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The effect of self-control on drinking outcomes is mediated by automatic appetitive responses to alcohol

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ABSTRACT

While trait self-control has typically been conceptualized as the ability to successfully inhibit responses to temptation, recent research has suggested that those who report higher levels of self-control may also experience less responsivity to tempting cues. To explore the question of whether the association between trait self-control and alcohol use among drinkers may be a function of weakened appetitive responses to alcohol cues, we utilized an alcohol-specific Implicit Association Task. One hundred twenty-two undergraduate drinkers completed the Brief Self-Control Scale, the alcohol-approach Implicit Association Test, and the Daily Drinking Questionnaire. Hierarchical regression analyses were conducted to examine the direct and indirect effects (through automatic appetitive responses to alcohol) of self-control on drinking outcomes, controlling for gender. Consistent with the hypothesis, automatic alcohol associations were found to partially mediate the relationship between trait self-control and both per-occasion alcohol use and the frequency of heavy drinking episodes. These results support the idea that those who exhibit high levels of trait self-control may drink less, in part, because they experience weaker automatic alcohol-approach associations in response to alcohol-related cues.

1. Introduction

In research on dual-process models of behavior (e.g., Deutsch & Strack, 2006; Evans & Coventry, 2006; Wiers et al., 2007), trait self-control is often conceptualized as effortful behavioral restraint (Duckworth & Kern, 2011; Maloney, Grawitch, & Barber, 2012; Tangney, Baumeister, & Boone, 2004), such that individuals with higher levels of self-control are seen as better able to inhibit or restrain short-term impulsive responses to tempting cues in the service of achieving personally important longer-term goals (losing weight, saving money, etc.) (e.g., Baumeister & Heatherton, 1996; Gillebaart & de Ridder, 2015). A number of studies in the alcohol literature have shown that greater trait self-control, a construct frequently measured by the Brief Self-Control Scale (BSCS) (Tangney et al., 2004), is associated with better alcohol-related outcomes, including reduced alcohol consumption, fewer instances of heavy drinking episodes (HDEs) (four or more drinks during a single drinking session for women, or five or more for men; Wechsler et al., 2002), and fewer alcohol-related consequences (de Ridder, de Boer, Lugtig, Bakker, & van Hooft, 2011; Quinn & Fromme, 2010). Lower self-control is associated with more frequent alcohol use, more intense use, and use in situations that may place the individual at risk for negative consequences.

In most dual-process models of alcohol use, self-control and automatic responses to alcohol cues are treated as separate processes that interact to influence drinking behavior (Burton, Pedersen, & McCarthy, 2012; Duckworth & Kern, 2011; Lindgren, Neighbors, Westgate, & Salemink, 2014; Tangney et al., 2004). Despite the value of dual-process models for predicting how and when individuals may be likely to engage in hazardous drinking (Christiansen, Cole, Goudie, & Field, 2012; Houben & Wiers, 2009), there is a growing recognition that trait self-control and automatic responsiveness to cues may not be independent processes. Several authors have suggested that trait self-control, especially as assessed by the BSCS, may be better understood as a multifaceted construct that includes the capacity for restraint as well as the tendency to experience temping cues with diminished intensity (e.g., de Ridder et al., 2011; Hofmann, Friese, & Strack, 2009; Maloney et al., 2012). In this vein, an emerging literature on "effortless" self-control proposes that individuals who successfully resist temptation may experience goal-incongruent stimuli as less-tempting than those who are unable to moderate their behavior (Fujita, 2011; Gillebaart & de Ridder, 2015; Haynes, Kemps, & Moffitt, 2016).

Haynes et al. (2016), for example, found that self-reported desire strength mediated the relationship between self-control and snack consumption in a group of female dieters, so that those with greater self-control (as assessed by the 36-item version of the Self-Control Scale [Tangney et al., 2004] and the inhibitory and initiatory subscales of the

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BSCS [de Ridder et al., 2011]) consumed fewer snacks than those with lower levels of self-control because they felt less temptation to eat when exposed to unhealthy stimuli. Similarly, and across multiple participant-selected behavioral domains, Milyavskaya and Inzlicht (2017) found that goal attainment in those with greater self-control was facilitated by decreased reactivity to goal-incongruent temptation rather than by effortful attempts to ignore stimuli perceived to be especially attractive. These results provide initial evidence that successfully exercising self-control may not always involve the conscious and effortful capacity to override responses to tempting cues (e.g., Baumeister & Heatherton, 1996; de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012), but may, in part, result from the reduced strength of automatic reactions to tempting stimuli.

While this initial evidence suggests that weaker responsivity may play a role in the link between trait self-control and responses to tempting cues, this model has not been directly examined as a potential mechanism to explain individual variability in alcohol use. Drinkers with greater self-control may consume less alcohol not only due to a greater capacity to override impulsive behavior (i.e., restraint ability), but also because they are less-tempted by consumption-related impulses after exposure to the sight, smell, or idea of alcohol. To investigate this question, the current study examined whether the relation between BSCS-assessed trait self-control and drinking outcomes is mediated, in part, by automatic appetitive responses to alcohol cues measured by an alcohol-specific Implicit Association Task (IAT) (Palfai & Ostafin, 2003). It was hypothesized that drinkers with higher levels of self-control would report less alcohol consumed per occasion and less frequent HDEs as compared to those with lower self-control, and that these associations would be partially mediated by lower IAT scores as indicated by significant indirect effects.

2. Methods

2.1. Participants

Participants were 122 undergraduate student drinkers in an introductory psychology course at a large urban university in the northeastern United States. Classification as a "student drinker" required having consumed at least one alcohol-containing drink during the month prior to enrollment in the study. All participants were awarded course research credit for their participation in the study. The sample included 73 female (59.8%) and 49 male (40.2%) students with an average age of 19.2 years (SD = 1.1). Reported race was 64.8% white, 20.5% Asian/Pacific Islander, and 1% Black, with 5.7% identifying as Hispanic. Participants reported consuming an average of 2.57 drinks per drinking occasion (SD = 1.28) and engaging in an average of 2.71 (SD = 2.85) HDEs during the 30 days prior to enrollment in the study.

2.2. Measures

Participants completed a modified version of the Daily Drinking Questionnaire (DDQ) (Collins, Parks, & Marlatt, 1985) to assess average per-occasion drinking and the frequency of HDEs during the past 30 days. Participants were instructed to report their consumption in terms of standard drinks, which in the United States contain approximately 14 g of alcohol (Kalinowski & Humphreys, 2016). Self-control was measured by the BSCS, a 13-item self-report questionnaire that has been validated in student populations (Tangney et al., 2004) and used extensively in the self-control research literature (de Ridder et al., 2012). Finally, the strength of automatic appetitive responses to alcohol cues was assessed by an alcohol-specific version of the IAT (Greenwald, McGhee, & Schwartz, 1998), a computerized categorization task that uses reaction times to quantify individual variation in the relatedness of different concepts. The alcohol-approach IAT (Palfai & Ostafin, 2003) evaluates the degree to which participants associate the concept of alcohol with appetitive or inhibitory motivations by comparing the time required to sort alcohol and neutral images into target categories of "approach" and "avoid". Several studies have found the alcohol-approach IAT to predict hazardous drinking in college student samples (e.g., Lindgren et al., 2013; Ostafin & Palfai, 2006). The task has been described in detail elsewhere (see Palfai & Ostafin, 2003); briefly, in this study, participants completed 60 practice trials in three blocks and 80 scored categorization trials in four blocks in which the beverage images and approach/avoid words were either congruent (the association of alcohol images with approach words) or incongruent (the association of alcohol images with avoid words). IAT scores were computed using the D3 scoring technique (Greenwald, Nosek, & Banaji, 2003), and an IAT alcohol-approach score was calculated by subtracting the average reaction time in the congruent condition from the average reaction time in the incongruent condition, so that a positive difference indicated greater implicit alcohol-approach associations.

2.3. Procedures

The study procedures were approved by the university's Institutional Review Board and were in accord with the precepts of the Declaration of Helsinki. Participants completed the IAT and then a series of questionnaires that included the DDQ and the BSCS. Since the IAT was used to measure individual differences in automatic alcohol-approach associations as a mediator, all participants received the task in the same order (congruent-incongruent) to ensure that participant responses would be directly comparable (Perugini, 2005).

2.4. Statistical analyses

Regression analyses were used to determine whether scores on the BSCS predicted the two drinking-related outcomes of interest (quantity of per-occasion alcohol consumption and monthly frequency of HDEs). Mediational analyses were conducted using the PROCESS macro for SPSS (Hayes, 2013) which estimated the direct effects of trait self-control on per-occasion drinking and heavy episodic drinking and the indirect effects of trait self-control through automatic appetitive responses to alcohol cues as assessed by IAT scores. The impact of univariate outliers in the data was reduced by replacing those outliers with the value of the next-lowest score and then adding one additional unit to that value (Tabachnick & Fidell, 1996). Gender was included as a covariate in all analyses.

3. Results

As expected, trait self-control was a significant predictor of drinking outcomes when controlling for gender. Participants who endorsed more self-control on the BSCS reported (1) less per-occasion drinking, $b = -0.035$, $t(119) = -2.846$, $p = 0.005$, and (2) fewer HDEs, $b = -0.102$, $t(119) = -3.548$, $p = 0.001$, than those with lower self-control. These findings accord with previously published research on the relationship between trait self-control and drinking outcomes (de Ridder et al., 2011; Quinn & Fromme, 2010). Fig. 1 includes the unstandardized path coefficients for the regression analyses for both outcome variables.

Fig. 1 also displays the results of the mediational analyses for each outcome variable through the presentation of unstandardized path coefficients for each model. As hypothesized, both the direct effect of self-control on drinking outcomes and the indirect effect of self-control through automatic alcohol associations were significant, indicating that IAT alcohol-approach scores were partial mediators of both relationships. The point estimate of the indirect effect of automatic appetitive responses on average per-occasion drinking was −0.0099 (95% corrected and accelerated bootstrapping confidence interval: −0.0192, −0.0030) and the point estimate of the indirect effect of automatic appetitive responses on the monthly frequency of HDEs was −0.017 (95% corrected and accelerated bootstrapping confidence interval: