



Examination of approach and avoidance inclinations on the reinforcing value of alcohol[☆]

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HIGHLIGHTS

- Effects of craving and competing desires on alcohol demand are examined.
- Results illustrate the importance of both approach and avoidance on alcohol demand.
- Avoidance improves the prediction of the craving-alcohol demand relationship.
- Strategies enhancing avoidance may have indirect effects on alcohol demand.

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ABSTRACT

Although behavioral economics tends to focus on environmental factors (i.e., price, availability) that act to influence valuation of alcohol, recent research has begun to address how motivational and cognitive factors influence an individual's demand for alcohol. Motivational states, including craving, are one possible mechanism underlying the value based decision making that demand represents. Using a multidimensional model of craving (Ambivalence Model of Craving), the current study examined the relationships between indices of alcohol demand (i.e., reinforcing value of alcohol) and craving (i.e., approach inclinations), and the ways in which competing desires moderate that relationship (i.e., avoidance inclinations). Individuals who reported consuming alcohol in the past month were recruited for the study using Amazon's Mechanical Turk. A total of 529 participants (mean age = 33.03 years, $SD = 8.85$) completed a series of surveys assessing their drinking behavior and other alcohol-related measures. Multiple regression analyses indicated that while approach significantly predicted intensity (i.e., consumption at zero cost), O_{max} (i.e., the maximum alcohol expenditure) and breakpoint (i.e., the first price that seizes consumption), avoidance moderated the relationship between approach and O_{max} and breakpoint. Specifically, follow up analyses demonstrated that higher avoidance inclinations attenuated the effect of approach inclinations on these demand indices. Finally, despite conceptual overlap between approach, avoidance, and alcohol demand, regression analyses indicated that these constructs account for unique variance in alcohol outcomes. These results illustrate the importance of considering the effects of both approach and avoidance inclinations on an individual's valuation of alcohol.

1. Introduction

Despite decades of research on the etiology and treatment, Alcohol Use Disorder (AUD) continues to significantly impact society with an estimated 29% of adults meeting criteria in their lifetime (Grant, Goldstein, Saha, et al., 2015). As such, careful investigations into the processes underlying problematic drinking are needed, including broader evaluation of theoretical components that may explain drinking behavior. Several promising theories attempting to explain problematic drinking have been proposed, including behavioral

economics. Behavioral economics focuses on environmental factors such as price and availability that influence the reinforcing value of alcohol (see Bickel, Madden, & Petry, 1998). Research examining the reinforcing value of alcohol (i.e., alcohol demand) has demonstrated consistent relationships between higher alcohol demand, quantity and frequency of drinking, and alcohol-related problems (Murphy & MacKillop, 2006; Murphy, MacKillop, Skidmore, & Pederson, 2009). Although this perspective provides a useful conceptualization of problematic drinking behavior, it often fails to address cognitive and motivational factors associated with demand, and the decision to use more

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broadly. Research into factors associated with alcohol demand may provide a better understanding of value based decision making, including the identification of treatment targets for changing drinking behaviors. The current study sought to examine the influence of motivational states on the reinforcing value of alcohol.

1.1. Behavioral economics and alcohol demand

Alcohol demand represents the value an individual places on alcohol. As such, those with problematic alcohol use are posited to place higher value on alcohol than other commodities, and are more willing to allocate more resources to obtaining alcohol than non-problematic drinkers (Bickel, Johnson, Koffarnus, MacKillop, & Murphy, 2014). More broadly, alcohol demand reflects the level of reinforcement an individual anticipates from consuming alcohol.

Alcohol demand is most widely assessed using the Alcohol Purchase Task (Murphy & MacKillop, 2006), which yields four indices: intensity (reported consumption at zero cost), O_{\max} (the maximum alcohol expenditure), P_{\max} (price at which consumption starts to be affected in relation to the change in price), and breakpoint (the first price that seizes consumption). In addition, elasticity of demand can also be derived, reflecting how much demand declines with increasing price. While these demand indices are functionally related to one another, theoretically they reflect distinct measures of reinforcement (Bickel, Marsch, & Carroll, 2000). More importantly, in a recent meta-analysis of studies using the APT, while some effect sizes were small, all indices of demand had significant associations with alcohol consumption, alcohol-related problems, and/or AUD symptoms (Kiselica, Webber, & Bornovalova, 2016). Further, intensity and O_{\max} tend to exhibit the most robust associations with drinking behavior and alcohol-related problems (MacKillop & Murphy, 2007; Murphy et al., 2009).

Though the validity of alcohol demand indices has been established, research is only beginning to examine contextual factors influencing demand. For example, stress and symptoms of depression and PTSD (Amlung & MacKillop, 2014; Murphy et al., 2013), impulsivity (Gray & MacKillop, 2014; Kiselica & Borders, 2013; Smith et al., 2010) and drinking motives (Yurasek et al., 2011) have all been linked to elevated demand. However, despite these findings, there is a lack of research examining broader cognitive and motivational factors. For example, craving and basic motivational states (i.e., to approach a stimulus, to avoid a stimulus) have strong influences on the decision to engage in alcohol use and may be powerful influences on the valuation of alcohol.

1.2. Craving and demand

Craving, acting as a powerful motivational state, has been theorized to influence the value placed on a commodity (Loewenstein, 1996). Research examining the associations between craving, traditionally defined as an intense desire to use, and alcohol demand suggests that the experience of craving increases the reinforcing value of alcohol (e.g., Ramirez, Dennhardt, Baldwin, Murphy, & Lindgren, 2016; MacKillop, O'Hagen et al., 2010; MacKillop, Miranda et al., 2010). For example, MacKillop, Miranda et al. (2010) demonstrated that higher demand (intensity) was associated with higher reported alcohol craving. Research has also shown that exposure to alcohol-related cues increases subjective craving along with an increase in intensity, O_{\max} and breakpoint (MacKillop, O'Hagen et al., 2010). Though it is clear that a relationship between craving and indices of demand exists, further research is needed that considers the full spectrum of motivational influences.

1.3. Approach and avoidance inclinations

The Ambivalence Model of Craving (AMC; Breiner, Stritzke, & Lang, 1999) offers a broader conceptualization, defining craving in terms of both approach (i.e., desire to use) and avoidance (i.e., desire to avoid

using) inclinations. Although a variety of historical and current factors are posited to influence these inclinations (see Breiner et al., 1999), of note, positive and negative consequences of alcohol use largely affects their development. More importantly, considering both approach and avoidance allows for capturing the motivational conflict that arises when an individual simultaneously wants to use alcohol and wants to avoid using alcohol (i.e., ambivalence). Indeed, it has been argued that measuring approach in the absence of avoidance may misrepresent a person's motivational state (Breiner et al., 1999).

The importance of considering both approach and avoidance inclinations in the study of drinking outcomes has been demonstrated in the literature. Specifically, approach and avoidance has been shown to predict drinking behavior and related variables, including quantity and frequency of alcohol consumption, stages of readiness to change, and alcohol-related problems (Schlauch, Breiner, Stasiewicz, Christensen, & Lang, 2013; Schlauch, Rice, Connors, & Lang, 2015; Stritzke, Breiner, Curtin, & Lang, 2004). Importantly, those high on both approach and avoidance consume significantly less alcohol than those high on approach inclinations alone (Schlauch et al., 2013; Schlauch et al., 2015). This suggests that avoidance attenuates the effect of approach inclinations on drinking behavior, highlighting the importance of competing desires in the study of craving.

1.4. Current study

The current study sought to examine the associations between approach and avoidance inclinations and indices of alcohol demand. Based on the basic learning principles used to explain elevated demand (e.g., MacKillop, 2016) and the development of approach and avoidance inclinations (Breiner et al., 1999), we hypothesized that avoidance would moderate the relationship between approach and demand indices, such that the effect of approach inclinations on alcohol demand indices would be lower among those with higher avoidance when compared to those lower on avoidance inclinations. Further, we explored the extent to which demand indices, approach and avoidance accounted for unique variance in drinking outcomes.

2. Materials and methods

2.1. Participants

A total of 600 individuals were recruited using Amazon's Mechanical Turk (MTurk) for participation in a study assessing substance use and alcohol-related attitudes. Participants were required to a) be at least 18 years of age; b) speak English; c) report consuming alcohol at least once in the past month; and d) have a 90% hit approval rate on M-Turk (to aid in ensuring reliability of responses). Data from 63 individuals were excluded from analyses due to failed validity check items (see procedures for more details) and 8 participants were removed due to inconsistent responding (e.g., reversals from zero) on the APT, resulting in a final sample of 529.

Participants had a mean age of 33 ($SD = 8.85$) years, with a range of 19 to 64 years. There were approximately equal numbers of males and females (53.3% and 46.6%, respectively), and the sample was predominately Caucasian (78.4%; 6.9% African American, 7.3% Asian; 7.4% Other or Multi-racial). Approximately half of participants (53.8%) reported an income below \$40,000, 22.2% reported an income between \$40,000 and \$60,000, and 24% reported an income above \$60,000. A majority of participants reported full-time employment (65.4%; 14.5% part-time; 12.3% unemployed; 7.8% other). With regard to drinking behaviors, participants reported consuming alcohol approximately twice per week ($M = 2.09$, $SD = 2.64$) and 3.57 ($SD = 2.28$) drinks per drinking occasion. Approximately 57% of participants indicated drinking at least once per week, with 37% (or 21% of the total sample) reporting binge levels (i.e., ≥ 4 drinks for women, ≥ 5 for men in one occasion). Finally, participants on average experienced a low number of

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