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Brief report: The interaction of impulsivity with risk-taking is associated with early alcohol use initiation

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A B S T R A C T

Early alcohol use initiation is a well-established risk factor for the subsequent development of alcohol abuse and dependence. Separate lines of research indicate that impulsivity and risk-taking each are associated with early alcohol use. In this research, the association of the interaction of risk-taking and impulsivity with early alcohol initiation was examined. Results suggest the interaction between impulsivity and risk-taking was related to early alcohol initiation. Among children with lower levels of risk-taking, level of impulsivity was associated with beginning to drink. By contrast, among children with higher levels of risk-taking, level of impulsivity was not associated with the likelihood of initiating alcohol use. These findings suggest that early adolescence is a critical developmental period in which implementing an intervention to reduce impulsivity and risk-taking may be particularly effective to prevent the early initiation of alcohol use.
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Early alcohol use is a well-established risk factor for the subsequent development of alcohol abuse and dependence (Guo, Hawkins, Hill, & Abbott, 2001; Mason et al., 2011). Alarmingly, many children have their first experience with alcohol during the early middle school years (Donovan, 2007; Gunn & Smith, 2010), necessitating an understanding of psychological factors that contribute to early alcohol initiation. Risk-taking, the behavioral tendency to take risks in response to cues for potential reward, and trait impulsivity, the tendency to act immediately with diminished regard for consequences, are distinct factors that each confer risk for alcohol use in adolescents (MacPherson, Magidson, Reynolds, Kahler, & Lejuez, 2010; Pedersen, Molina, Belendiuk, & Donovan, 2012).

Research suggests that both risk-taking propensity and impulsivity increase across adolescence (Casey, Jones, & Hare, 2008) and are independently associated with early risk behaviors (MacPherson et al., 2010; Steinberg, 2008). For instance, risk-taking propensity was associated with alcohol use in early adolescent and young adult samples (Lejuez et al., 2002; Lejuez et al., 2007). Similarly, adolescent impulsivity was associated with early alcohol initiation (Gullo & Dawe, 2008).

To date, most research has considered these constructs independently with the exception of a study by Skeel, Pilarski, Pytlak, and Neudecker (2008), in which both constructs were examined in a sample of young adults. In this study, a composite personality measure of impulsivity predicted alcohol consumption while risk-taking, when considered independently, did not. However, when the joint contributions of the variables were examined, risk-taking interacted with impulsivity to predict additional variance in alcohol consumption (Skeel et al., 2008). Specifically, high levels of risk-taking were associated

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with greater increases in alcohol consumption for young adults with lower, but not higher, levels of impulsivity (Skeel et al., 2008).

According to Problem Behavior Theory (Jessor, 1991), dysfunctional and maladaptive behaviors in adolescence can result from interactions among three systems, the personality, behavior, and perceived-environment systems. Consistent with this theory, it is possible that early alcohol initiation in adolescence may arise from interactions among the personality and behavioral tendencies of impulsivity and risk-taking, respectively; however, to our knowledge, no study has examined these interrelations among adolescents as it relates to alcohol initiation.

In this study, we examined the relative effects of these constructs during early adolescence, a vulnerable developmental period for the initiation of alcohol use (Gunn & Smith, 2010) We followed a sample of youth who reported never having had alcohol over a one-year period to identify factors associated with early alcohol initiation. Based on Problem Behavior Theory and previous research with adults (Skeel et al., 2008), we hypothesized that the interaction of impulsivity and risk-taking would be associated with early alcohol use initiation, such that risk-taking would be more highly associated with the likelihood of initiating alcohol use in adolescents with low levels of impulsivity than in adolescents with high levels of impulsivity.

Methods

Participants and procedure

We used data from a sample of early adolescents ($n = 277$) participating in a larger prospective study of HIV-related risk behaviors in youth. Follow-up assessments were conducted at yearly intervals for 3 consecutive years, with additional assessments planned. All analyses used data from wave 3 of data collection during which participants were a mean age of 12.97 ($SD = 0.92$), corresponding to particularly vulnerable age for the initiating alcohol use (Gunn & Smith, 2010). In order to assess onset of alcohol use at this critical developmental period, we selected a subset of participants who did not endorse alcohol use at any previous wave ($n = 180$). The sample was 44.4% female, with 48.8% identifying as White, 35.5% Black, and 15.7% Other. Permission to conduct research was obtained from the University of Maryland Institutional Review Board (IRB).

Instruments

Impulsivity

The *Eysenck Impulsiveness Scale* (Eysenck, Pearson, Easting, & Allsopp, 1985) assesses an individual's level of impulsivity. Scores range from 0 to 19, with higher scores indicating higher levels of impulsivity. In previous research, this measure demonstrated good internal consistency, Cronbach's alpha = .84 (Eysenck et al., 1985).

Behavioral risk-taking

The *Balloon Analogue Risk Task – Youth* (BART-Y) (Lejuez et al., 2007; Lejuez et al., 2002) is the youth version of an ecologically valid, laboratory-based assessment of risk-taking propensity; average adjusted pumps were used as an index of risk-taking. (see Lejuez et al., 2002 for complete task details). The average correlation among the first, second, and third blocks of ten trials in the current study was 0.71, consistent with previous research (Lejuez et al., 2002).

Alcohol use initiation

A modified version of the Youth Risk Behavior Surveillance System (Centers for Disease Control and Prevention, 2002) was used to assess past year engagement in alcohol use at each assessment wave (MacPherson et al., 2010). Frequencies of each response option above the response option "zero" were low, with endorsement of no other response option exceeding 20%. Consistent with previous research (see MacPherson et al., 2010), a dichotomous scale was constructed to identify whether the child had engaged in alcohol use a few times or more (1) or zero to one time (0) in the past year (between wave 2 and 3).

Table 1
Correlations, means, and standard deviations of study variables.

Measure	1.	2.	3.	4.	5.	6.
1 Drinks	–					
2. BART	.091	–				
3. EIS	.066	.134	–			
4. Sex	.003	−.030	.161*	–		
5. Ethnicity	−.098	−.202*	.027	−.001	–	
6. Age	−.041	.136	.020	.236**	.005	–
Mean	.167	37.51	8.257	.52	1.732	12.97
SD	.375	13.732	4.287	.501	.723	.924

Note. BART = Balloon Analogue Risk Taking, Youth Version; EIS = Eysenck Impulsivity Scale. Drinks was coded 0 = no, 1 = yes; sex was coded 0 = Girls, 1 = Boys; ethnicity was coded 1 = Caucasian, 2 = African American, 3 = Other.
*$p < .05$; **$p < .01$.

Table 2
Hierarchical logistic regression.

Predictor	B	SE(B)	Wald	Sig.	OR	95% CI for OR	
						Lower	Upper
Step 1							
Constant	−2.648	.802	10.902	.001	0.071		
Sex	0.246	.474	0.269	.604	1.279	0.505	3.241
Age	−0.219	.263	0.695	.405	0.803	0.480	1.344
African-American	1.147	.825	0.074	.164	3.150	0.625	15.862
Other Ethnicity	0.880	.840	1.099	.294	2.412	0.465	12.503
BART	0.012	.017	0.525	.469	1.013	0.979	1.047
EIS	0.056	.055	1.041	.308	1.058	0.950	1.178
Step 2							
BART × EIS	−0.011	0.005	10.638	.001	0.989	0.980	0.998

Note. BART = Balloon Analogue Risk Taking, Youth Version; EIS = Eysenck Impulsivity Scale. Sex was coded 0 = Girls, 1 = Boys. Reference group was White for ethnic differences.

Results

Descriptive statistics

Means, standard deviations, and correlations between study variables were computed and are displayed in Table 1. One-way ANOVA tests revealed significant differences between ethnic groups on risk-taking, $F(2, 152) = 6.697$, $p = .002$. Post-hoc Tukey comparisons revealed higher levels of risk-taking in White adolescents ($M = 42.13$, 95% CI [39.12, 45.15]) than Black adolescents ($M = 33.60$, 95% CI [29.92, 37.29]). No other comparisons between groups were significant at $p < .05$.

Predicting change in drinking behaviors

Next, variables contributing to early alcohol initiation were examined using hierarchical logistic regression (see Table 2). Sequential coding was used to create two dummy variables for ethnicity, with one dummy variable coded 1 = White, 0 = Black/Other, and the next coded 1 = Black, 0 = White/Other. This approach allows for the systematic examination of differences between ethnic groups. Risk-taking, impulsivity, and age were centered to aid in interpreting interaction effects. In the first block, child age, gender, ethnicity, impulsivity and risk-taking scores were entered. Girls were used as the reference group. There were no significant predictors from block one. In the second block an interaction term between impulsivity and risk-taking scores was added. The interaction term was significant. In line with recommendations from Hayes and Matthes (2009) the interaction was probed using the Johnson-Neyman technique whereby regions of the moderator variable (i.e. risk-taking) were identified that represent the point at which the effect of the focal variable on the outcome becomes statistically significant (Hayes & Matthes, 2009). This approach is preferable to simple slope analyses or other analytic approaches which examine the statistical significance of arbitrary points related to “low” and “high” levels of the moderator. In

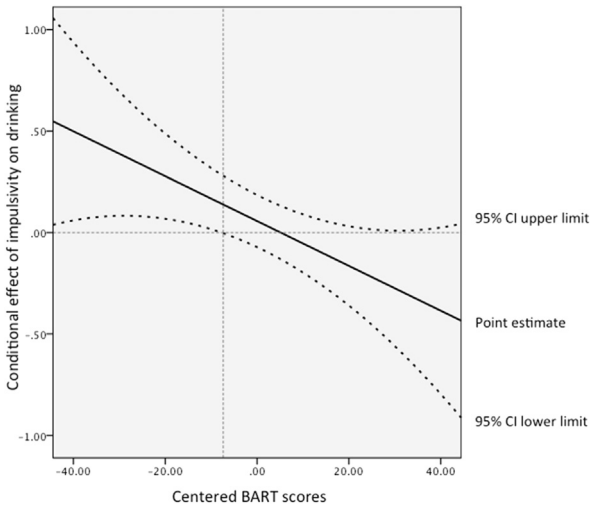

Fig. 1. Statistical significance of point estimates and confidence intervals of BART scores moderating the relation between impulsivity and drinking.

the present analyses, the Johnson-Neyman technique indicated that for children with (centered) risk-taking scores below −7.37, the association of impulsivity with alcohol use was significant. As can be seen in Fig. 1, these findings suggest that the association of impulsivity with drinking initiation becomes increasingly stronger at lower levels of risk-taking propensity.

Discussion

To our knowledge, the present study was the first to examine the interaction of impulsivity and risk-taking as they relate to early alcohol use initiation. The interaction of impulsivity and risk-taking propensity assessed in early adolescence was related to alcohol initiation in the subsequent year, such that for children with low levels of risk-taking, level of impulsivity was differentially associated with early initiation of alcohol use. Among children with lower levels of risk-taking, being impulsive was associated with beginning to drink. By contrast, among children with higher levels of risk-taking, level of impulsivity was not associated with the likelihood of initiating alcohol use. These results suggest that the interaction between these constructs contributes to the onset of early alcohol use, providing support for the hypothesis. The present results underscore the interactive roles of impulsivity and risk-taking in early alcohol use initiation, and suggest that assessing levels of only one variable may not be sufficient to increase understanding of early alcohol initiation. Rather, it may be the interplay of impulsivity and risk-taking that contributes to alcohol initiation in very young adolescents.

The present research was limited by the use of a self-report measure of impulsivity, rather than a behavioral measure. However, the fact that an interaction was found between self-reported impulsivity and behaviorally assessed risk-taking propensity even when using different assessment modalities speaks to the strength of the relationship. Future research using behavioral measures that assess various aspects of impulsivity (e.g., choice, response) would allow for a fuller characterization of the relationship among impulsivity, risk-taking, and early initiation of alcohol use. Further, while these cross-sectional analyses suggest an important relation between these constructs, longitudinal research is needed to examine temporal precedence and causal pathways.

In sum, these findings highlight the importance of considering the joint effects of impulsivity and risk-taking, and provide support for the development of interventions to reduce these vulnerabilities in order to prevent early initiation of alcohol use (Conrod et al., 2013; Reyna & Mills, 2014).

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