own behavior, understand the consequences of their behavior, and delay gratification (Baumeister & Vohs, 2003). Building from cybernetic theory, Carver and Scheier's control theory (1981, 1982) posits a negative feedback loop that involves comparison of one's current state to a standard or a goal state, modifying one's behavior to reach the goal, and reexamination of the discrepancy between the current state and the goal state, which repeats until the goal is reached. Applied directly to explain addictive behaviors, Miller and Brown (1991) developed a seven-step model of self-regulation with a similar feedback loop: 1) receiving relevant information, 2) evaluating the information and comparing it to norms, 3) triggering change, 4) searching for options, 5) formulating a plan, 6) implementing the plan, and 7) assessing the plan's effectiveness, which returns to step 1. These self-control models point to the complexity of self-regulation and the importance of not only one's personal standards/goals, but also self-monitoring of one's behavior.

Research has shown that deficits in general self-control capacity is an important antecedent to alcohol use/problems (Carey et al., 2004; Hustad, Carey, Carey, & Maisto, 2009; Neal & Carey, 2005, 2007). Rather than operationalizing self-control as a single construct with good self-control and poor regulation as opposite ends of a single spectrum, research supports good self-control and poor regulation as two related, but distinct constructs that should be assessed independently (Dvorak & Simons, 2009; Wills & Stoolmiller, 2002; Wills, Windle, & Cleary, 1998). Several studies using confirmatory factor analysis support the two-factor operationalization of self-control as having superior fit compared to a single factor model in samples of children (Wills & Stoolmiller, 2002), adolescents (Wills, Windle, & Cleary, 1998), and college students (Dvorak & Simons, 2009). Further, multiple studies have found that good self-control and poor regulation are only weakly to moderately correlated with correlations ranging from $-.13$ to $-.50$ (Dvorak & Simons, 2009; Wills, Anette, Mendoza, Gibbons, & Brody, 2007; Wills et al., 2001; Wills & Stoolmiller, 2002; Wills, Windle, & Cleary, 1998). Thus, theoretically, one could be high in both good self-control as well as poor regulation.

Across these studies, good self-control has been assessed as a latent variable with multiple combinations of indicator variables including future time perspective (Dvorak & Simons, 2009), problem solving (Dvorak & Simons, 2009; Wills, Anette, Mendoza, Gibbons, & Brody, 2007; Wills et al., 2001; Wills & Stoolmiller, 2002), cognitive effort (Dvorak & Simons, 2009), soothability (Wills et al., 2007; Wills et al., 2001; Wills & Stoolmiller, 2002; Wills et al., 1998), dependability (Wills et al., 2001; Wills & Stoolmiller, 2002; Wills et al., 1998), attentional control (Wills, Sandy, & Shinar, 2009), planfulness (Wills et al., 2007; Wills et al., 2001), delay of gratification (Wills et al., 2007), and positive self-reinforcement (Wills et al., 2007).

Similarly, poor regulation has been assessed as a latent variable with multiple combinations of measured variables including impatience (Wills et al., 2007; Wills et al., 2001; Wills & Stoolmiller, 2002; Wills et al., 1998), distractibility (Dvorak & Simons, 2009; Wills et al., 2007; Wills et al., 2001; Wills & Stoolmiller, 2002; Wills et al., 1998), angerability (Wills et al., 2001; Wills & Stoolmiller, 2002), poor delay of gratification (Dvorak & Simons, 2009), and impulsivity (Dvorak & Simons, 2009; Wills et al., 2007; Wills et al., 2001).

Few researchers have examined the two-factor model of self-control as a predictor of alcohol-related problems; however, some research supports these two self-control factors as predictors of substance use and related problems among adolescents (Wills, Ainette, Stoolmiller, Gibbons, & Shinar, 2008; Wills, Sandy, & Yaeger, 2002; Wills & Stoolmiller, 2002). Specifically, Wills et al., (2002) found a negative relationship between good self-control and substance use/related problems, whereas a positive relationship was found between poor regulation and substance use/related problems. Wills and Stoolmiller (2002) found that good self-control (soothability, dependability, planning, & problem solving) was negatively associated with substance use among sixth-graders, whereas poor regulation (impatience, distractibility, & angerability) was positively associated with substance use among sixth-graders and predicted increases in levels of substance use over the subsequent three years. Despite the predictive validity of the two-factor model of self-control for substance use among children and adolescents, this model has largely not been applied to the problem of college student drinking (see Dvorak & Simons, 2009, for an exception). The present research examines the predictive effect of good self-control and poor regulation on alcohol consumption and alcohol-related problems.

Given their proven predictive validity among children and adolescents, it is also of interest to characterize the psychological mechanism(s) by which these predictors relate to behavior. Although some researchers have examined the two self-control factors as mediators of more distal antecedents to substance use including temperament (Wills & Stoolmiller, 2002), religiosity (Walker, Ainette, Wills, & Mendoza, 2007), and parental support (Wills, Windle, & Cleary, 1998), little research has examined more proximal antecedents to explain the effect of self-control on substance-related outcomes.

Protective Behavioral Strategies

Protective behavioral strategies (or drinking control strategies) are behaviors used to limit alcohol consumption and/or reduce negative consequences from drinking (Martens, Pedersen, LaBrie, Ferrier, & Cimini, 2007). Examples of protective behavioral strategies include limiting the number of drinks consumed per hour, alternating alcoholic drinks with non-alcoholic drinks, and using a designated driver (Martens et al., 2005). Because protective behavioral strategies involve adjusting drinking behaviors to enjoy alcohol while minimizing negative consequences, they can be conceptualized of as a type of behavioral self-regulation specific to alcohol consumption.

Martens et al. (2005) identified three types of protective behavioral strategies: *Limiting/Stopping Drinking*, *Manner of Drinking*, and *Serious Harm Reduction*. Research has shown that all three types of protective behavioral strategies are related to alcohol use and alcohol-

related problems in similar ways. Several studies have found that use of protective behavioral strategies, or alcohol-specific self-regulation, is associated with reduced alcohol consumption and fewer alcohol-related problems in college samples (Araas, & Adams, 2008; LaBrie, Kenney, Lac, & Mirza, 2011; Martens et al., 2009; Martens et al., 2008; Martens et al., 2004; Patrick, Lee, & Larimer, 2011). These findings suggest that various types of protective behavioral strategies can potentially help college students minimize alcohol-related problems.

Previous research has demonstrated that use of protective behavioral strategies mediates the relationship among risk enhancing variables and alcohol-related outcomes. For example, use of protective behavioral strategies was found to mediate the relationship between conscientiousness and alcohol-related outcomes (Martens et al., 2009), depressive symptoms and alcohol-related consequences (Martens et al., 2008), and drinking motives and alcohol use (LaBrie, Lac, Kenney, & Mirza, 2011; Martens, Ferrier, & Cimini, 2007). In fact, one recent study examined whether protective behavioral strategies mediate the predictive effects of global self-regulation on alcohol-related problems (D’Lima, Pearson, & Kelley, in press). The authors reasoned that protective behavioral strategies can be thought of as an alcohol-specific form of behavioral self-regulation, suggesting that the effects of global self-regulation on alcohol outcomes may be mediated by this more proximal alcohol-specific form of self-regulation. They termed their mediation hypothesis the ‘self-control equals drinking control’ hypothesis, and they found that protective behavioral strategies partially mediated the relationship between global self-regulation and alcohol-related problems. However, no one has yet examined the two-factor model of self-control in conjunction with the multidimensional assessment of protective behavioral strategies.

Purpose

The purpose of the present study was to extend previous research using the two-factor model of self-control (Dvorak, & Simons, 2009; Wills, Ainette, Mendoza, Gibbons, & Brody, 2007; Wills & Stoolmiller, 2002) by examining a potential behavioral mediator of the predictive effects of good self-control and poor regulation on alcohol-related outcomes. Specifically, we used structural equation modeling to examine both the direct effects of good self-control and poor regulation on alcohol use and alcohol-related problems as well as the indirect effects (i.e., mediated effects) of these self-control constructs on alcohol-related outcomes via use of protective behavioral strategies. The conceptual model is depicted in Figure 1. Consistent with previous research (D’Lima, Pearson, & Kelley, in press), the ‘self-control equals drinking control’ hypothesis purports that use of alcohol-specific behavioral self-regulation (i.e., protective behavioral strategies) will mediate the relationship between self-control factors and alcohol-related outcomes.

Method

Participants and Procedure

Three hundred and ten undergraduate students were sampled from a large southeastern university and participated for course credit. The study description described that only participants who had consumed alcohol within the past 30 days were eligible for the present

study. There were 32 participants who reported not consuming alcohol at all during a typical week, and they were removed from all analyses; thus, the analytic sample consisted of 278 participants. Most of the participants were women (68.3%) and self-identified as Caucasian/White (65.2%); the rest self-identified as African American/Black (21.9%), Asian/Pacific Islander (3.6%), Latino/a (3.2%), Native American (.4%), and 4.7% choose the option of *other*. The sample consisted of 19.8% freshmen, 23.4% sophomores, 30.9% juniors, 24.8% seniors, and .7% graduate students. All participants read a notification statement prior to participating in the present study, and the study was approved by the Human Subjects Committee at the participating university.

Measures

Good self-control—Good self-control was assessed with items that have been used in previous research, and three factors comprised the operationalization of good self-control: future time perspective (7 items; Gonzales & Zimbardo, 1985), problem solving (8 items; Wills, 1986), and self-reinforcement (3 items; Heiby, 1983). We choose our factors with the intention of providing a comprehensive operationalization of good self-control that captures unique, but related aspects of this construct. For the future time perspective items, participants responded on a 5-point, Likert-type scale ranging from *Not At All True* to *Very True* (e.g., “I usually complete assignments on time”). The problem solving and self-reinforcement items were assessed on a 5-point Likert-type scale ranging from *Never to Usually* (problem solving: “I get as much information as I can;” self-reinforcement: “I think about things that I can do well”). The internal consistency of all multi-item scales exceeded .74 and are reported in Table 1.

Poor regulation—Poor regulation was also assessed using items that have been used in previous research, and three factors comprised the operationalization of poor regulation: present time perspective (7 items; Gonzales & Zimbardo, 1985), poor delay of gratification (8 items; Chen, Sheth, Elliott, & Yaeger, 2004), and distractibility (6 items; Kendall & Williams, 1982). As with good self-control, poor regulation factors were chosen in an attempt to provide the most comprehensive operationalization of the construct. Participants responded to items on a 5-point, Likert-type scale ranging from *Not At All True* to *Very True* (present time perspective: “I get irritated at people who keep me waiting;” poor delay of gratification: “I tend to spend my money as soon as I get it;” distractibility: “I am easily distracted from my school work”).

Protective behavioral strategies—Protective behavioral strategies were assessed using the Protective Behavioral Strategies Survey (PBSS; Martens et al., 2005). The PBSS is a 15-item questionnaire. This scale’s stemming question asks: “How often do you use the following drinking behavior?”, and it was scored on a five-point Likert-type scale ranging from *Never to Always*. As previously mentioned, the PBSS assesses three types of strategies: Limiting/Stopping Drinking (7 items; “Determining a set number of drinks”), Manner of Drinking (5 items; “Avoid drinking games”), and Serious Harm Reduction (3 items; “Use a designated driver”). Martens, Pederson, LaBrie, Ferrier, and Cimini (2007) supported the factor structure of the PBSS using confirmatory factor analysis, and Pearson, Kite, and Henson (in press) demonstrated that the PBSS had stronger concurrent validity

with alcohol problems measures compared to other measures of protective behavioral strategies.

Alcohol consumption—Alcohol consumption was measured using a widely used modified version of the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985). This questionnaire uses a seven-item (Monday through Sunday) grid to assess daily drinking quantities. This grid was used to assess the number of standard drinks for a typical drinking week within the past 30 days. The DDQ is very commonly used to quantify alcohol consumption among college students and has been found to be very strongly correlated with other alcohol use measures (e.g., time line followback; Collins, Koutsky, Morsheimer, & MacLean, 2001).

Alcohol-related problems—Alcohol-related problems were assessed using the 23-item Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) and the 23-item Brief-Young Adult Alcohol Consequences Questionnaire (B-YAACQ; Kahler, Strong, & Read, 2005). Both scales were scored using a checklist, the participants were asked to check a box for each problem that they had experienced within the past 90 days. Previous research has justified the scoring of alcohol-related problems measures dichotomously (Martens, Neighbors, Dams-O'Connor, Lee, & Larimer, 2007). The RAPI and the B-YAACQ are assessing the same construct; however, the B-YAACQ was designed for college students and contains more items about more common alcohol-related problems (most commonly endorsed items in the present study: “While drinking, I have said or done embarrassing things”, “I have had a hangover (headache, sick stomach) the morning after I had been drinking”, and “I have felt very sick to my stomach or thrown up after drinking”); whereas the RAPI was originally designed for adolescents and assesses the occurrence of more serious alcohol-related problems (most commonly endorsed items for present research: “Neglected your responsibilities”, “Got into fights, acted bad, or did mean things”, and “Missed a day (or part of a day) of school or work”). Using both scales provides a more comprehensive assessment of alcohol-related problems such that both more common (B-YAACQ) and more severe (RAPI) problems are assessed. Previous research using the PBSS with this data set has found differential prediction of problems depending on whether the RAPI or B-YAACQ was used (Pearson, Kite, & Henson, in press).

Statistical Analysis

Although not extreme, alcohol consumption and alcohol-related problems are often skewed, leading to at least minor violations to normality. Therefore, it is important to use a method that is robust to violations of normality (Erceg-Hurn & Mirosevich, 2008). Further, our primary research question concerns mediated effects, and traditional tests of mediation make the tenuous assumption that the indirect effect is normally distributed. As recommended by mediation experts (Fritz & MacKinnon, 2007; Preacher & Hayes, 2004; 2008), we tested for mediation using the bias-corrected bootstrap based on 5000 bootstrapped samples (Efron & Tibshirani, 1993). Whereas statistical tests based on normal theory require making distributional assumptions for the derivation of the standard error, this method creates empirically-derived sampling distributions from which statistical tests are based. Further, it

has been shown that this method is one of the most powerful tests of mediation (Fritz & MacKinnon, 2007).

Results

Descriptives

On average, our sample¹ consumed about ten standard drinks during the typical drinking week ($M = 9.98$, $Median = 8.00$, $SD = 8.45$, skewness = 1.64, kurtosis = 2.97). As we screened out participants who did not consume alcohol during a typical week in the previous 30 days, non-drinkers and very light drinkers were underrepresented. Whereas 43% of college students are estimated to engage in binge drinking in the past 30 days based on a large epidemiological survey (Hingson et al., 2005), the vast majority (81.9%) of participants in our sample reported binge drinking at least once in the past 30 days (five/four or more drinks on a single drinking occasion for men/women); in fact, on average, participants reported greater than four binge drinking occasions in the past 30 days ($M = 4.42$, $SD = 4.49$). Based on the RAPI, the average student experienced about 3 types of alcohol-related problems in the past 90 days ($M = 3.09$, $SD = 4.02$, skew = 1.60, kurtosis = 2.22), which is similar but slightly lower than the mean obtained in two large samples of college students ($Ms = 3.46, 3.48$; Martens, Neighbors, et al., 2007). Based on the B-YAACQ, the average student experienced nearly 5 types of alcohol-related problems ($M = 4.86$, $SD = 4.95$, skew = 1.18, kurtosis = 0.95), which is less than in the development sample in which only “regular drinkers” were included ($M = 9.26$; Kahler et al., 2005). Correlations and descriptive statistics for all study variables are reported in Table 1.

Structural Equation Model

All analyses were conducted using Mplus 6 (Muthén & Muthén, 1998–2010). Based on the conceptual model in Figure 1, we examined good self-control and poor regulation as predictors of all other variables; protective behavioral strategies were modeled as predictors of alcohol use and the two measures of alcohol-related problems; and alcohol use w alcohol problems. We hypothesized that protective behavioral strategies, or alcohol-specific measures of self-control, would be predicted by global self-control constructs and in turn, predict alcohol-related outcomes. In other words, we expected protective behavioral strategies to mediate these effects. First, we describe the significant direct effects, and then we describe the indirect, or mediating, effects.

Overall model fit—The overall model demonstrated acceptable fit according to standard fit indices, $\chi^2(32) = 89.36$, $p < .001$, CFI = .950, RMSEA = .080, SRMR = .037 (with gender controlled, $\chi^2(36) = 97.86$, $p < .001$, CFI = .948, RMSEA = .079, SRMR = .036). Based on Hu and Bentler (1999), the criteria for a well-fitting model was set to be CFI .95, RMSEA .06, and SRMR .08. Other researchers have suggested less stringent criteria for ‘acceptable fit’: CFI .90, RMSEA .10, and SRMR .10 (Kline, 2005). Based on these criteria, all fit indices indicate at least ‘acceptable’ model fit.

¹Using this dataset, the authors have also compared three measures of protective behavioral strategies and found that the PBSS was superior based on theorized factor structure and predictive validity (Pearson, Kite, & Henson, in press).

Direct effects—All significant direct effects are illustrated in Figure 2. Good self-control was positively related to all three types of protective behavioral strategies, whereas poor regulation was not significantly related to any of the three protective behavioral strategies. Good self-control did not have any significant direct effects on alcohol-related outcomes after controlling for protective behavioral strategies and poor regulation. In contrast, poor regulation did not predict protective behavioral strategies after controlling for good self-control, but had significant positive relationships with alcohol use and alcohol-problems as assessed by the RAPI beyond what was explained by protective behavioral strategies. Of the three types of protective behavioral strategies, Manner of Drinking and Limiting/Stopping Drinking were significant independent predictors of decreased alcohol consumption. Further, Manner of Drinking also had a negative direct effect on alcohol-related problems as assessed by the B-YAACQ after controlling for consumption. Serious Harm Reduction was unrelated to both alcohol consumption and problems after controlling for the other two types of behavioral strategies. Finally, alcohol use strongly predicted both measures of alcohol-related problems.

Indirect effects—All total, direct, and indirect effects of self-control constructs on outcomes are shown in Table 2. We found that only good self-control had a significant indirect effect on alcohol consumption through protective behavioral strategies (specifically, Manner of Drinking and Limiting/Stopping Drinking). There were also a few ‘marginal’ indirect effects of good self-control on alcohol problems. Specifically, the double mediated effect of good self-control on alcohol-related problems through Manner of Drinking protective behavioral strategies and alcohol consumption was ‘marginally’ significant ($p < .10$) for both problems as assessed by the B-YAACQ and the RAPI; the double mediated path through Limiting/Stopping Drinking and alcohol consumption was ‘marginal’ for problems as assessed by the B-YAACQ. The single mediated effect of good self-control on alcohol problems as assessed by the B-YAACQ through Manner of Drinking protective behavioral strategies was also ‘marginally’ significant.

For poor regulation, we found that there were no indirect effects through protective behavioral strategies; however, poor regulation did have rather strong total effects on both measures of alcohol-related problems. These relationships were partially mediated by their relationship to alcohol consumption. For problems assessed by the RAPI, the indirect effect of poor regulation on alcohol problems via increased alcohol use accounted for about 24% of the total effect, and there was still a significant direct effect of poor regulation on alcohol problems that could not be explained by its relationship to alcohol use. For problems assessed by the B-YAACQ, the indirect effect of poor regulation on alcohol problems via increased alcohol use accounted for about 42% of the total effect, which reduced the direct effect to a ‘marginally significant’ trend ($p = .098$). Although this could technically be described as ‘full mediation’ (Baron & Kenny, 1986), given the strength of the direct effect relative to the total effect, we consider the relationships between poor regulation and both alcohol problems measures as evidence for partial mediation.

Discussion

The present study extended previous research examining the relationship between self-regulation and alcohol-related outcomes via protective behavioral strategies. Specifically, we examined the two-factor model of self-control (Dvorak & Simons, 2009; Wills, Ainette, Mendoza, Gibbons, & Brody, 2007; Wills et al., 2001; Wills & Stoolmiller, 2002; Wills, Windle, & Cleary, 1998) rather than a single factor (D'Lima, Pearson, & Kelley, in press) as a means to understand how self-control relates to alcohol-related outcomes among college drinkers. We also modeled three types of protective behavioral strategies as potential mediators of the predictive effects of the self-control constructs on alcohol-related outcomes using a well-validated scale (Martens et al., 2005; Martens, Pederson, LaBrie, Ferrier, & Cimini, 2007; Pearson, Kite, & Henson, in press).

Generally, our results support the idea that protective behavioral strategies mediate the predictive effects of good self-control on alcohol-related outcomes. Individuals with a higher capability and/or tendency to plan ahead and proactively work to solve problems are more likely to use protective behavioral strategies, which in turn minimizes their risk for drinking to excess or experiencing negative alcohol-related consequences. Therefore, the previously identified relationship of 'self-control equals drinking control' can be refined to fit within the two-mode model of self-control: 'good self-control equals drinking control.'

For poor regulation, our results do not support a similar mediated path to explain its positive relationship to alcohol use and alcohol-related problems after controlling for good self-control. In fact, even the relationship between poor regulation and alcohol-related problems was only partially mediated by alcohol consumption. Therefore, the relationship between poor regulation and alcohol-related problems could not be fully explained by its association with increased alcohol consumption, and was not even partially explained by its relationship to protective behavioral strategies. Therefore, individuals with a low ability to delay gratification and control impulses are at risk of experiencing negative alcohol-related consequences even after controlling for consumption; however, it does not appear that this impulsiveness necessarily leads to an underutilization of protective behavioral strategies. Given the unique pattern of results, this study supports distinguishing between good self-control and poor regulation in order to ascertain how self-regulation relates to alcohol-related outcomes.

Another finding from the present study is that the pattern of relationships between both self-control constructs and protective behavioral strategies with alcohol-related problems depended on the measure of alcohol-related consequences. Specifically, poor regulation had a direct effect on the more severe alcohol-related problems assessed by the RAPI, but did not have a significant direct effect on more common alcohol-related problems assessed by the B-YAACQ. Manner of Drinking protective behavioral strategies had a direct effect on the more common alcohol-related problems assessed by the B-YAACQ, but not more severe problems assessed by the RAPI. Therefore, having poor regulation abilities seems to increase one's proneness to experience more severe alcohol-related problems, whereas using Manner of Drinking protective behavioral strategies seem to protect individuals from experiencing

more common alcohol-related problems. These divergent findings demonstrate the importance of assessing alcohol-related problems comprehensively.

Clinical Implications

The predictive effect of good self-control on alcohol-related outcomes could be explained by its relationship to alcohol-specific behavioral self-regulation, or use of protective behavioral strategies. In other words, individuals low in good self-control were likely to underutilize these strategies, and in turn, experience more negative alcohol-related consequences. Self-control theories (Carver & Scheier, 1981, 1982; Miller & Brown, 1991) emphasize that self-regulation depends on the standards or goals of the individual, their ability to effectively self-monitor, and their ability to adjust their current behavior to meet the goal state. The present study is unable to explicate the precise mechanism through which good self-control relates to use of protective behavioral strategies. This relationship could reflect different standards or goals of individuals with low good self-control. For example, compared to individuals with higher planfulness, individuals with low planfulness may differ in their motivation to avoid negative consequences, their assessment of the negativity of these consequences, their awareness of protective behavioral strategies, or their beliefs that protective behavioral strategies can protect against negative consequences. Alternatively, individuals with low good self-control may be less able to successfully monitor their drinking and implement the use of protective behavioral strategies. It is important to identify which of these mechanisms account for these relationships because it has important implications for the development of successful interventions.

A sizeable literature on the efficacy of individual-focused interventions for reducing alcohol consumption among college students suggests that motivational interviewing may be one of the most effective ways of modifying one's drinking standards or drinking goals (Carey, Scott-Sheldon, Carey, & DeMartini, 2007; Larimer & Cronce, 2007). Therefore, if individuals with low good self-control are not motivated to drink responsibly, motivational interviewing may be particularly effective for reducing their negative alcohol-related consequences. Not incidentally, brief motivational interventions often contain a skills training component in which students are given information and encouraged to use protective behavioral strategies in order to avoid negative consequences of alcohol consumption. We believe it is reasonable that the relationship between good self-control and alcohol-related outcomes can at least in part be attributed to either different motivations in controlling or regulating alcohol consumption and/or a lack of awareness of protective behavioral strategies. It is important to note that if individuals with low good self-control simply lack awareness of protective behavioral strategies, a simple skills training intervention may be warranted.

If individuals with low good self-control are unable to successfully monitor their drinking and unable to implement protective behavioral strategies to reduce negative consequences while drinking, self-control training may be required to reduce their negative alcohol-related consequences (Walters, 2000). If individuals low in planfulness lack both the motivation and the ability to regulate their drinking, then perhaps a combined treatment with both motivational interviewing and self-control training would be warranted.

Although the relationship between good self-control and alcohol-related outcomes was accounted for by use of protective behavioral strategies, the direct effect of poor regulation on alcohol-related problems could not be accounted for by alcohol use or use of protective behavioral strategies. From a harm reduction perspective, it is important to identify why poor regulation predisposes individuals to experience more alcohol-related problems. Identifying proximal mediators of more distal antecedents to alcohol-related problems provides an opportunity to design interventions that may buffer against the risk associated with such vulnerability factors. Unfortunately, the present study simply rules out protective behavioral strategies as a primary mechanism through which poor regulation relates to alcohol-related problems.

Limitations

It is important to consider some of the limitations to the present study. First, all measures were self-reported and collected at a single time point. The cross-sectional nature of the data precludes strong causal conclusions. Certainly, future longitudinal research and intervention studies will provide more definitive tests of how self-control constructs related to alcohol-related outcomes. Second, our sample size was modest. Given that a number of the mediated effects were ‘marginal,’ a larger sample size would allow for more powerful tests of mediation. Third, although fit indices showed that our model fit was ‘acceptable,’ it could use significant improvement as it failed to meet some criteria for a ‘good’ fitting model (Hu & Bentler, 1999). Fourth, the time window of our alcohol use measure was the previous 30 days, and the time window for the alcohol problems measures was the previous 90 days; future research should attempt to use validated measures of both alcohol use and problems that use the same time window. Fifth, the present study used a convenient sample from a psychology department participant pool. Given the demographics of the participant pool, women were overrepresented. Therefore, one must be careful when generalizing the present study’s findings to other populations. Finally, based on models of self-regulation (Carver & Scheier, 1981, 1982; Miller & Brown, 1991), there are several steps involved in successful behavioral self-regulation. Although examining self-control from a two-factor model may be an improvement from a single factor model, future research is needed determine at which step individuals tend to fail to regulate their alcohol consumption so that interventions can be developed with sufficient specificity.

Conclusion

The present study has taken a step towards better understanding the interrelationship between self-control, protective behavioral strategies, and alcohol-related outcomes. Consistent with previous research (Martens et al., 2005; Martens et al., 2008; Martens et al., 2004), protective behavioral strategies were negatively associated with alcohol-related problems. Whereas the relationship between good self-control and alcohol-related outcomes was mediated by use of protective behavioral strategies, poor regulation had a direct effect on alcohol use and alcohol-related problems. In the future, researchers should attempt to ascertain what mechanism mediates the relationship between poor regulation and alcohol-related problems.

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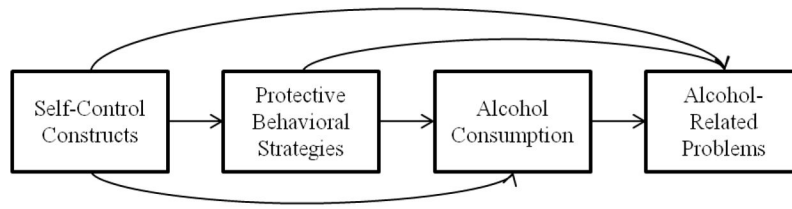


Figure 1. Depicts the conceptual model of relationships between self-control constructs, protective behavioral strategies, alcohol use, and alcohol-related negative consequences.

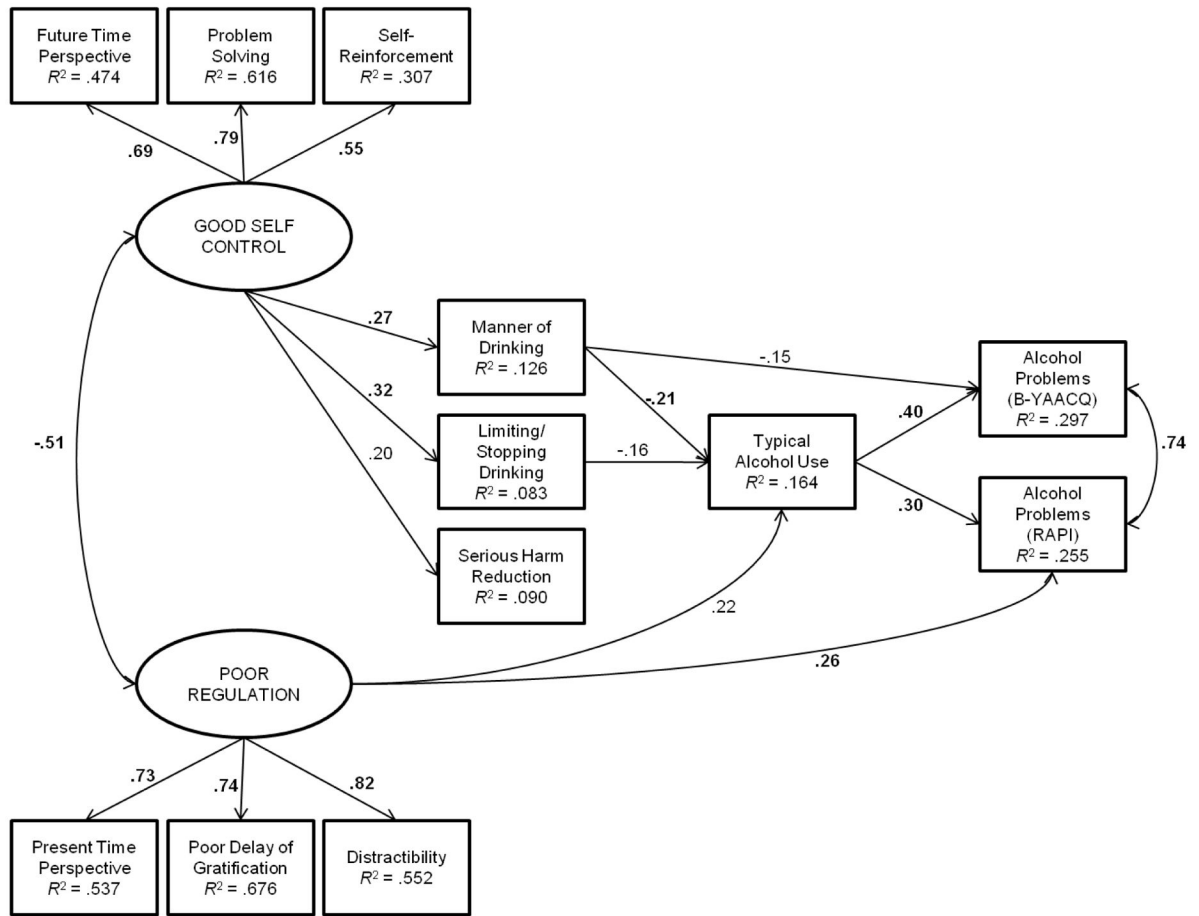


Figure 2.

The observed model shows only the significant relationships between the self-control factors, protective behavioral strategies, alcohol use, and alcohol-related negative consequences. Effects significant at $p < .01$ are bolded; all other effects are significant at $p < .05$. Correlations between the three protective behavioral strategies are not included in the depicted model for parsimony (Manner of Drinking with Limiting/Stopping Drinking, $r = .55$, with Serious Harm Reduction, $r = .18$; Limiting/Stopping Drinking with Serious Harm Reduction, $r = .16$).

Table 1

Correlations among all study variables

	1	2	3	4	5	6	7	8	9	10	11	12	M	SD	Range*
1. Future Time Perspective	.80												3.49	0.76	1.7–5.0
2. Problem Solving	.53	<i>.92</i>											3.84	0.75	1.0–5.0
3. Self-Reinforcement	.34	.48	<i>.84</i>										3.84	0.88	1.0–5.0
4. Present Time Perspective	-.21	-.31	<i>-.15</i>	<i>.76</i>									2.28	0.72	1.0–4.3
5. Distractibility	-.42	-.26	-.25	.54	<i>.82</i>								2.56	0.80	1.0–4.5
6. Poor Delay of Gratification	-.31	-.33	-.16	.61	.61	<i>.82</i>							2.53	0.77	1.1–4.6
7. Limiting/Stopping Drinking	.28	.17	<i>.13</i>	<i>.01</i>	<i>-.09</i>	<i>-.10</i>	<i>.85</i>						2.74	0.86	1.0–5.0
8. Manner of Drinking	.25	.24	.22	-.18	-.22	-.22	.58	<i>.74</i>					3.04	0.78	1.0–5.0
9. Serious Harm Reduction	.20	.21	<i>.13</i>	-.29	<i>-.09</i>	-.20	.21	.27	<i>.78</i>				4.15	0.83	1.7–5.0
10. Typical Quantity of Alcohol Use	<i>-.15</i>	<i>-.14</i>	<i>-.07</i>	.16	.18	.25	-.28	-.34	<i>-.10</i>	<i>---</i>			9.98	8.45	1–43
11. Alcohol Problems-RAPI	-.23	-.16	<i>-.13</i>	.22	.31	.34	-.18	-.25	-.21	.40	<i>.88</i>		3.09	4.02	0–20
12. Alcohol Problems-B-YAACQ	-.23	<i>-.11</i>	<i>-.10</i>	<i>.12</i>	.24	.30	-.23	-.33	<i>-.10</i>	.50	.79	<i>.90</i>	4.86	4.94	0–23
13. Gender (0=female, 1=male)	<i>-.14</i>	<i>-.03</i>	<i>-.05</i>	<i>.14</i>	<i>.06</i>	<i>.06</i>	-.19	<i>-.10</i>	-.24	.21	<i>.01</i>	<i>-.04</i>	0.32	0.47	0–1

Note. N = 278. Significant effects are bolded ($p < .01$) or italicized ($p < .05$) for emphasis. The underlined values on the diagonal reflect Cronbach's alphas for multi-item inventories. RAPI = Rutgers Alcohol Problem Index; B-YAACQ = Brief Young Adult Alcohol Consequences Questionnaire.

* Reflects the actual minimum and maximum value for each variable.

Table 2
Total, Direct, and Indirect Effects of Good Self-Control and Poor Regulation on Alcohol-Related Outcomes

Dependent Variable:	Alcohol Use			B-YAACQ			RAPI		
	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>	
Independent Variable: Good Self-control									
Total Effect	-.068	.474	-.074	.426	-.068	.450			
Total Indirect	-.101	.009	-.068	.166	-.057	.163			
Direct Effect	.033	.724	-.006	.951	-.011	.911			
Specific Indirect Effects									
Limiting/Stopping Drinking (LSD)	<i>.052</i>	<i>.080</i>	-.004	.859	-.007	.757			
Manner of Drinking (MoD)	<i>-.056</i>	<i>.055</i>	<i>-.040</i>	<i>.059</i>	-.011	.544			
Serious Harm Reduction (SHR)	<i>.007</i>	<i>.676</i>	<i>.004</i>	<i>.760</i>	-.019	.284			
Alcohol Use (AU)	---	---	.013	.729	.010	.732			
LSD→AU	---	---	<i>-.021</i>	<i>.097</i>	-.015	.114			
MoD→AU	---	---	<i>-.023</i>	<i>.068</i>	<i>-.017</i>	<i>.087</i>			
SHR→AU	---	---	.003	.682	.002	.689			
Dependent Variable:									
Independent Variable: Poor Regulation									
Total Effect	.228	.010	.259	.002	.348	.000			
Total Indirect	.010	.772	.108	.028	.085	.030			
Direct Effect	.218	.019	<i>.152</i>	<i>.094</i>	.264	.003			
Specific Indirect Effects									
Limiting/Stopping Drinking (LSD)	-.012	.472	-.001	.906	-.002	.840			
Manner of Drinking (MoD)	.027	.185	.020	.251	.005	.642			
Serious Harm Reduction (SHR)	-.005	.702	-.003	.775	.014	.273			
Alcohol Use (AU)	---	---	.088	.032	.065	.046			
LSD→AU	---	---	-.005	.487	-.004	.492			
MoD→AU	---	---	.011	.209	.008	.215			
SHR→AU	---	---	-.002	.709	-.001	.716			

Note. All parameter estimates and significance test are based on 1000 bootstrapped samples. Significant effects ($p < .05$) are bolded, and 'marginal' effects ($p < .10$) are italicized for emphasis. RAPI = Rutgers Alcohol Problem Index, B-YAACQ = Brief Young Adult Alcohol Consequences Questionnaire.