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Short communication

Predicting dyscontrolled drinking with implicit and explicit measures of alcohol attitude

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ABSTRACT

Background: A defining feature of alcohol addiction is dyscontrol – drinking despite intentions to restrain use. Given that dyscontrolled drinking involves an automatic (nonvolitional) element and that implicit measures are designed to assess automatic processes, it follows that implicit measures may be particularly useful for predicting dyscontrolled alcohol use. Although there is accumulating evidence for the benefit of using implicit measures to predict nonvolitional behaviors, relatively little research has examined such predictive validity for alcohol dyscontrol. The current study was designed to examine whether an implicit measure of alcohol attitude would predict variance of dyscontrol above that explained by typical drinking behavior and an explicit measure of alcohol attitude.
Methods: A sample of 62 undergraduate students completed implicit and explicit measures of alcohol-positive (relative to alcohol-negative) valence associations and retrospective self-report measures of typical drinking behavior and difficulty in controlling alcohol consumption.
Results: Both the implicit and explicit measures predicted alcohol dyscontrol. The implicit measure continued to predict dyscontrol when controlling for the explicit measure and typical drinking behavior.
Conclusions: These findings indicate that assessing the automaticity of alcohol-positive associations may be beneficial for predicting clinically relevant behaviors such as post-treatment outcome.
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1. Introduction

A defining feature of alcohol addiction is the difficulty of controlling use despite intentions to restrain (Widiger and Smith, 1994). The centrality of dyscontrol in addiction is demonstrated in the DSM-5 criteria for substance use disorders (American Psychiatric Association, 2013). These criteria include items that specifically assess dyscontrol (e.g., using more than intended or despite intentions to limit use), situations in which dyscontrol is likely to be occurring (e.g., use despite the presence of substance-related negative consequences), and behavioral concomitants of dyscontrol (e.g., giving up important activities due to substance use). Given the individual and societal costs of addiction (Rehm et al., 2009), it is important to develop theories that can account for dyscontrol and measures that can predict failure to control consumption.

Dual-process theories of addiction propose that failure to control alcohol use can result from either strong associations between alcohol-related cues and appetitive motivational responses or weak cognitive control processes required for overriding unwanted impulses (Deutsch and Strack, 2006; Wiers and Stacy, 2006). The associations between cues of alcohol (or other drugs) and appetitive response can be understood as developing through repeated experience of the reinforcing effects of alcohol with the result that alcohol-related cues become conditioned incentive stimuli (Robinson and Berridge, 2001; Stewart et al., 1984). Importantly, this perspective proposes that the strength of the associations should be represented in the extent to which cues automatically activate appetitive responses (Fazio, 2001; Strack and Deutsch, 2004; Tiffany, 1990).

The idea of *transfer-appropriate-processing* states that the greater the overlap in the processes that contribute to a behavior and those that contribute to performance on a measure, the better the measure will be in predicting the behavior (Roediger, 1990). Given that dyscontrol involves a non-volitional (automatic) element, its prediction should be improved by using measures designed to assess automatic processes (cf., De Houwer, 2006). Initially, explicit measures (i.e., introspective self-report) were used to

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assess the strength of alcohol attitudes and expectancies. Although such explicit measures have been shown to predict drinking behavior (Burden and Maisto, 2000; Stacy et al., 1990), it has been argued that the contribution of associative strength to explicit measure scores can be obscured by processes such as reactivity and self-presentation (Greenwald and Banaji, 1995). In contrast, implicit measures are less reliant on introspection and instead provide information about the automaticity of associations through indices such as response latencies (De Houwer et al., 2009). One widely used measure is the Implicit Association Test (IAT; Greenwald et al., 1998). In the IAT, participants categorize stimuli from four categories by pressing one of two response keys. In the critical blocks, two categories are assigned to each key (in one block, left key = *alcohol* and *positive* and right key = *softdrink* and *negative*; in the second block the pairings are switched). The IAT is based on the logic that response time should be faster when strongly associated concepts are paired on the same key. Evidence for the capability of the IAT to assess automatic processes includes findings that compared to explicit measures, the IAT is more difficult to fake (Steffens, 2004) and that a cognitive load does not reduce the IAT's construct validity (Schmitz et al., 2013).

The idea of transfer-appropriate-processing is supported by research showing that compared to explicit measures, implicit measures such as the IAT are better at predicting spontaneous behavior (Asendorpf et al., 2002; Huijding and de Jong, 2006; Perugini, 2005, study 2). Although there is accumulating evidence that the IAT and other implicit measures predict variance of alcohol use over and above that accounted for by explicit measures (Reich et al., 2010), relatively little research has examined their predictive validity in regards to dyscontrolled drinking. Previous work has shown that the IAT predicts failure to control alcohol consumption in the lab (Ostafin et al., 2008) and differentiates treatment-seeking alcohol dependent individuals from social drinkers (Dickson et al., 2013). Another study found that the IAT was positively related to self-reported difficulty controlling alcohol use (Palfai and Ostafin, 2003). Although both Dickson et al. (2013) and Ostafin et al. (2008) found that the IAT continued to predict dyscontrol when controlling for explicit measures, neither controlled for typical drinking behavior and an explicit measure simultaneously. Further, the implicit and explicit measures in these studies were structurally dissimilar (i.e., the scale labels in the explicit measures were not used as category labels or exemplars in the implicit measures). Previous research has shown that structural dissimilarity reduces the strength of relation between implicit and explicit measures (Payne et al., 2008). Controlling for structural similarity would thus increase confidence that an implicit measure's incremental predictive validity is due to different functional properties of the measures (i.e., automatic or controlled processes) rather than different types of associations. Last, Palfai and Ostafin (2003) did not control for either an explicit measure of alcohol associations or typical drinking behavior. It is important to control for these variables in order to demonstrate that the IAT is not redundant with them (e.g., is not simply a proxy for typical drinking behavior).

The current study was designed to extend the Palfai and Ostafin (2003) findings by examining whether an implicit measure of alcohol attitude would predict alcohol dyscontrol, even when controlling for typical drinking behavior and an explicit measure of alcohol attitude that is structurally similar to the implicit measure.

2. Methods

2.1. Participants

Sixty-two students participated for a class requirement. Age ranged from 18 to 27, with a mean of 20.6 (SD = 1.9). The sample was primarily male (57%) and White (95%) and reported drinking 3.0 (SD = 2.6) days/week (range from 0 to 7 days) and 5.4 (SD = 6.3) drinks/occasion (range from 0 to 25) over the previous month.

2.2. Measures

2.2.1. Alcohol consumption. A calendar-based measure was used to assess drinking behavior over the previous month, including frequency of use and quantity/occasion. Calendar measures of alcohol use have demonstrated good reliability and validity (Sobell et al., 1979; Sobell and Sobell, 1992). The drinking behavior variables demonstrated positive skew and were subsequently log-transformed.

2.2.2. Dyscontrolled alcohol use. The Govern scale of the Temptation and Restraint Inventory (Collins and Lapp, 1992) was used to assess difficulty of controlling alcohol consumption. This scale is scored as the mean of three items ("Do you ever find that once you start drinking it is difficult for you to stop?", "How much difficulty do you have controlling your drinking?", and "How much effort does it take for you to keep your drinking under control?") assessed with a nine-point scale with the anchors of *never* to *always* for the first item and *none* to *a great deal* for the second and third items. The scale demonstrated good internal consistency (*Cronbach's alpha* = 0.87). The scale demonstrated positive skew and was log-transformed.

2.2.3. Implicit measure of alcohol–valence associations. Automatic alcohol–valence associations were assessed with an IAT (Greenwald et al., 1998), presented on Inquisit software (Draine, 2004). Participants were instructed to press one of two response keys to categorize verbal stimuli as being related to the target categories of *Alcohol* (alcohol, beer, cocktail, liquor, wine) or *Softdrink* (iced-tea, juice, lemonade, sodapop, softdrink) and the attribute categories of *Positive* (enjoyable, good, happy, like, pleasant) or *Negative* (awful, bad, dislike, unhappy, unpleasant). The IAT was presented in seven blocks: (a) 20-trials of *Alcohol* vs. *Softdrink*; (b) 20-trials of *Positive* vs. *Negative*; (c) 40-trials of *Alcohol* + *Positive* vs. *Softdrink* + *Negative*; (d) a second 40-trial combination block with the same pairing as (c), (e) a 20-trial block in which the attribute categories were reversed (*Negative* vs. *Positive*); (f) 40-trials of *Alcohol* + *Negative* vs. *Softdrink* + *Positive*; and (g) a second 40-trial reversed combination block with the same pairing as (f). Errors led to an error message after which participants were required to make the correct response before the next trial. The IAT score was calculated with the D_1 algorithm from Greenwald et al. (2003), as D measures have shown superior construct validity and psychometric properties with internet (Greenwald et al., 2003) and laboratory (Glashouwer et al., 2013) samples. Larger IAT scores indicated stronger alcohol-positive relative to alcohol-negative associations. The mean error rate was 6.45% (SD = 4.72, range from 0.0 to 23.1%). Internal consistency was assessed by creating two IAT scores (blocks c and f and blocks d and g). The correlation between the two scores, $r(62) = 0.40$, $p = 0.001$, was similar to values in previous research (Nosek et al., 2005).

2.2.4. Explicit measure of alcohol–valence associations. A self-report measure of alcohol attitudes consisted of five items, using a scale ranging from −5 to +5. In order to increase structural similarity, the anchors of the questions consisted of the same attribute items used in the IAT: *Dislike-Like, Bad-Good, Unpleasant-Pleasant, Unhappy-Happy*, and *Awful-Enjoyable*. The scale demonstrated good internal consistency (*Cronbach's alpha* = 0.96).

2.3. Procedure

Participants completed the study in private workstations. After signing an informed consent, participants completed the IAT and then a set of questionnaires including the explicit measure of alcohol motivation, drinking behavior, and the Govern scale.

3. Results

Studentized residuals from a regression analysis of the Govern scale on the IAT indicated two outliers (scores greater than 2). These were removed before conducting the analyses (positive results remained statistically significant when including the outliers).

Given that questions regarding difficulty in controlling alcohol consumption may be best examined with individuals who drink, the analyses were conducted with the total sample, participants who consumed alcohol over the previous month ("drinkers"; n = 45), and participants who endorsed consuming five or more drinks in a day at least once a week ("heavy drinkers", n = 30).

We first tested whether an implicit measure of alcohol–valence associations would predict difficulty of controlling drinking behavior with bivariate correlation analyses. As shown in Table 1, the IAT demonstrated a statistically significant relation with self-reported difficulty of controlling drinking behavior, $r(60) = 0.35$, $p = 0.006$ (for drinkers, $r(45) = 0.36$, $p = 0.015$; for heavy drinkers, $r(30) = 0.44$, $p = 0.016$), indicating a medium effect size (Cohen, 1988). In the full

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