

# Multidimensional Assessment of Impulsivity in Undergraduate Hazardous Drinkers and Controls\*

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**ABSTRACT. Objective:** Alcohol misuse in college students represents a significant public health problem. Toward improving the understanding of determinants of collegiate alcohol misuse, the current study examined several dimensions of impulsivity in relation to hazardous drinking in college students. **Method:** A one-way, two-group, cross-sectional design was used to compare hazardous drinkers (HZD) with social drinkers (SOC). HZD drinkers were required to score 6 or more on the Alcohol Use Disorders Identification Test (AUDIT); SOC drinkers were required to score 1-5 on the AUDIT. The sample comprised 93 participants (56% HZD; 76% male) who were recruited from a medium-sized public university. Participants were assessed under neutral conditions using the Eysenck Impulsivity Questionnaire (EIQ), Delay Discounting Task (DDT), and Stanford Time Perspective Inventory

(STPI). **Results:** Consistent with predictions, HZD participants exhibited significantly greater impulsivity on the EIQ-Impulsivity subscale ( $p < .001$ ), the STPI-Present Hedonism subscale ( $p < .01$ ), and the STPI-Future subscale ( $p < .01$ ); however, no differences were evident on the DDT ( $p > .40$ ). The HZD group also scored marginally higher than the SOC group on the EIQ-Venturesomeness subscale ( $p < .10$ ). **Conclusions:** These findings suggest that greater impulsivity is associated with alcohol misuse in college students, most prominently in the area of propensity toward risk-taking and nonplanning (EIQ-Impulsivity subscale). The correspondence between these findings and previous studies, methodological considerations, and the need for prospective studies on impulsivity and alcohol misuse in college students are discussed. (*J. Stud. Alcohol Drugs* **68**: 785-788, 2007)

ALCOHOL MISUSE ON UNIVERSITY CAMPUSES currently constitutes a significant public health problem (Hingson et al., 2005). Epidemiological studies have found alcohol misuse to be associated with increased risk of academic impairment (e.g., Wechsler et al., 1998), physical assault (e.g., Presley et al., 1996), sexual assault (e.g., Abbey et al., 1998), and accidental injury or death (e.g., Hingson et al., 2005). However, in contrast to the clear data on the extent and consequences of college alcohol misuse, considerably less is known about specific traits and processes that contribute to the problem. Understanding the determinants of excessive collegiate drinking could have manifold benefits, such as suggesting appropriate prevention or intervention strategies and clarifying variables associated with persistent drinking problems (e.g., Jennison, 2004; O'Neill et al., 2001).

Impulsivity is one personality trait that is a clear candidate. Evidence suggests that impulsivity is generally associated with greater alcohol misuse (for a review, see Sher et al., 1999), and recent prospective research suggests that the causal direction of this relationship is from impulsivity to alcohol consumption (Grano et al., 2004), not the other way around. Moreover, several studies have revealed a positive association between impulsivity and alcohol misuse in college students (e.g., Benjamin and Wulfert, 2005; James and Taylor, 2007; Vuchinich and Simpson, 1998).

However, a limitation of the existing literature is that many studies use only one index of impulsivity (e.g., Benjamin and Wulfert, 2005; James and Taylor, 2007), and impulsivity is a multifaceted construct (Evenden, 1999), comprising aspects of risk-taking proneness (e.g., Eysenck and Eysenck, 1978), subjective evaluation of immediate rewards (e.g., Ainslie, 1975), and time perspective (e.g., Zimbardo and Boyd, 1999), among others. This is further complicated by the fact that these diverse aspects are not always associated with each other (e.g., Monterosso et al., 2001; Vuchinich and Simpson, 1998). As such, it is unclear which specific aspects of impulsivity are most relevant to collegiate alcohol misuse and the goal of the current study was to address this issue more precisely by examining multiple dimensions of impulsivity in hazardous college drinkers (HZD) and a control group of social drinkers (SOC). We predicted that, compared with the SOC group, the HZD group would exhibit greater impulsivity but made

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no predictions regarding which dimensions would reveal the most prominent differences.

## Method

### *Participants*

The sample was drawn from a larger study validating several gambling assessment instruments (MacKillop et al., 2006). Inclusion criteria were drinkers who scored 6 or more on the Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001) for the HZD group (a validated criterion for hazardous drinking in college students; Aertgeerts et al., 2000) and from 1 to 5 for the SOC group. These criteria were consistent with the goal of studying impulsivity and misuse of alcohol, not just use. Included in the sample were 52 individuals who met the criteria for the HZD group and 41 who met the criteria for the SOC group. The HZD group was approximately 19 years old (mean [SD] = 19.75 [2.58]); 83% male; and, in terms of race, composed of white (63%), Asian (31%), Hispanic (4%), and black (2%) individuals. The SOC group was of a similar age (mean = 19.35 [1.65]) and gender ratio (67% male) but was somewhat more racially diverse, including white (41%), Asian (32%), Hispanic (12%), black (12%), and other (2%) individuals. Participants in the HZD group had a mean AUDIT score of 11.82 (4.71), whereas participants in the SOC group had a mean score of 2.85 (1.46). Based on modal responses, participants in the HZD group were most different from the SOC group in quantity and frequency of drinking, not negative consequences from drinking.

### *Assessment*

Alcohol use was assessed using the AUDIT. Impulsivity was assessed using four indices: the Impulsivity subscale of the Eysenck Impulsivity Questionnaire (EIQ; Eysenck and Eysenck, 1978), the Delay Discounting Task (DDT; Green et al., 1994), and the Present Hedonism and Future subscales of the Stanford Time Perspective Inventory (STPI; Zimbardo and Boyd, 1999). The EIQ-Impulsivity subscale defines impulsivity as a personality orientation toward nonplanning and risk taking. The DDT defines impulsivity as an individual's relative preference for smaller immediate rewards compared with larger delayed rewards; the administration of the DDT in this study matched that of Madden et al. (1997). In contrast to the DDT, the subscales of the STPI assess impulsivity as more general myopia for the future (Zimbardo and Boyd, 1999). The Present Hedonism subscale assesses an orientation toward short-term pleasure and unwillingness to make sacrifices for future reward. The Future subscale assesses an orientation toward long-term planning and willingness to pursue such goals

(Zimbardo and Boyd, 1999). Finally, although conceptualized as distinct from impulsivity, the EIQ-Venturesomeness subscale, measuring the related construct of thrill-seeking propensity, was also assessed. These measures were selected because of their previous use implicating impulsivity with substance misuse (e.g., Benjamin and Wulfert, 2005; Keough et al., 1999; Vuchinich and Simpson, 1998). Of note, because the larger study was related to gambling, lifetime gambling involvement was assessed using the South Oaks Gambling Screen (Lesieur and Blume, 1987).

### *Procedure*

The Human Subjects Research Review Committee at the State University of New York at Binghamton, Binghamton, NY, approved all procedures. Participants underwent a 90-minute assessment session, completing informed consent at the outset. The self-report questionnaires were counterbalanced by participants to avoid order effects. Participants were compensated with either course research credit or \$10, at their preference.

### *Data analysis*

All data were initially screened for potential anomalies. Data from the DDT were used to generate an estimate of each participant's temporal discounting function using non-linear regression with the following hyperbolic equation (Mazur, 1987):  $V = A/1 + kD$ , where  $V$  is the subjective value of the delayed reward,  $A$  is the objective value of the delayed reward,  $D$  is the delay duration, and  $k$  is the empirically determined constant proportional to the degree of delay discounting (i.e., temporal discounting function). The principal analyses used univariate analyses of variance (ANOVAs) to compare impulsivity by hazardous drinking status, with partial eta squared ( $\eta_p^2$ ) as a measure of effect size. Continuous analyses were conducted using Pearson product-moment correlations.

## Results

No data were missing, but 10 participants provided erratic responses on the DDT, and those data were excluded from analysis. For the remaining participants, Mazur's (1987) equation generally provided a very good fit to the data (median  $R^2 = .86$ , interquartile range = .37-.94), reflecting hyperbolic discounting of delayed rewards. All distributions were approximately normal, with the exception of the temporal discounting function, which required a logarithmic transformation to normalize the distribution, as is common.

Significant positive associations were evident between EIQ-Impulsivity and STPI-Present Hedonism ( $r = .64$ ,  $p < .01$ ) and EIQ-Venturesomeness ( $r = .27$ ,  $p < .05$ ), and

TABLE 1. Means, standard errors, *F* ratios, and effect sizes ( $\eta_p^2$ ) for comparisons of social drinkers (SOC) and hazardous drinkers (HZD) on indices of impulsivity and other associated subscales

Measure	SOC ( <i>n</i> = 41)		HZD ( <i>n</i> = 52)	
	Mean (SE)	Mean (SE)	<i>F</i>	$\eta_p^2$
EIQ-Impulsivity	8.76 (0.71)	12.77 (0.63)	17.68 <sup>‡</sup>	.16
EIQ-Venturesomeness	9.37 (0.57)	10.81 (0.51)	3.56 <sup>§</sup>	.04
STPI-Present Hedonism	48.66 (1.33)	53.29 (1.18)	6.77 <sup>†</sup>	.07
STPI-Future	45.71 (1.36)	40.83 (1.21)	7.17 <sup>†</sup>	.07
Delay Discounting Task	0.17 (0.05)	0.16 (0.03)	0.66	.01

Notes: Degrees of freedom for all analyses were 1/91, with the exception for the Delay Discounting Task, which were 1/81. EIQ = Eysenck Impulsivity Questionnaire; STPI = Stanford Time Perspectives Inventory.

§*p* < .10; †*p* < .01; ‡*p* < .001.

between the two latter subscales ( $r = .42, p < .001$ ). Significant negative correlations were evident between the STPI-Future subscale and EIQ-Impulsivity ( $r = -.52, p < .001$ ) and STPI-Present Hedonism ( $r = -.28, p < .01$ ). The DDT was not significantly associated with any other indices of impulsivity ( $p$ 's > .25).

Between-group comparisons revealed that, compared with the SOC drinkers, the HZD drinkers had significantly higher scores on the EIQ-Impulsivity subscale, the STPI-Present Hedonism subscale, and the EIQ-Venturesomeness subscale, although the effect was marginal in the case of the last of these three. Means, test statistics, significance, and effect sizes are provided in Table 1. Similarly, HZD drinkers had significantly lower scores on the STPI-Future subscale compared with SOC drinkers (Table 1). No significant differences were evident on the DDT (Table 1). The effect sizes observed for significant effects reflected medium-sized effects (Cohen, 1988); the trend-level EIQ-Venturesomeness finding reflected a small effect. Follow-up analyses including gambling involvement and gender as covariates did not alter the significance or nonsignificance of the preceding findings. Consistent with the between-groups findings, significant correlations in the anticipated directions were detected between the AUDIT score and EIQ-Impulsivity ( $r = .40, p < .001$ ), STPI-Present Hedonism ( $r = .34, p < .001$ ), and STPI-Future ( $r = -.24, p < .05$ ), with a trend-level association for EIQ-Venturesomeness ( $r = .20, p = .06$ ) and no association with DDT performance ( $r = .05, p > .65$ ).

## Discussion

The results of this study broadly support the hypothesis that greater impulsivity is associated with alcohol misuse in college students. The HZD group reported significantly greater impulsivity, defined as greater risk-taking and failure to plan ahead (EIQ-Impulsivity subscale); greater orientation to pleasure seeking in the present (STPI-Present Hedonism subscale); foreshortened orientation toward the future (STPI-Future subscale); and a propensity for thrill and adventure seeking (EIQ-Venturesomeness), with the

largest effect size for the first of the preceding variables. These findings were further supported by corresponding significant continuous correlations between alcohol use and the aforementioned indices, suggesting a linear relationship between those aspects of impulsivity and alcohol misuse. In contrast to these findings and contrary to our predictions, delay discounting was neither significantly greater in the HZD group nor continuously associated with alcohol misuse.

The current findings generally converge with the existing empirical literature indicating greater impulsivity in heavy-drinking college students, with the exception of the delay discounting findings. Vuchinich and Simpson (1998) conducted two experiments on discounting in college drinkers, finding a statistical trend toward greater delay discounting in heavy drinkers compared with light drinkers and significantly greater delay discounting in problem drinkers compared with light drinkers. However, the contrast to the current study may be a function of different sample selection criteria. The current study used the AUDIT criteria for hazardous drinking, whereas Vuchinich and Simpson used the relative levels of drinking or problems within a distribution of candidate participants. Moreover, the HZD and SOC group differed most in terms of the volume of alcohol consumed, suggesting this study was more similar to Vuchinich and Simpson's heavy-/light-drinker comparison, where the difference between groups was trend level. Thus, albeit obliquely, precipitous discounting in college students appears to be more related to the level of alcohol-related problems than the level of alcohol use.

There are a number of considerations to the current study that should be noted. First, there are aspects of the sample that may affect the generalizability of these findings, including its size, ethnic diversity, and that all participants reported some level of gambling behavior, albeit wide ranging (MacKillop et al., 2006). These aspects of the sample should be borne in mind when considering the applicability of these results. Second, although the study examined multiple dimensions of impulsivity, not all facets were captured. For example, measures of impulsivity as response inhibition, such as the continuous performance test (Conners, 2000) and go/no-go task (Costantini and Hoving, 1973), were not included and could not be addressed in this study. Third, it was also the case that the majority of measures were self-report, which have shared method variance and would have been balanced by additional behavioral measures.

Finally, it is important to note that the current findings reflect cross-sectional relationships. As such, it is unclear if impulsivity caused greater alcohol misuse in college students or vice versa, or if an unmeasured third variable accounts for the association (e.g., Kreek et al., 2005). Although the recent study by Grano et al. (2004) suggests that impulsivity precedes excessive drinking, the

relationship is far from definitive and that study did not address college drinking. Therefore, prospective longitudinal studies that can more definitively elucidate the relationship between impulsivity and collegiate alcohol misuse would be worthwhile.

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