



Positive Attitudes Toward Alcohol and Impaired Self-Regulation: A Behavioral Economic Analysis



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BACKGROUND

In behavioral economic theories of addiction, the relative reinforcing efficacy (RRE) of alcohol (or other drugs of abuse) describes the extent to which the substance is capable of influencing individual drinking behavior. RRE can be reliably measured via hypothetical purchase tasks that ask participants to describe how many drinks they would purchase at different price points (Murphy, MacKillop, Skidmore, & Pederson, 2009). This produces a demand curve with several different behavioral economic measures of RRE, including intensity (the number of drinks consumed when free) and elasticity (the extent to which increasing drink prices reduce demand for alcohol). Individual differences in RRE have been shown to predict alcohol consumption and alcohol-related problems (Murphy & MacKillop, 2006; Murphy et al., 2009). Little, however, is known about individual differences in RRE among non-alcohol dependent young-adult social drinkers. Understanding predictors of RRE in this group of drinkers at risk for developing alcohol-use disorders may be critical in guiding preventive efforts.

HYPOTHESES

In this study, we sought to assess the extent to which two well-known correlates of problem drinking: (1) positive attitudes toward alcohol (Greenwald, McGhee, & Schwartz, 1998; Jajodia & Earleywine, 2003; Lindgren, Neighbors, Westgate, & Salemink, 2014), and (2) trait impulsivity (de Wit, 2009; Houben & Wiers, 2009), contribute to individual differences in RRE. Consistent with previous reports (Burton, Pedersen, & McCarthy, 2012), we hypothesized that social drinkers with positive attitudes toward alcohol who also exhibit high levels of impulsivity would have particularly high levels of RRE.

METHODS

In the current study, we collected data on participant attitudes toward alcohol, impulsivity, and economic decisions about alcohol consumption.

Participants

- Participants were 36 healthy young adult social drinkers (22 female, 14 male) with a mean age of 19.6 years ($SD = 1.9$).
- Reported ethnicity: Caucasian (42%), African American (23%), Hispanic (17%), and Asian (17%).
- Participants began drinking at age 19.2 ($SD = 2.2$) and consumed an average of 3.7 ($SD = 1.9$) drinks per drinking episode with 2.8 ($SD = 1.2$) drinking episodes per week.

Implicit Association Test (IAT)

Participants completed a modified IAT (Greenwald et al., 1998; Wiers, Van Woerden, Smulders, & De Jong, 2002) that measured the strength of their associations between approach/avoid attribute words and target images of alcohol and water.

Delay Discounting Task (DDT)

Trait impulsivity was assessed by a computerized DDT (Richards, Zhang, Mitchell, & de Wit, 1999) in which participants indicated their preference for receiving an amount of money at the end of the testing session against a larger amount of money after a waiting period of 0, 2, 30, 180, or 365 days. A delay discounting curve was then computed individually for each participant, with the coefficient of "steepness" of the curve (known as "k") indicating his or her relative impulsivity.

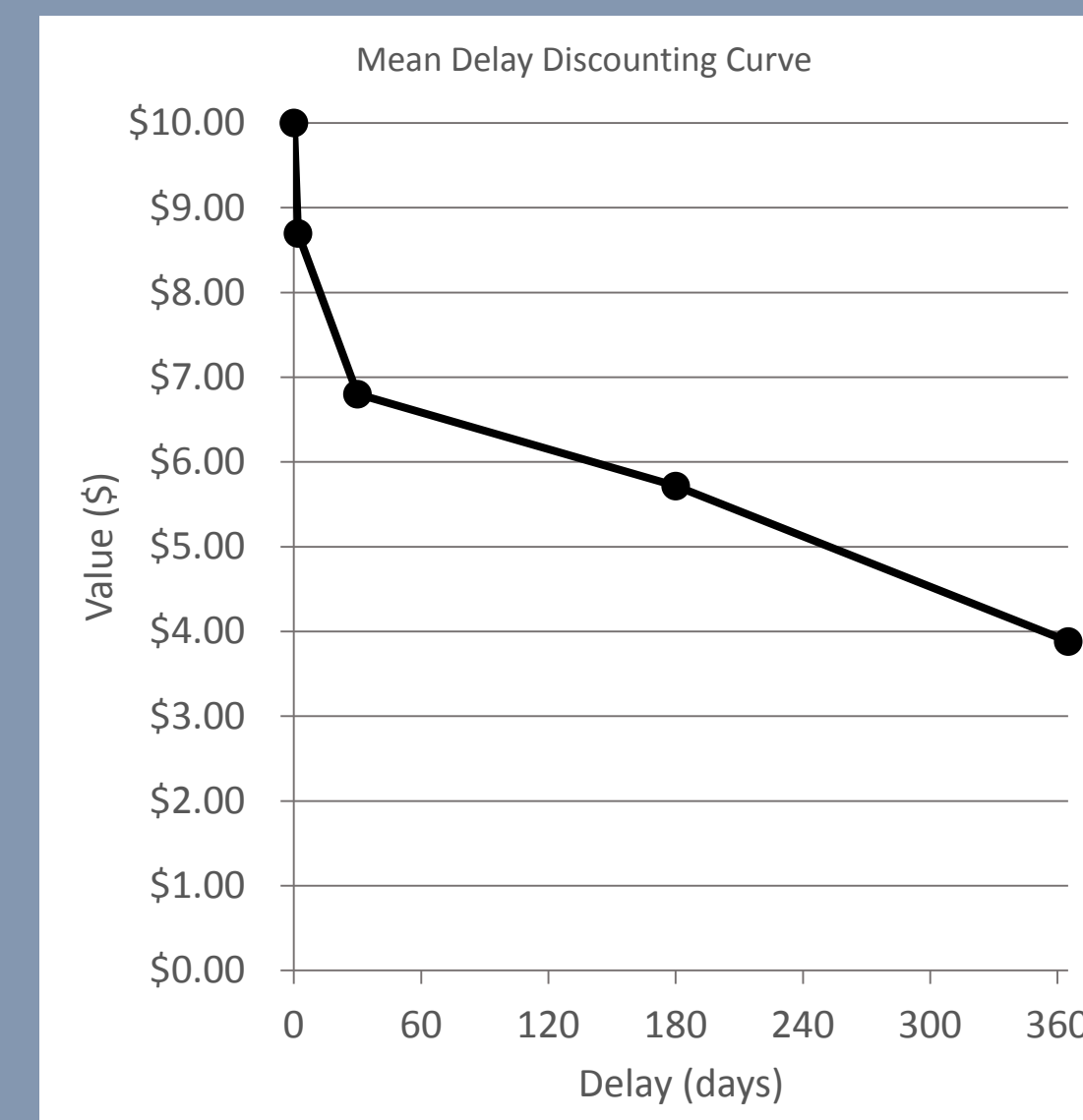


Figure 1: Mean delay discounting curve for all participants.

Alcohol Purchase Task (APT)

The APT (Murphy & MacKillop, 2006) was used to assess participant demand for alcohol via behavioral economic analysis. The APT, which asks participants to estimate how many drinks they would purchase at different price points, yields multiple behavioral measures (Murphy & MacKillop, 2006; Murphy et al., 2009), including:

- Intensity – the number of drinks a participant would consume if the drinks were free.
- Elasticity – the degree to which an increased per-drink price impacts the number of drinks consumed in a hypothetical drinking situation: lower elasticity represents reduced sensitivity to the effects of increasing cost.

Intensity and elasticity can be observed directly from the APT data or derived via a regression equation. In this study, we examined observed and derived values for comparative purposes.

RESULTS

IAT and RRE for Alcohol

- Multivariate analyses of IAT preference for alcohol was significantly predictive of the derived indices of the APT (intensity and elasticity): $F(2,28) = 3.8, p = 0.041$.
- Univariate analyses revealed that IAT score significantly predicted reduced elasticity: $b = -0.004, SE = 0.001, p = 0.018$, indicating that participants with stronger positive implicit associations about alcohol were less likely to reduce their alcohol consumption as per-drink prices increased.
- IAT scores predicted increased intensity with marginal significance: $b = 7.85, SE = 3.8, p = 0.05$.

STUDY VARIABLES	Mean	SD
IAT	-0.32	0.35
Delay Discounting (Discounting Coefficient "k")	0.55	2.0
Alcohol Purchase Task		
<i>Observed Indices</i>		
Intensity	6.63	4.17
Breakpoint	13.10	4.67
O-max*	12.31	4.95
P-max*	12.31	4.95
<i>Derived Indices</i>		
Elasticity	0.0092	0.003
Intensity	7.77	5.59

*P-max and O-max are equal in this sample because all participants reported a purchase of exactly 1 drink at the maximum expenditure.

Delay Discounting and RRE for Alcohol

- The mean delay discounting coefficient (k) was 0.55 ($SD = 2.0$), reflecting considerable variability in discounting within the sample.
- Delay discounting was related to neither the observed [$F(3,19) = 0.64, p = 0.599$] nor the derived [$F(2,20) = 1.5, p = 0.254$] indices of the APT.

The IAT x Delay Discounting Interaction and RRE for Alcohol

- Interestingly, the interaction between delay discounting and implicit associations significantly predicted the derived indices of the APT, $F(2,20) = 3.94, p = 0.037$.
- Univariate analysis revealed that this effect was apparent for elasticity [$F(1,20) = 8.09, p = 0.010$], but not for intensity [$F(1,20) = 0.48, p = 0.497$]. The interaction between delay discounting and implicit associations did not predict observed indices of the APT, $F(3,19) = 0.07, p = 0.974$.

	Multivariate		Elasticity		Intensity	
	F	p	F	p	F	p
IAT	3.8	0.041	6.6	0.018	4.3	0.050
DD	1.5	0.254	1.8	0.197	0.3	0.599
IAT x DD	3.9	0.037	8.1	0.010	0.5	0.497

Table 1 – Summary of relationships between IAT and DDT results and the derived indices of the APT.

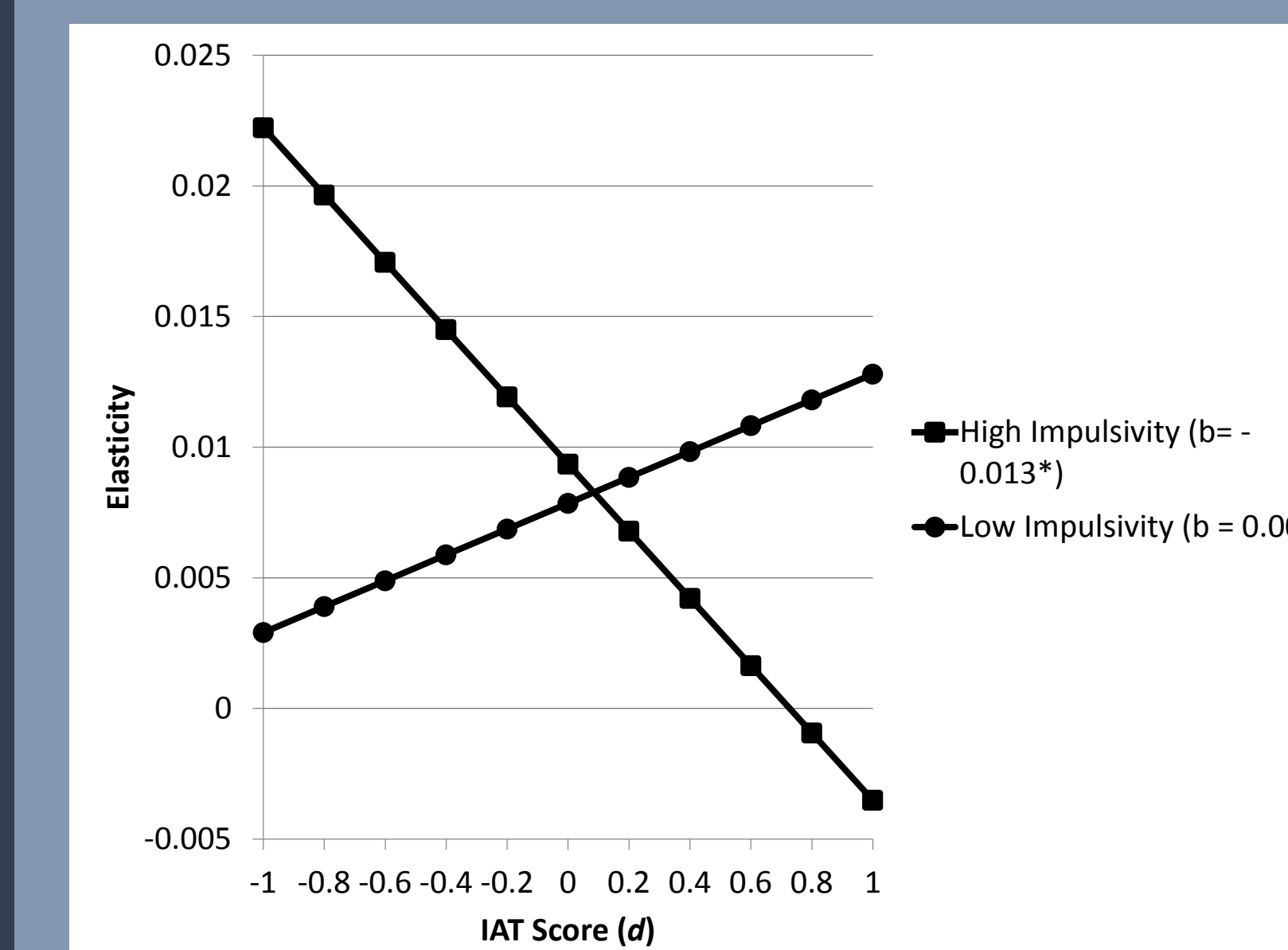


Chart 1 – Simple slopes analysis of the interaction.

A simple slopes analysis (Aiken & West, 1991) indicated that among participants exhibiting high levels of delay discounting (+1 SD), IAT score predicted significant decreases in price elasticity ($b = 0.013, SE = 0.004, p = 0.004$). On the other hand, for participants who exhibited lower levels of delay discounting (-1 SD), IAT was not predictive of price elasticity ($b = 0.005, SE = 0.003, p = 0.100$).

DISCUSSION

As hypothesized, IAT scores predicted elasticity and intensity on the APT, which accords with past research that has found IAT scores to be predictive of drinking behavior (Jajodia & Earleywine, 2003; Lindgren et al., 2014). Contrary to expectations, and despite strong evidence that links delay discounting to alcohol use outcomes (see, e.g., Field, Christiansen, Cole, & Goudie, 2007) we did not find delay discounting scores to be predictive of elasticity or intensity on the APT.

As in previous research (Burton et al., 2012), impulsivity was found to moderate the relationship between positive attitudes toward alcohol and drinking behavior. This study helps to develop the concept that impulsivity may be a significant contributor to the development of problematic drinking behavior.

Our finding of a significant multivariate interaction between IAT scores and delay discounting coefficients appears to be driven by effects on elasticity rather than intensity. The fact that more positive IAT scores predicted elasticity but not intensity in individuals with greater impulsivity is perhaps not surprising: delay discounting measures the extent to which long-term gain is valued against short-term reward, and reductions in elasticity result in spending more money on alcohol in the short-term rather than allocating that money for alternate use in the long-term.

Findings suggest that a combination of reduced sensitivity to delayed reward and positive attitudes toward drinking can contribute to drinking decisions in young adult social drinkers.

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